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Abstract

This study investigates the consequences of poor implementation in public workfare programs, focusing on the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in India. Using nationally representative data, we test empirically for a discouraged worker effect arising from either of two mechanisms: administrative rationing of jobs among those who seek work and delays in wage payments. We find strong evidence at the household and district levels that administrative rationing discourages subsequent demand for work. Delayed wage payments seem to matter significantly during rainfall shocks. We find further that rationing is strongly associated with indicators of implementation ability such as staff capacity. Politics appears to play only a limited role. The findings suggest that assessments of the relevance of public programs over their lifecycle need to factor in implementation quality.

Keywords: administrative rationing, discouraged worker effect, employment guarantee, India,labor supply,MGNREGA, workfare programs

JEL Code: J08;J38

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The "Discouraged Worker Effect" in Public Works Programs: Evidence from the MGNREGA in India[1]

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Abstract

This study investigates the consequences of poor implementation in public workfare programs, focusing on the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in India. Using nationally representative data, we test empirically for a discouraged worker effect arising from either of two mechanisms: administrative rationing of jobs among those who seek work and delays in wage payments. We find strong evidence at the household and district levels that administrative rationing discourages subsequent demand for work. Delayed wage payments seem to matter significantly during rainfall shocks. We find further that rationing is strongly associated with indicators of implementation ability such as staff capacity. Politics appears to play only a limited role. The findings suggest that assessments of the relevance of public programs over their lifecycle need to factor in implementation quality.

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1. Introduction

Workfare programs in developing economies have long been recognized for their role in providing social security to vulnerable populations (Subbarrao, 2003; von Braun 1998). Many of these programs are self-targeting in nature, on account of the nature of work involved and also because wage rates are typically set at lower than market wages. The demand driven nature of these programs allows those who need it most to select themselves in, while those who have access to better opportunities select themselves out, thereby avoiding problems associated with targeting (Basu, 1991; Besley and Coate, 1992; Braun, 1998; Ravallion, 2003). Some of these workfare programs have been designed as entitlement programs, with employment on public works guaranteed on demand.

There is substantial literature on whether self-targeting really works. Specifically, these address whether participants of the program are from among the poor or whether the elite capture program benefits instead – either due to the exercise of socio-political power or due to multiple market failures that cause poorer, rather than better-off, individuals to self-select out (Braun, 1998; Barrett and Clay, 2003)[3]. There is also research on whether these programs (perhaps inadvertently) exclude potential beneficiaries who seek assistance, a phenomenon known as administrative rationing

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[3] The broader questions of elite capture in development programs are discussed in Bardhan and Mookherjee (2000) and Platteau (2004).

(Dutta, et al., 2012; Liu and Barrett, 2013). While these sorts of implementation failures have been well documented, the ultimate consequences for potential beneficiaries' behaviour remain relatively under-researched. For example, does poor implementation undermine access to the planned safety nets in ways that can affect expressed demand for public employment, leading to underutilization of the program? This paper examines the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in India to see if implementation failures discourage potential beneficiaries from seeking work.

Labor market research on developed countries notes a "discouraged worker effect", that workers are less likely to seek work in downturns of the business cycle (that hold lower probability of getting a job) since the benefit-cost calculus of doing so would lead them to be worse off than if they were to remain unemployed or do unpaid work at home (See Benati, 2011, for a review of literature). We apply this idea to the context of a public works program, the MGNREGA in India.

There has been little systematic research of discouraged worker effects in the context of public works programs in developing countries although this phenomenon might be widespread. Much of the existing literature comes from India. For example, Khera (2008) documents such a phenomenon for drought relief works in the Indian state of Rajasthan. Recent evidence on the MGNREGA itself suggests that the uncertainty of securing work discourages workers from actively demanding work, who choose instead to wait passively and take up work if and when it is supplied (Drèze and Khera, 2014 in ten states in India; Himanshu, et al., 2015, in Rajasthan). These studies document the possible presence of a discouraged worker effect but do not explicitly test for it. In this paper, we empirically test this hypothesis using nationally representative data.

We hypothesize that implementation failures in the MGNREGA might manifest in either or both of two forms, first as administrative rationing of work – i.e., denying employment to those who apply – and second, as delays in wage payments. Given that work under the MGNREGA is a demand-driven, legal entitlement, these implementation problems potentially affect worker demand for employment under the program. This is especially relevant in a political context where the future of the MGNREGA itself has been uncertain and its relevance has been questioned.[4]

We use nationally representative household data from two rounds of India's National Sample Survey, the 66th Round (2009-10) and the 68th Round (2011-12), combined with relevant district level data from various other sources to test for a discouraged worker effect both at the household and district levels. We find evidence consistent with a discouraged worker effect – a 10 percent increase in a district's administrative rationing rate decreases the probability that a household seeks work by 3.4-3.5%. For poor households, the discouragement effect of administrative rationing appears somewhat stronger, 3.8-3.9%. These results hold in the analysis at the district level as well– changes in district-level demand for MGNREGA employment are negatively and significantly associated with the uncertainty of obtaining MGNREGA work in the district, represented by rationing rates at the district level. The district level demand rate decreases by 8.9-9.2% in response to a 10% increase in rationing rate.

By contrast, we find no consistently robust evidence that delays in wage payments influence household-level demand for MGNREGS work. Payments delays appear to influence an individual household's probability of seeking work or district level demand rates only in some specifications. We examine reasons for this results later in the paper, but note here that this result is consistent with the widespread finding of wage inelastic labor supply (Blundell and MaCurdy 1999; Skoufias, 2004) since payment delays effectively reduce the present value of earnings. Wage delays however matter significantly when there are negative rainfall shocks.

[4] The MGNREGA was implemented in 2005 by the United Progressive Alliance (UPA). Since the Bharatiya Janata Party (BJP) won the general elections in India in 2014, there has been a debate on whether or not the MGNREGA should continue.

Given that administrative rationing is a consistently significant source of discouragement, we then examine the correlates of administrative rationing and find that rationing is associated strongly with indicators of implementation ability. Removing the time invariant differences across districts using panel data that presumably strips out states' differential capacity to implement the program, politics appears to play only a limited role. The identity of the political party in power seems to matter more for pro-poor rationing, though these results are not robust. The most consistent correlate of administrative rationing appears to be negative rainfall shocks, indicating that perhaps administrative capacity is stressed and undermined with surges in demand in response to deficit rainfall.

While this study focuses on one program in India, it aims to make a broader contribution to understanding specific aspects of the lifecycle of workfare guarantees and the trajectories of welfare programs in general. Do programs decline because they outlive their usefulness or do they contain ingredients (that may or may not be manipulable) of their own demise?

The paper is organized as follows. Section 2 describes the MGNREGA in India and discusses the motivating issues in detail. Section 3 describes the data and model. Section 4 discusses administrative rationing and its correlates. Section 5 concludes.

2. The MGNREGA, then and now

The MGNREGA is arguably the largest public workfare program in the world and has generated more than 18 billion person days of work, involving expenditures of US$ 44.6 billion since its inception in 2006.[5] The MGNREGA has been at an interesting juncture. When the Act was passed on September 5, 2005, its stated goal was to improve livelihood security for rural households by providing up to one hundred days of guaranteed wage employment in every financial year to every household whose adult members volunteer to do unskilled manual work (Government of India, 2013). Permissible works, typically provided within the village, include water conservation and harvesting, land development, horticulture and plantations, and rural connectivity, to name a few. Workers are paid piece rate according to a schedule of rates established by state governments for different tasks performed in different soil conditions. The program had a phased-in rollout starting with the 200 districts deemed the poorest and from there expanding to cover all of India's districts over the three year period 2006-08.

Administrative data suggest that the MGNREGA peaked in 2009 and has since declined both in the total expenditure as well as in the person-days employed (Figure 1). The reasons for MGNREGA's decline have been a focus of debate. One proposed explanation is that the "MGNREGA has done its job" and is perhaps no longer needed.[6] This view stems from the hypothesis that declines in demand reflect growth in attractive alternate opportunities for workers, who therefore self-select out of MGNREGA work more than they did previously. A second explanation is that the program is now better targeted.[7] It is hypothesized that in the early years of the program a lot of rural workers obtained a job card to be able to work under the MGNREGA without clear expectations of the benefits of the program. Exposure to the program over time has reduced uncertainty over program costs and benefits, inducing many people to self-select out, even without improvement in alternate employment options. Both of these explanations imply that more people self-select out than in the earlier years and that the decline in MGNREGA's scale is natural and desirable.

[5]Days generated are until financial year 2014-15 and expenditures include current financial year 2015-16 in cumulated in nominal terms valued at the exchange rate in November 2015 (http://mnregaweb4.nic.in/netnrega/all_lvl_details_dashboard_new.aspx)

[6]Former Member of the Planning Commission at a seminar titled Labour Dynamics in India organized by the International Crop Research Center in the Semi Arid Tropics (ICRISAT) in New Delhi, September 15, 2014.

[7] A Ministry of Rural Development official's statement in a conference titled The MGNREGA in India: Taking Stock, Looking Ahead, March 26, 2014.

Others contest these views, especially the former, by pointing out that there is in fact a large unmet demand for MGNREGA work (Himanshu, et al., 2015; Khera, 2015; Mukhopadhyay, 2012). This claim is based mostly on survey data from workers in specific geographies, that suggests that poor implementation – specifically, unmet demand for work – has undermined the demand-driven design of the employment guarantee, discouraging workers from actively seeking work. These studies are based on surveys that ask workers how much they would like to work and/or whether or not they have sought work but not obtained it. For example, the 2013Public Evaluation of Entitlement Programmes (PEEP) Survey asked MGNREGA workers across twenty districts in ten states how many days of employment they would like to have over the year, assuming that they are paid on time. An overwhelming majority (83%) answered '100 days', the maximum entitlement. However, only 8% had actually done 100 days of MGNREGA work in 2012-13 (Drèze and Khera, 2014). In an earlier survey,only 13% of the survey households in the six Hindi speaking states secured 100 days of work (Drèze and Khera, 2011). Das (2015) and Dey and Bedi (2010) observe unmet demand in parts of West Bengal with the latter's survey finding that workers get only 10% of their desired number of days. In Surguja in Chhattisgarh, a relatively well-performing district in terms of the average number of person days of employment generated, 32.7% of sample workers reported that they faced problems getting any work.[8] These findings are reinforced in a government-initiated survey of MGNREGA workers in three states (National Sample Survey, 2011). In principle, MGNREGA is a demand-driven program where anyone who seeks work would have to be granted work according to prescribed guidelines, failing which they are entitled to an allowance. In its implementation in many parts of India, however, the program appears to be supply-driven so that work is provided by the local administration and workers do not proactively seek work. There have been instances too of workers seeking work but not getting work – i.e., they are administratively rationed out – for various reasons (Dutta et al 2012; Liu and Barrett, 2013).

There is also growing evidence that MGNREGA workers often face significant delays in wage payments, ranging anywhere between three months to over a year, even as the Act stipulates a 15 day window for wage payments. In the PEEP Survey, around 66% of respondents waited over 15 days. Similarly, close to 48% of a 1600 household survey in Surguja district, Chhattisgarh, claimed they faced problems regarding timely payments.[9] These delays, many claim, have diminished laborers' interest in MGNREGA employment (Khera 2010) and lead to a significant loss in welfare (Basu and Sen, 2015).[10]

These latter claims offer directly testable hypotheses: do program implementation failures, represented both by the uncertainty of securing work due to administrative rationing as well as by wage payments delays and/or uncertainties, cause potential beneficiaries to self-select out of the program? Further, if there is indeed evidence of a "discouraged worker effect", what factors are associated with administrative rationing or delays in wage payment in the first place?

Much has been written about the varied record of MGNREGA implementation across states.[11]Political will is often identified as a key factor and states that have better technical capacity tend to implement the MGNREGA relatively well (Narayanan and Lokhande, 2013; Comptroller and Auditor General of India, 2015). It has also been observed that poorer states tend to administratively ration more (Dutta, et al., 2012). Studies suggest that there are no discernable patterns relating to political party affiliation (Khera 2015; Sheahan, et al., 2016;). Khera (2015) points out that the better performers in terms of the average days generated were in fact the states that were administered by

[8]Baseline report (unpublished) of the Stanford University's Liberation Technology Program project titled "Combating Corruption with Mobile Phones".
[9]*Ibid.*
[10]This has been reported fairly widely in the popular presss. See for example http://www.thehindu.com/sunday-anchor/is-the-mgnrega-being-set-up-for-failure/article7265266.ece, Accessed May 31, 2015.
[11] See Drèze and Oldiges (2006) for an early assessment across states and Government of India (2012) for an annotated bibliography of studies.

parties that were not in power at the center, although there is also evidence of local government power to deny wage-seekers work based on their political affiliations or proximity to the village leader (Das, 2015; Himanshu, et al., 2015).

There is a substantial difference across states in not just the extent of administrative rationing but also the degree to which rationing favors (or at least does not disfavor) the poor (Table 1).[12] National Sample Survey (NSS) data, a source we describe in detail in the next section, suggest that relative to 2009-10, for the country as a whole, work seeking and administrative rationing fell across the whole household expenditure distribution, the latter more than the former, resulting in increased participation rates conditional on job seeking for all but the very poor households (Figures 2a-c). The NSS data indicate that a greater proportion of the poor seek work and participate in the MGNREGA relative to those who are not poor. The data also suggest that rationing rates fell by nearly half, from 44% to 23% nationwide (Table 1) and became effectively uniform across the expenditure distribution, whereas in 2009-10 rationing rates were moderately pro-poor (Figure 2b).

The key hypotheses we test in this paper are therefore: is prior administrative rationing, delayed wage payments, or both associated with reduced worker demand for MGNREGA employment? Are any such effects distributionally regressive, discouraging poor households more than the non-poor? Which district-level factors are associated with such poor implementation?

3. Testing for a Discouraged Worker Effect

3.1. Data and Empirical Strategy

To test the discouraged worker hypothesis, we use data from two NSS rounds, the 66th Round (2009-10) and the 68th Round (2011-12).[13] These "thick rounds" covered 59,129 and 59,700 rural households, respectively.[14] Both rounds include questions on the sample household's participation in MGNREGA. Questions common to both surveys ask whether or not the household possesses a job card, whether any member of the household sought work, and whether any member of the household actually worked.

For the household level analysis, we use household level data from the 68th Round (2011-12) on whether or not any member of the household sought work in the past 365 days (representing a household's expressed demand for work) and combine these with district level rationing rate and district level delays in wage payments from the 66th Round (2009-10), representing the sources of potential discouragement. These are described in detail later in the section. For the district level analysis, we construct a district-level data from these two rounds, using work-seeking rate at the district level as indicative of demand (See Appendix 1 for Data Sources and Methods).

A few data issues merit attention. First, some districts have very few observations. We restrict the sample to those districts with a sample size over 30.[15] We also trim the bottom and top 5% of the monthly per capita expenditure (MPCE, in rupees) for the entire sample.[16]Second, discrepancies have been documented between the NSS data and the management information system data maintained by the Ministry of Rural Development (Government of India, 2012; Imbert and Papp, 2012; Narayanan and Das, 2014). While we acknowledge these discrepancies, this work focuses on the NSS data alone and aims to provide a robust analysis of the NSS data rather than attempting to explain or reconcile across the data sets the research questions concerning the discouraged worker hypothesis.

[12] Discerning readers will note that in 2009-10 in some states the share of households seeking work exceeded that holding job cards. 2009-10 was a drought year and the program was still in its early stages, suggesting that not all people who wanted work had applied for job cards.

[13]The NSS 68th Round (July 2011 - June 2012) and the NSS 66th Round (July 2009 - June 2010) surveys include schedules on Employment and Unemployment and Household Consumer Expenditure.

[14] These surveys include information on 281,237 individuals in 2009-10 and 280,763 in 2011-12.

[15] Data from the NSS are representative at the district level only since the 61st Round (2004-5).

[16] For the figures we plot households on a scale of log MPCE, ranging from 5 to 9.

We test the discouraged worker hypothesis first at the household level (whether or not a household seeks work in the presence of implementation failures) and then at the district level (represented by the demand rate at the district) using the econometric strategy described below.

Household Analysis

The first model (Model 1) regresses household-level demand for MGNREGA work in 2011-12 (i.e., whether or not the household sought MGNREGA work in 2011-12) as a function of lagged (2009-10) district level rationing rates and variables representing wage payments delays.

The district rationing rate represents the proportion of district households who sought but did not get work during 2009-10 pertaining to the 66thNSS round. Under the maintained hypothesis that administratively rationing rates are relatively well known throughout the population – if only impressionistically – the discouraged worker hypothesis would imply that higher administrative rationing rates are associated with lower subsequent probability that a household would seek MGNREGA work since workers expect a high probability of not obtaining work.[17]

Variables representing different aspects of delays in wage payments are constructed from administrative data reported annually at the district level. These administrative data report the proportion of muster rolls for which wage payments were delayed between 15-29 days, 30-59 days, 60-89 days, and 90 or more days. We use these data to construct three different variables: the proportion of muster rolls that are delayed for 90 days or more (representing uncertainty in wage payments), the proportion of muster rolls that have any delay, and an average number of days of delay. This last variable is a coarse measure, wherein we treat the minimum of each class interval reported (i.e., 15, 30, 60 and 90 days) as the delay and weight it by the proportion of muster rolls in each class interval. This is obviously a lower bound estimate on the average days of delay but is the best feasible estimate in these data. Since it is not clear whether short delays are less likely than long delays to discourage workers and likewise whether finite delays are tolerated more than uncertainty in payments, we investigate the use of these different variables to reflect the different aspects of wage delays, in turn representing implementation failures. As it turns out, the proportion of musters experiencing delayed wage payments is only modestly correlated with both the average delay (0.35) and with the proportion of muster rolls that are significantly delayed (0.32). The discouraged worker effect would appear as a negative and statistically significant coefficient estimate on the regression of seeking MGNREGA work by a household on any of these three variables, especially for the proportion of muster rolls whose delay is greater than 90 days. We use this latter as our preferred variable to represent delays in wage payments.

The discouraged worker hypothesis implies that a higher rationing rate in the district and / or delays in wage payments would reduce the probability that a household seeks work in the MGNREGA in the following period.

In general, the prospective endogeneity of past delays in wage payments is only of moderate concern since for a typical worker, his/her desire to work under the MGNREGA itself is unlikely to cause an increase in payment delays at the district level that too in the past. Yet, district level unobservable factors that affect household demand could also influence rationing rates and delays in payments. For example, the year 2009 saw banks waive debts for a large number of farmers, who had loans with banks and owned less than a hectare of land. Such a scheme imposes burden on work effort of bank staff and could aggravate delays in wage payments that are routed through banks. At the same time, these debt waivers represent implicit transfers that make workers less dependent on the MGNREGA in the subsequent period. Likewise, weather shocks might persist over time, influencing

[17] Work is obtained under the MGNREGA via a written application submitted to the Gram Rozgar Sewak or Field Assistant in the village. While there is no fee associated with applying for work, the cost it involves in terms of time and effort could be non-trivial.

demand over a longer period. We, therefore, estimate the probit model and account for the potential endogeneity of both past payments delay as well as rationing rates using a set of instruments to achieve identification.

We instrument for delay in wage payments with commercial bank branch (CBB) expansion, which offers an exogenous source of variation that influences payments delays but should have no independent effect on MGNREGA job seeking. Bank branches are likely to be established in areas of high commercial and economic activity, while the Government of India has had a long history of promoting, even mandating, expansion of bank branches in rural areas (Kochar, 2011). More recently in 2009, the government identified unbanked districts and villages; 72,721 villages were identified for branch expansion by 2012.[18]As a result, bank branch expansion is exogenous to MGNREGA and not confined to specific types of places. It is unlikely that banks open branches in anticipation of MGNREGA payments since these are by and large no-frills zero balance accounts that hold little commercial appeal for bankers. We use district level commercial bank branches in urban as well as rural areas since, in practice, job seekers in rural villages often access urban branches for wage transactions. We use these data in two different forms: the number of branches per job card, the rate of expansion of branches over a two-year period (i.e., between 2011-12 and 2009-10).[19] Both banks and post offices are involved in wage payments and the relative importance of these two varies across regions and (somewhat less) over time. Overall, around 39% of the muster roll payments were made through post offices and the rest (61%) through banks in 2011-12 and 2009-10, as per the MGNREGA administrative data. While in principle, this variable may be correlated with outside opportunities that may also contribute to demand for the MGNREGA, controls such as change in district level MPCE and change in the composition of labor types serve as proxies for outside opportunities and should ensure that this instrument satisfies the exclusion restriction condition.

We instrument for lagged rationing rate with indicators of staffing constraints. Qualitative research suggests that there exists a "technical capacity deficit" in many states (Shrivastava, 2015). There is also evidence to suggest these staffing constraints are on account of the political priorities of the state rather than of lack of personnel to fill the posts and therefore likely to be unrelated to district characteristics such as backwardness. For example, there is often a unilateral rejection of the MGNRGEA itself by higher level state functionaries.[20]We argue that staffing shortages undermine state capacity to implement the program and manifests as higher rationing rates.[21]In theory, it is possible that the greater the number of MGNREGA staff, the greater the awareness of the program among the potential workers and hence it is plausible that it has a direct effect on demand. While a proactive village functionary (Gram Rozgar Sewak) can influence and raise awareness within the village, staff at the district and block levels are far less likely to influence demand rates directly and we use the latter set of variables. Another reason this is not a concern is because staff are not paid based on performance indicators. In Maharashtra, an incentive system was introduced only recently in 2013,where village functionaries were offered a bonus for the number of person days generated. This

[18]. F. No.21/13/2009-FI, Government of India Ministry of Finance Department of Financial Services.

[19]Likewise, we also used the number of post office branches with delivery services per job card, but do not present these results. We have data on post offices for 2015 but job cards data for all the years. In the absence of annual data for post offices, we use the 2015 data for post offices but job cards data for 2009-10 under the maintained hypothesis that the post office network has not expanded over these years.

[20]Shrivastava (2015) points out that the "capacity deficit" is sometimes because of an outright rejection of the Act. In the state of Uttar Pradesh, a senior functionary reportedly said "If matters were in my hand, I would have thrown away the existing contractual staff under MGNREGA, [and] forget about hiring any more" (pg.64, *ibid.*). Elsewhere in Madhya Pradesh, Nayak (2015) documents similar problems and in the authors' own fieldwork in Maharashtra; local functionaries mentioned that if they did try to implement MGNREGA they would be in trouble.

[21]We test for this in a very basic sense by estimating a cross section regression of district level rationing rate on various factors that could potentially explain rationing and find the block level staff availability is a significant correlate (Appendix Table 1)

is however not during the period studied here. Further, the roles defined for each of the MGNREGA functionaries do not include activities that would likely influence demand patterns systematically.

The estimated model 1 is therefore:

$$Pr(Y_{hit} = 1) = F(\beta_0 + \beta_1 R_{it-1} + \beta_2 P_{i\,t-1} + \beta_3 X_{hi\,t} + \beta_4 Z_{i\,t} + \beta_5 W_i + \varepsilon_{hit}) \quad (1)$$

$$R_{it-1} = \gamma_1 + \gamma_2 Staff_{i\,t-1} + \gamma_3 Z_{it-1} + \gamma_4 W_i + \epsilon_r \quad (2)$$

$$P_{it-1} = \pi_1 + \pi_2 CB_{i\,t-1} + \pi_3 Z_{it-1} + \pi_4 W_i + \epsilon_p (3)$$

where $Y_{hit} = 1$ if any individual in household h in district i sought work in time t (2011-12) and $Y_{hit} = 0$ otherwise. F(.) is a standard normal distribution function.R_{it-1} is the rationing rate for district i at *t-1*(2009-10) and $P_{i\,t-1}$ is the extent of wage delays, R_{it-1} is instrumented for in the regression. $Staff_{i\,t-1}$ comprises proportion of block level MGNREGA positions that are left vacant and block level MGNREGA staff per village, $CB_{i\,t-1}$ refers to the growth of commercial bank expansion over the preceding two years. The discouraged worker hypothesis would imply negative and statistically significant coefficient estimates on both variables. X_{hit} refers to household level characteristics drawn from the NSS data and district level characteristics – those that vary over time (Z_{it}) and those that don't (W_i). These district level characteristics include the proportion of marginalized communities in the district (specifically those who belong to the Scheduled Tribes and Scheduled Castes), district literacy rate, the timing of the introduction of the program in the district (whether it is a Phase 1, 2 or 3 district), among others. All these variables control for both, the general awareness level relating to the program and proxies for the economic status of the district, both of which might influence worker interest in the MGNREGA and work seeking. We also include a binary variable for districts that come under the Integrated Action Plan (IAP).[22]

To account for weather shocks, we include the annual positive and absolute value of negative deviation of rainfall from its decadal average divided by the standard deviation of the decadal annual rainfall. These enter separately to capture possible asymmetries in the relationship. We also use a measure of the relative attractiveness of the MGNREGA that would influence current demand, proxied by the wage gap, at the district level, between the MGNREGA and a relevant alternative, the average wage of the bottom decile of the wage distribution for casual labor in agriculture and off farm.

Alongside the probit model, we estimate a Linear Probability Model (LPM) version for Model 1 (Model 1a), both as an alternate specification and to test the validity of instruments used in Model 1. Equation 1 is now therefore[23]

$$Y_{hit} = \beta_0 + \beta_1 R_{it-1} + \beta_2 P_{i\,t-1} + \beta_3 X_{hi\,t} + \beta_4 Z_{i\,t} + \beta_5 W_i + \varepsilon_{hit} \quad (4)$$

where $Y_{hit} = 1\ or\ 0$ and estimated along with Equations (2) and (3). We cluster the standard errors at the district level in the probit model and use robust standard errors for the LPM. In addition to the above, we estimate versions of Models 1 and 1a to allow for interaction effects of average delay in wage payments with rainfall shocks to allow for the possibility that when there is no negative rainfall shock, delays in wage payments might be better tolerated and might not generate a discouraged

[22]The IAP was a package of assistance directed at selected tribal and backward districts under the Backward Region Grant Fund (BRGF) program.

[23]In the absence of apparent consensus on whether or not the probit or the LPM should be privileged in the context of IV estimation, we estimate both and report the correlation between the predicted probabilities from the two models.

worker effect. But if wage payments delays occur when households are already suffering from a negative rainfall shock and especially dependent on MGNREGA earnings for essential cash liquidity, payments delays may have a more adverse effect on subsequent labor supply. Given that the measure of delayed wage payments data is not available for all the districts in the analysis, we use a missing data dummy to avoid dropping observations from the analysis.[24] We run these models separately for the subpopulation that is poor, with monthly per capita expenditure (MPCE) below the official poverty line in the state of domicile.

District level analysis

We supplement the household analysis with district level analysis, where we test for a discouraged worker effect using the district demand rate in the context of poor MGNREGA implementation relative to other explanations that might attenuate worker interest in the program. The dependent variable is the difference in the MGNREGA work demand rate in the district between 2011-12 and 2009-10. The demand rate for district i in year t ($D_{it} \epsilon [0,1]$) is the proportion of sampled rural households in the district that reported "seeking" work under MGNREGA. We test whether the district's past MGNREGA implementation record – reflected in the 2009-10 administrative rationing rate and wage payments delays – is negatively and statistically significantly associated with change in worker demand over time.

We implement a "naive" least squares model that regresses the difference in demand rate between the 68th and 66th Round ($\Delta D_i \equiv D_{i,t} - D_{i,t-1}$) on administrative rationing and payments delays in the 66th Round, controlling for other the labor market attributes such as wage gap and changes in the structure in terms of sectoral distribution of workers.[25]

$$\Delta D_i = \beta_0 + \beta_1 R_{it-1} + \beta_2 P_{i\,t-1} + \beta_3 D_{it-1} + \beta_4 \Delta Z_{it} + \beta_5 W_i + \varepsilon_i (5)$$

One potential issue is that a district may suffer a fall in MGNREGA job seeking if it had an extraordinarily high demand rate in 2009 due to time-varying idiosyncratic factors (e.g., weather shocks, among others) not controlled for in differencing the dependent variable. In order to control for possible mean reversion, the model includes the demand rate in 2009-10 (66th Round) as a control. For example, if the demand rate was very high in 2009-10, the fall in demand to 2011-12 might be high as well, conditional on other factors, generating a negative regression-to-the-mean effect in the demand rate. The demand rate for 2009-10 may also independently affect implementation, for example by overtaxing administrative staff or the financial infrastructure, such that both rationing rates and delays in wage payments might be associated with the level of demand as a result. We therefore need to control for the demand rate in 2009-10 while testing for a discouraged worker effect.

We also control for the change from 2009-10 to 2011-12 in time-varying district characteristics, ΔZ_i, which might separately induce intertemporal change in jobseeking. To represent change in the availability of alternate employment opportunities we use a proxy for the district's economic growth, computed as the difference in the average MPCE between the two years. We also include alternate measures: the inter-temporal difference in the proportion of workers whose main work in the week before the survey was farming, non-farm occupations, casual work in agriculture, or

[24] The proportion of observations for which data are missing ranges from 0.46 to 0.48. It is possible that there is a systematic difference between those states that report this data and those that do not. The results on delayed payments must therefore be interpreted with care.

[25] This model is formulated to reflect closely the articulation of the discouraged worker hypothesis. We also estimate a model on levels, using demand rate in 2011-12 instead of the difference in demand rate as a dependent variable.

casual work in non-farm sectors.[26] These variables would only measure associations since these could be partly influenced by the operation of the MGNREGA itself although estimates suggest that the scale of MGNREGA relative to the overall rural labor market is too small to make a large impact on sectoral distribution of workers. Moreover, given that we study MGNREGA demand or work-seeking, not actual participation, the case is stronger for their inclusion. Variables representing the wage gap differences are meant to reflect the fact that nominal MGNREGA wage did not increase very much until 2012 over this period even as other wages rose. So working under the MGNREGA would seem less attractive in 2011-12 relative to 2009-10.

The extensive set of controls mitigates significantly – but not entirely – the likely problem of endogeneity of wage payments delays and administrative rationing rates, since the lagged terms are predetermined, we control for base period demand and for a host of other factors that might independently affect change in MGNREGA job seeking and also be correlated with lagged payments delays or administrative rationing. There could nevertheless be more unobservable factors that induce bias in the estimates of interest.

We attempted to estimate models that address the potential endogeneity of delays in wage payments, rationing rate and demand, relying on a Two Stage Least Squares (2-SLS) model using instruments for the endogenous variables to achieve identification. We used the same set of instruments as with the household level analysis, with commercial bank branch presence and expansion in the lagged delayed payments equation and number of staff at the block level for lagged rationing rates. In addition we also use the Growing Degree Days (GDD) for the dominant crop for the major cropping season in the district as controls for lagged demand rate. GDD measures the cumulative exposure of a crop to temperature and thus has a close relationship to plant physiological growth and yields and hence to agricultural income shocks (see Appendix 2 for details). In addition, we also use the number of days in the growing period when the temperature stayed above the maximum threshold and the number of days the temperature remained above the optimum for the crop's yield levels. These thresholds and the optimal range of temperatures differ across crops and we compiled these norms relevant to India from scientific experiments conducted by agronomists (Appendix 2). The GDD has a close correlation with crop loss and hence agricultural distress (Harou, et al, 2014; Lobell et al. 2012). Moreover, this is perhaps a more sophisticated measure for the district, since across a district one would expect less variation in the experience of temperature than with rainfall that is known to vary widely across villages within the same district. This can therefore be expected to influence rationing rate that year if this is associated with a surge in demand. But one would not expect it to have an independent effect on demand rate two years later, especially when rainfall shocks are included as explanatory variables for demand in 2011-12.

The model (Model 2) we estimate is therefore

$$R_{it-1} = \gamma_1 + \gamma_2 Staff_{i\,t-1} + \gamma_3 D_{it-1} + \gamma_4 Z_{it-1} + \gamma_5 W_i + \epsilon_r \quad (6)$$

$$P_{it-1} = \pi_1 + \pi_2 CB_{i\,t-1} + \pi_3 D_{it-1} + \pi_4 Z_{it-1} + \pi_5 W_i + \epsilon_p \quad (7)$$

$$D_{it-1} = \phi_1 + \phi_2 GDD_{i\,t-1} + \phi_3 Z_{it-1} + \phi_4 W_i + \epsilon_d \quad (8)$$

where R_{it-1} is the district 2009-10 rationing rate, $P_{i\,t-1}$ represents the measure(s) of delay in wage payments in 2009-10, each reflecting the information that becomes available to prospective MGNREGA workers subsequent to their demand for work in 2009-10. Controls include D_{it-1}, the

[26]The recall window is not a concern since the survey is balanced across seasons across the districts.

2009-10-demand rate, a range of time invariant district characteristics, W_i, and changes of a set of time varying district level characteristics measured both in 2009-10 and in 2011-12 (ΔZ_i). Details of Model 2 are available in Appendix 3.

We also used a control function approach (Model 3) as an alternative for addressing endogeneity assuming, somewhat restrictively, that the endogenous variables are generated independently of one another (Wooldridge, 2015). We use staff capacity, bank branch expansion and GDD as sources of exogenous variation. We report these in an Annexure 1 & 3. It turns out that the results don't appear to be very different from the least squares model. Coefficients estimated from the district level regression models should be interpreted as correlational relationships and not causal. These models are estimated for both the whole sample and for just the subsample of districts for which delay in payments data are available.

The descriptive statistics for data used in Models 1-3, household level and district levels, are presented in Tables 2 and 3 and a complete list of the data sources and metrics computed available in Appendix 1.

3.2. Results and Discussion

The household-level estimated average marginal effects (Model 1) and the IV coefficients from the second stage in the LPM (Model 1a), both reported in Table 4 suggest that household interest in MGNREGA employment, represented by whether or not they seek work, is negatively and significantly associated with the lagged administrative rationing rate in the household's district, controlling for a host of confounding household and district level characteristics (with full results in Appendix Tables 2-7). A 10% increase in rationing rates at the district level reduces the probability that a household seeks work by 3.4 to 3.9%. The LPM coefficients suggest a decline in work seeking probability relative to a 10% increase in rationing rate in the range of 8.4-9.2%. [27]Instrument validity tests based on the LPM suggest that the instruments are valid and the model is identified (Appendix Table 5-7), justifying a causal interpretation of this relationship.

In contrast, there is no consistent evidence that the discouragement effect on account of payment delays matters, except in the LPM model – which suggests strongly that wage delays are another source of discouragement. Even there, wage delays seem to be comparatively less influential in determining the chances that a household seeks work. A Shorrocks-Shapely decomposition of the pseudo-R-squared from the IV-Probit model, following Shorrocks (1982), indicates that lagged rationing rate accounts for about 38.6% of the pseudo R-squared, whereas the variables associated with delayed payments account for about 4%.

Table 5 presents the results for district level analysis from Models 2 and 3 with full results presented in Appendix Table 8 and Appendix 3. Tests for over identifying restrictions for identification in the overidentified model failed suggest that instruments are invalid. Lagged administrative rationing is indeed negatively and statistically significantly associated with a decline in demand rates at the district level across both the `naive' least squares, 2SLS and the control function models (Model 2, Table 5). A 10% increase in the rationing rate is associated with suppression in work seeking by 2.2-4%.[28] Variables representing delays in wage payments have the expected sign in some specifications (Table 5) but not in others and not across the variables that represent these delays. In the district analysis, payments delays have a statistically significant negative effect on MGNREGA

[27]The correlation coefficient between the predicted probability of seeking work in the LPM and the probit model is high at 0.77 to 0.84 but not high enough to render the choice of model irrelevant.

[28]Running this model in levels instead of differences yields qualitatively similar results. We also run the model for the subsample for which there is no missing payments delay data and the results do not change. These are not presented in the paper but can be obtained from the authors.

labor supply when a negative rainfall shock hits, signaling that individual workers' confidence in MGNREGA as a safety net is lessened by payments delays and gets reflected in district demand rates (Table 5).

In general, one would have expected variables representing aspects of wage delays to be a key source of discouragement, especially the case for poor households, for whom payment delays are likely most costly due to binding liquidity constraints that drive up their shadow interest rate. One plausible reason for the absence of evidence of a discouraged worker effect for wage payment delays could be the problem of missing data; we are able to secure data only for around half of the districts for the years considered. A second reason is that these data represent delays for wages paid and do not include those wages that were left unpaid. To the extent that we do not factor in the proportion of wage liabilities that remain, that presumably is a strong source of discouragement, these results reflect this. A third reason could be that delays in wage payments are an entrenched feature of the program right since its inception so that payments delays are likely to be subsumed into peoples' expectations and the 2009-10 payments delays were consistent with people's priors, and therefore did not discourage workers in 2011-12 relative to 2009-10.[29]

The lagged demand rate, a pre-determined endogenous variable included to control for possible mean reversion, is negatively associated with change in demand and statistically significant in some specifications. As one would expect, negative rainfall shocks are associated with increases in demand, indicating that shocks tend to push people to seek employment under the MGNREGA. Districts, where the proportion of tribal population is high, tend to have higher demand, as do districts with higher literacy rates, a proxy for awareness.

There is limited evidence to support the hypothesis that as the general economic conditions improve, demand for MGNREGA work tends to fall. The change in the proportion of the district workforce employed in agriculture, either as a farmer or as a casual farm worker, is positively and statistically significantly associated with change in demand for MGNREGA. These seem to suggest that the alternate explanations for the decline of MGNREGA uptake are perhaps not credible.

4. Administrative rationing, pro-poor rationing and its correlates

The results in the previous section suggest that administrative rationing is a consistently important factor that depresses worker interest in MGNREGA program participation, whether we study demand for work at the level of district aggregates or individual households. This section therefore attempts identify correlates of administrative rationing.[30]Are there systematic factors associated with administrative rationing rates? Further, to what extent are these factors related to whether such rationing is pro-poor? Specifically, we are interested in understanding if any such correlates are largely political in nature or if they are more related to district-level administrative capacity relative to demand for the program.

To answer these questions, we use the NSS data as a district level panel dataset for 2009-10 and 2011-12. The panel data enables us to difference out some time invariant unobservable factors (such as chronic administrative capacity deficit) that might affect inter-district variation in administrative rationing or wage payments delays, as well as MGNREGA labor supply. We use the rationing rate for each district in each round (R_{it}) as the dependent variable and model these as a function of various time varying characteristics at the district level (Z_{it}), including district fixed effects (α_i). Demand rate (D_{it}) is instrumented for with the GDD, as in previous models.

[29] Conversations with consultants based with the Ministry of Rural Development suggest that this may be the case in several states.

[30]We do not attempt a similar analysis with delays in wage payments for these years owing to missing data.

$$R_{it} = \alpha_i + \delta D_{it} + \varphi Z_{it} + \varepsilon_{it} \text{ (Model 4)}$$

$$D_{it} = \phi_1 + \phi_2 GDD_{i\,t-1} + \phi_3 Z_{it-1} + \phi_4 W_i + \epsilon_d$$

In order to capture weather shocks we include in Z_{it} the annual positive deviation of rainfall from its decadal average divided by the standard deviation of the decadal annual rainfall as well as the annual negative deviation. In the absence of time varying data at the district level, on MGNREGA staffing and administrative vacancies (that get differenced out in the panel; see Appendix Table 1), in order to capture an aspect of implementation efficiency, we use a proxy – performance in achieving project targets in the area of sanitation. The Nirmal Bharat Abhiyan (NBA) is the total sanitation campaign launched by the Government of India in 1999. NBA falls under a different department than MGNREGA but under the same ministry. The goal of NBA is to achieve complete coverage of all habitations and hence is, by design, not selective.[31] We use data on the percentage of planned or targeted facilities installed that have been completed as reflective of bureaucratic efficiency of the ministry implementing MGNREGA in the district.

Political factors – e.g., the political party in power, election victory margins – could potentially play a substantial role in determining who gets work and who does not. Recent evidence suggests that politics plays only a limited role (Sheahan et al., 2016) although there is substantial literature suggesting that patronage and clientelism play a significant role in public policy implementation. Other time-invariant controls include variables that represent the socio-economic profile of the district – the proportion of population belonging to the Scheduled Castes and Tribes, whether or not it is an IAP district, etc.

We then gauge whether such rationing is pro-poor through three approaches, each involving a different sub-sample for Model 4. We first restrict our analysis to households below the official poverty line of the specific state. In the second approach, we obtain the proportion of poor households in the district and use these as weights to compute weighted rationing rates, described in detail Appendix 1. Third, we use the inverse of monthly per capita expenditure (MPCE) as household weights to obtain a weighted rationing rate (For details of these computations, see Appendix 1. These are denoted as Models 5, 6 and 7 respectively).Table 6 presents the results of these three sub-sample regressions along with the full sample regression. Here too we use an IV approach, where demand is instrumented with GDD and the number of days in the growing period that experience greater than optimum and threshold temperatures (explained in Appendix 2 with full results reported in Appendix Tables 9).

Demand rates in a district are positively and statistically significantly associated with rationing rates only in the Least Squares models; in the IV models, the coefficient estimates all turn statistically insignificant and are negative. The strongest correlate of the administrative rationing rate appears to be idiosyncratic shocks coming from rainfall deficits. Considering that this association exists controlling for demand rates, it appears therefore that rainfall shocks make extraordinary demands on district administrations independently of MGNREGA demand. This is conceivable since drought relief is typically the responsibility of the district administration and is often undertaken without an expansion in staff capacity.[32]

Explicit proxies for bureaucratic efficiency are not significantly associated with rationing rates. This needs to be interpreted in the light of the fact that differences across states in administrative capacity that presumably does not change quickly over time, has already been differenced out. The presence of banking infrastructure is negatively associated with rationing rates,

[31] After 2012, the Government of India allowed construction of toilets under the NBA as a permissible work of the MGNREGA. Since our data are from 2011-12, we can treat NBA as functionally unrelated and therefore exogenous to MGNREGA implementation.

[32]Expansion of MGNREGA entitlements, for example from 100 days per household to 150 days per household is often a part of drought relief packages.

suggesting that payments infrastructure helps obviate district administrations' tendency to ration work, presumably because processing payments is smoother, although anecdotal evidence from the field and the very small size of these effects suggest that this is limited.

Political factors are only weakly associated with rationing rates. While the identity of the political party representing the district matters, it is true only for certain variables that reflect UPA representation and they are not robust. For example, while share of United Progressive Alliance (UPA) votes seems to be associated with lower rationing rate, the proportion of constituencies under UPA rule does not seem to matter, nor whether or not UPA won any seat in the district.[33] The identity of the party seems to matter more for pro-poor rationing. When the proportion of constituencies within a district under control of the UPA increases to 1 from 0, the proportion of household below the poverty line rationed falls by a statistically significant 14.8%, with smaller and less precisely estimated impacts when we use rationing rates weighted by the proportion below the poverty line. Districts that have had elections more recently have lower rationing rates than those for which elections were held in the more distant past.[34] These findings are in line with previous observations that politics has limited influence over MGNREGA allocation decisions at the level of local administration (Sheahan, et al., 2016).

5. Concluding remarks

This paper explores the consequences of implementation failures of public workfare programs, as manifest in administrative rationing of eligible participants and in wage payments delays, using the example of the MGNREGA in India. In particular, we find strong support for the 'discouraged worker' effect in both district- and household-level data with respect to administrative rationing, but no clear support for the hypothesis arising from wage payments delays. We then examined the correlates of administrative rationing and found that rationing is associated most strongly with implementation ability, arising from the density of the supporting banking infrastructure and the extraordinary demands on district administration arising from drought shocks. Politics appears to play only a limited role in administrative rationing.

Where safety net programs offer temporary interventions in times of crisis, the ability to scale up a program during stress periods is critical. If increased administrative rationing is a natural consequence of drought shocks that temporarily overwhelm local governments and if such rationing discourages workers from subsequently seeking guaranteed employment under the program, implementation capacity can undermine program performance, especially serving the neediest households. Because declining demand for the program can be readily (mis)interpreted as an indicator of program success – graduating people from needing an employment guarantee – or growing program irrelevance – due to growth in alternate employment options – these findings are critically important to nuanced and accurate interpretation of observed decline in MGNREGA participation. Program decline may be largely a result of local implementation failures that discourage workers despite continuing need for the employment guarantee program as a safety net.

The presence of a discouraged worker effect in public works programs such as the MGNREGA offers a cautionary tale in assigning causes to program uptake, especially those that are purported to be demand driven. It is, in theory, possible that a decline in participation is misconstrued as a measure of the success of the program when it could mean the opposite, implying decay instead, suggesting that it is important to investigate the factors that drive the lifecycle trajectories of programs rather than tracking outcome indicators without scrutiny.

[33]The MGNREGA was the UPA's flagship social welfare program and the Indian National Congress that headed the alliance has historically been viewed as pro-poor.

[34]While it is the case that as this number is larger, it means that a district is closer to the next election, the years for which we have data are such that for no district is this figure higher than two.

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Table 1: Seeking, Rationing and Participation rates (2011-12 and 2009-10)

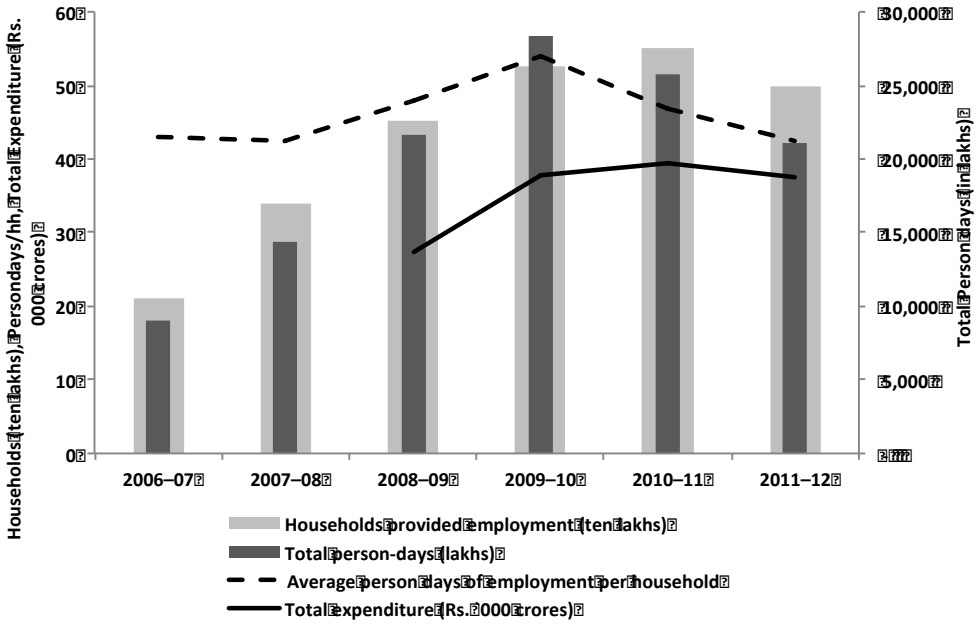
	2009-10						
	Share of total households					Share of	
States	**Job card**	**Seeking work**	**Participated**	**Rationing Rate***	**Rationing Rate (poor)***	**Job card**	**Seeking work**
Andhra Pradesh	0.434	0.472	0.354	0.249	0.240	0.495	0.384
Arunachal Pradesh	0.220	0.515	0.215	0.582	0.627	0.406	0.383
Assam	0.287	0.413	0.182	0.559	0.539	0.364	0.312
Bihar	0.172	0.461	0.099	0.785	0.788	0.223	0.184
Chhattisgarh	0.589	0.69	0.479	0.306	0.259	0.727	0.617
Goa	0.161	0.077	0.022	0.719	0.664	0.041	0.041
Gujarat	0.300	0.382	0.215	0.438	0.353	0.238	0.144
Haryana	0.066	0.195	0.051	0.738	0.735	0.058	0.050
Himachal Pradesh	0.454	0.418	0.334	0.202	0.177	0.498	0.386
Jammu & Kashmir	0.187	0.334	0.097	0.709	0.693	0.368	0.324
Jharkhand	0.306	0.517	0.192	0.628	0.635	0.352	0.304
Karnataka	0.151	0.228	0.08	0.648	0.506	0.202	0.150
Kerala	0.196	0.232	0.112	0.517	0.362	0.291	0.198
Madhya Pradesh	0.697	0.646	0.406	0.371	0.327	0.643	0.317
Maharashtra	0.134	0.277	0.044	0.84	0.769	0.167	0.116
Manipur	0.729	0.805	0.765	0.049	0.034	0.775	0.744
Meghalaya	0.506	0.611	0.457	0.253	0.208	0.717	0.706

	2009-10						
	Share of total households					Share of	
States	**Job card**	**Seeking work**	**Participated**	**Rationing Rate***	**Rationing Rate (poor)***	**Job card**	**Seeking work**
Mizoram	0.914	0.949	0.913	0.038	0.000	0.951	0.950
Nagaland	0.667	0.747	0.588	0.213	0.424	0.937	0.882
Orissa	0.404	0.507	0.22	0.567	0.532	0.469	0.355
Punjab	0.086	0.312	0.052	0.833	0.115	0.121	0.106
Rajasthan	0.710	0.732	0.618	0.155	0.144	0.674	0.517
Sikkim	0.458	0.460	0.441	0.041	0.025	0.631	0.593
Tamil Nadu	0.396	0.414	0.335	0.19	0.115	0.483	0.425
Tripura	0.801	0.860	0.782	0.091	0.052	0.797	0.786
Uttar Pradesh	0.211	0.35	0.162	0.536	0.504	0.264	0.227
Uttaranchal	0.343	0.406	0.292	0.28	0.357	0.358	0.316
West Bengal	0.593	0.658	0.432	0.344	0.305	0.599	0.516
India	0.348	0.447	0.249	0.444	0.423	0.384	0.300

Source: National Sample Survey, 66th Round and 68th Round.

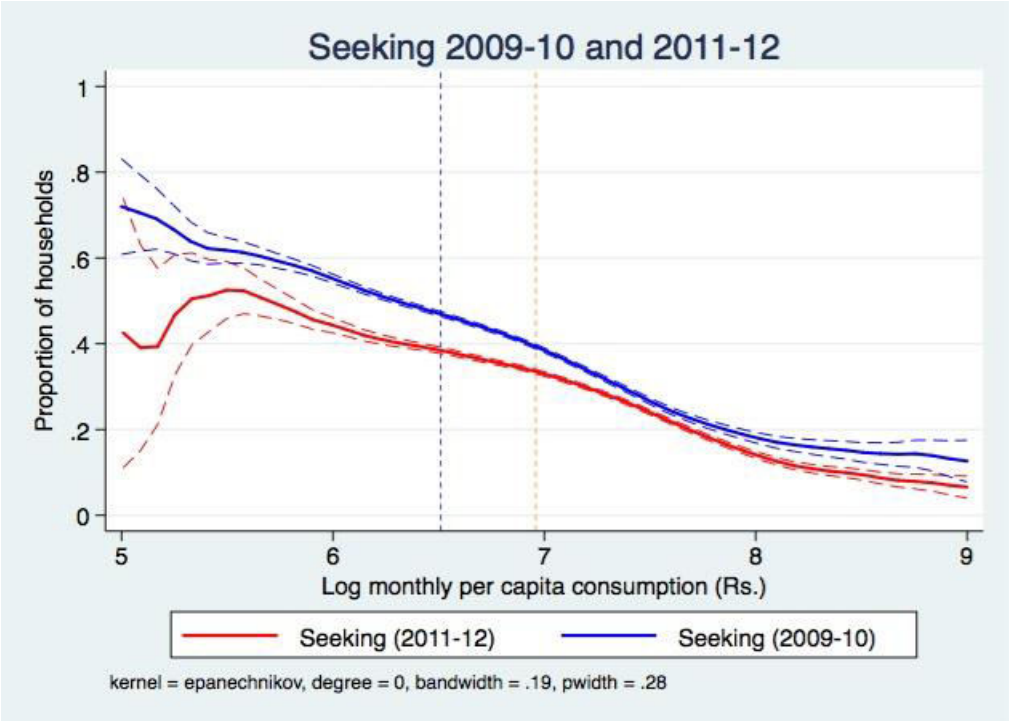
Notes: *Rationing rate is the total households seeking but not getting work/total households seeking work.Rationing rate for the po
poverty line who seek but do not get work as a fraction of total households below the poverty line who seek work.This is computed

Figure 1: MGNREGA implementation in India, 2006-07 to 2014-15



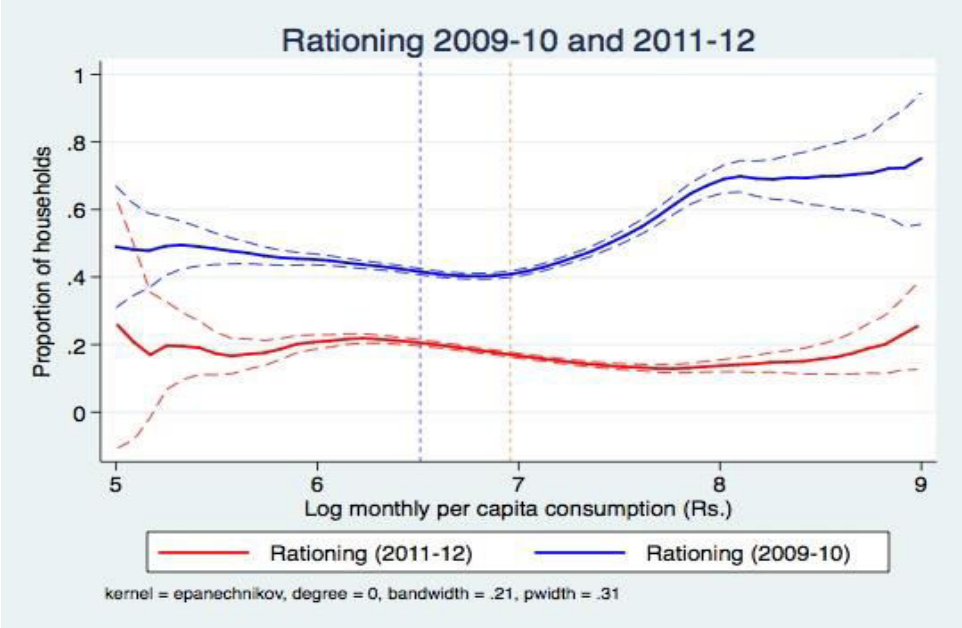
Source: Government of India (2012); www.nrega.nic.in . Accessed May, 2015.

Figure 2a :Workseekingrates in the MGNREGA, 2009-10 and 2011-12



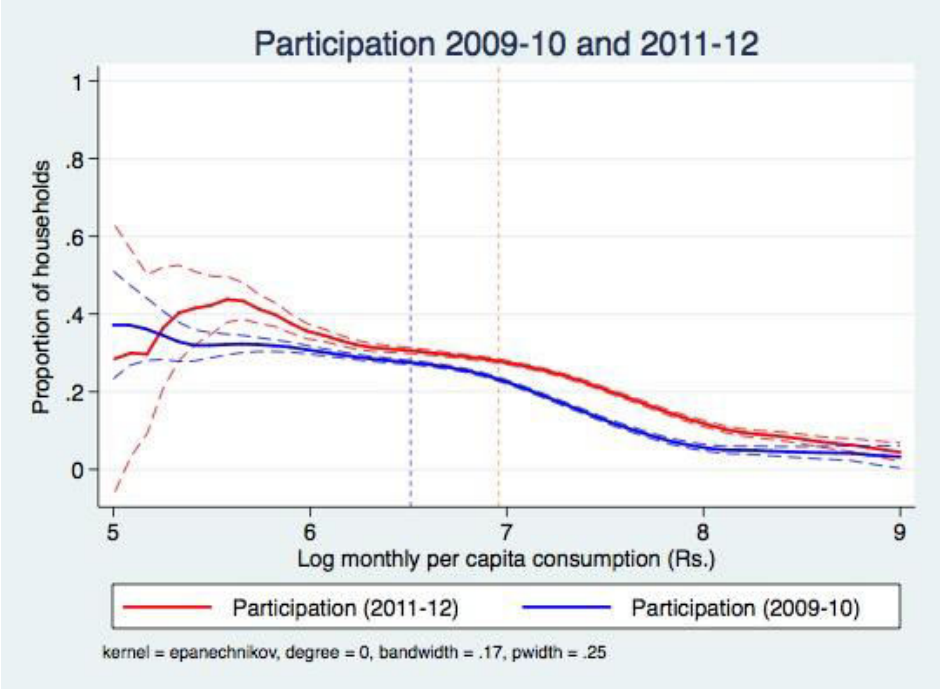
Note: The dashed vertical lines represent the Tendulkar poverty lines for each year, the red for 2011-12 and the blue for 2009-10. The dashed lines associated with each local polynomial regression are the 95% confidence intervals.

Figure 2b:Rationing rates in the MGNREGA, 2009-10 and 2011-12



Note: The dashed vertical lines represent the Tendulkar poverty lines for each year, the red for 2011-12 and the blue for 2009-10. The dashed lines associated with each local polynomial regression are the 95% confidence intervals.

Figure 2c: Participation rates in the MGNREGA, 2009-10 and 2011-12



Note: The dashed vertical lines represent the Tendulkar poverty lines for each year, the red for 2011-12 and the blue for 2009-10. The dashed lines associated with each local polynomial regression are the 95% confidence intervals.

Table 2: Summary Statistics for household level analysis (Model 1)

Variable	Mean/Proportion	Standard Deviation
Rationing Rate (2009-10)	0.48	0.31
Average days of delay in wage payment (2009-10)	17.17	22.02
Average proportion of payments with over 90 days delay (2009-10)	8.47	16.80
Average percentage of wage payments delayed (2009-10)	9.25	18.80
Proportion of Scheduled Tribe households	0.16	
Proportion of Scheduled Caste households	0.17	
Proportion of Other Backward Class households	0.40	
Proportion of Upper Caste households	0.27	
Proportion of Hindu households	0.76	
Proportion of Muslim households	0.12	
Proportion of households belonging to other religions	0.11	
Proportion of landless households (0 hectares)	0.44	
Proportion of marginal landholders (0 to 1 hectares)	0.37	
Proportion of small landholders (1 to 2 hectares)	0.09	
Proportion of other landholders (More than 2 hectares)	0.09	
Proportion of households engaged in agricultural and non agricultural labor	0.23	
Proportion of households self employed in non-agriculture	0.26	
Proportion of households self employed in agriculture	0.28	
Proportion of households engaged in other occupations	0.23	
Age of the household head (years)	46.89	14.14
Proportion of female household heads	0.16	
Proportion of households where head is illiterate	0.32	
Proportion of households where head is educated below primary level	0.11	
Proportion of households where head is educated between primary and middle level	0.31	
Proportion of households where head is educated between secondary and higher secondary level	0.18	
Proportion of households where head is educated above higher secondary level	0.08	
Monthly per capita consumption (‘000 Rs.)	1.365	0.591
Number of adult earning members	3.00	1.56
District Level Variables used in the Household Analysis		
Proportion of people from Scheduled Caste (districtwise)	0.17	0.10
Proportion of people from Scheduled Tribes (districtwise)	0.17	0.261
Literacy rate in the district	0.61	0.10
Integrated Action Plan district (1=Yes)	0.09	
MGNREGA Phase 1 district (1=Yes)		
MGNREGA Phase 2 district (1=Yes)	0.26	
MGNREGA Phase 3 district (1=Yes)	0.40	
Positive deviation of rainfall in 2011-12 (in standard deviation units)	9.30	2.75
Absolute value of negative deviation of rainfall in 2011-12 (in standard deviation units)	8.49	1.77
Positive deviation of rainfall in 2009-10 (in standard deviation units)	6.48	2.79
Absolute value of negative deviation of rainfall in 2009-10 (in standard deviation units)	10.61	1.92
Proportion of target in toilet construction achieved over the past three years	0.13	0.30
Difference between NREGA wages and bottom decile wages in 2011-12 (rupees)	-58.13	27.60

Table 3: Summary Statistics of district level variables (Models 1-3)

Variable	2009-10		2011-12	
	Mean	Standard Deviation	Mean	Standard Deviation
Demand rate	0.40	0.21	0.28	0.21
Rationing rate	0.50	0.31	0.26	0.26
Participation rate	0.22	0.20	0.24	0.20
Weighted rationing rate (See Appendix 1 for details)	0.20	0.17	0.11	0.13
Demand rate among households below poverty line	0.52	0.25	0.38	0.25
Rationing rate among households below poverty line	0.46	0.33	0.25	0.28
Participation rate among households below poverty line	0.30	0.26	0.30	0.25
Proportion among households below the official state poverty line	0.41	0.20	0.40	0.20
Average MPCE (Rs.)	1066	314	1422	413
Proportion with agriculture as the main occupation	0.29	0.10	0.30	0.10
Proportion with non-agriculture as the main occupation	0.23	0.09	0.25	0.09
Proportion with agricultural labour as the main occupation	0.12	0.07	0.09	0.06
Proportion with non-agricultural labour as the main occupation	0.17	0.09	0.15	0.09
Commercial Bank branches (hundreds)	137.2	126.4	159.9	148.5
Bank branch expansion over the two years preceding 2009-10, as percentage of branches in 2007-08	11.8	7.5	17.2	11.9
Absolute value of positive rainfall deviation	6.5	2.8	9.4	2.9
Absolute value of negative deviation of rainfall (in standard deviation units)	10.7	2.0	8.4	1.7
Proportion of targets in toilet construction achieved over the past three years under the Nirmal Bharat Abhiyan	0.14	0.28	0.12	0.08
Percentage of wage payments delayed	11.6	20.8	11.6	20.8
Approximate average delay in payment (days)	20.2	22.3	20.2	22.3
Proportion of payments with over 90 days delay	9.8	17.1	9.8	17.1
Growing Degree Days (GDD) current year	4959.9	1514.1	4816.0	1505.2
Growing Degree Days (GDD) lagged year	4911.6	1511.4	4858.9	1495.1
Job cards (in `0000 numbers)	17.73	15.08	22.44	18
Time invariant characteristics	**Mean /Proportion**	**Standard Deviation**		
Proportion of people from the Scheduled Castes	0.17	0.10		
Proportion of people from the Scheduled Tribes	0.19	0.28		
Literacy rate	0.59	0.10		
Integrated Action Plan district (1=Yes)	0.11	0.31		
MGNREGA Phase 1 district (1=Yes)	0.36			
MGNREGA Phase 2 district (1=Yes)	0.24			
MGNREGA Phase 3 district (1=Yes)	0.41			
Number of post offices (delivery) in 2015	254.7	172.7		
UPA victory in the district (1=Yes)	0.37			
Proportion of constituencies in the district won by UPA	0.34	0.34		
Ratio of UPA votes to non-UPA votes	0.90	1.97		
Share of seats reserved for SC/ST	0.35	0.31		
Proportion of electorate who voted (relative to eligible population)	0.67	0.14		
Years elapsed since previous election	3.1	1.35		
Election coincides with survey year (1=Yes)	0.31			

Source: Appendix 1 for data sources and description. Some of the district level variables are used as explanatory variables in Model 1 and 1a.

Table 4:The Discouraged Worker: Household level analysis Second stage results of IV Probit and IV Linear Probabil and 1a)

Dependent variable: Seeking work	Probit (estimated average marginal effects, with standard errors in parentheses, clustered at district level)				Linear Probability Mode	
Sample & Specification (∟) Variables of interest (∟)	(a) All households	(b) All households (with rain-delay interaction)	(c)Poor households	(d) Poor households (with rain-delay interaction)	(e) All households	(f) All households (with rain-delay interaction)
Lagged Rationing Rate (2009-10)	-0.357**	-0.341**	-0.394**	-0.382*	-0.891***	-0.922***
	(0.142)	(0.137)	(0.174)	(0.220)	(0.051)	(0.055)
Proportion of payments with over 90 days delay in 2009-10	0.00315	-0.0249	0.000032	-0.0302	-0.043**	-0.040**
	(0.0652)	(0.0597)	(0.0711)	(0.0875)	(0.018)	(0.016)
Average delay in wage payments interacted with the absolute value of negative deviation in rainfall (in standard deviation units) in 2009-10		-0.0434		-0.0458		-0.020
		(0.0725)		(0.138)		(0.023)
Number of observations	47131	47131	15476	15476	47131	47131
Wald chi-squared test of exogeneity	Chi-2(2) 4.9*	Chi-2(3) 16.08***	Chi-2(2) 3.73	Chi-2(3) 7.63*		
Underidentification test: Kleinberg Papp rank LM statistic					414.11***	735.444***
Weak instrument test: Kleinberg Papp Wald F statistic					203.024	257.696
Stock and Yogo critical values					7.03 (10% maximal IV size)	Not available

Notes: For coefficients on the probit regression and for the full set of regression results and for the Linear Probability Model with diagnostics for IV, ple 3 respectively. Poor households refer to households whose Monthly per capita expenditure (MPCE) is below the official state poverty line. These regres subsample of poor households. For marginal effects, standard errors in parentheses and for linear model, t-statistic in parentheses. *$p<0.10$, **$p<0.05$, *** validity tests are conducted for the LPM model and reported here. Instruments: For the IV delay in payments and rationing rate have been instrumented MGNREGA positions vacant and the percentage change in bank branches over the two years preceding 2009-10 for (a), (c), (e) and (g) and when rain-d this is instrumented with Number of block level MGNREGA staff per village for (b), (d), (f), (h)

Table 5: The Discouraged Worker Effect: District level analysis (Model 2 and Model 3)

Dependent variable: Change in district level demand rate	Least Squares		Two stage least squares (Model 2)		Control functio (Model
	Full sample	Sample with no missing data	Full sample	Sample with no missing data	Full sample
Lagged Rationing Rate (2009-10)	-0.257***	-0.242***	-0.400***	-0.334***	-0.234***
	(0.02)	(0.03)	(0.07)	(0.07)	(0.08)
Proportion of payments with over 90 days delay in 2009-10	-1.358**	-1.817***	0.077	1.924	-0.028
	(0.56)	(0.61)	(2.32)	(1.64)	(1.32)
Average delay in wage payments interacted with the absolute value of negative deviation in rainfall (in standard deviation units) in 2009-10	-24.629***	-29.524***	-8.251	-33.446***	-20.391**
	(7.21)	(8.30)	(20.13)	(10.30)	(9.91)
Demand Rate (2009-10)	-0.638***	-0.685***	-0.618***	-0.764***	-0.464***
	(0.03)	(0.05)	(0.05)	(0.08)	(0.09)
Predicted error term from the control function					-0.145*
					(0.09)
Number of Observations	550	283	551	284	522
R-squared	0.630	0.681			0.608

Notes: For the full set of regression results and other diagnostics, and for alternate estimations using Two Stage Least Squares and Control Function, ple
Appendix 3. Tables 1 and 2 respectively. Variables used in the 3SLS and control function as controls for the endogenous variables include the following
of variables including proportion of block staff vacant, the number of block level staff per village, block and per job card, bank branches per job card, G
payments with over 90 days delay in 2009-10, delayed interacted with absolute value of negative deviation in rainfall in 2009-10 we use block level vac
village and expansion of bank branches; and for demand rate in 2009-10 we use GDD variables, village level functionaries per job card and per village
job card and per village.

Table 6: Correlates of rationing and pro-poor rationing: district level panel data (Model 4,5,6,7)

Dependent variable: Rationing /Weighted rationing rate at the district level	All (Model 4)		Poor subpopulation (Model 5)		Weighted by proportion below poverty line (Model 6)		Weighted by inverse monthly per capita expenditure (Model 7)	
	Naive	IV Second Stage	Naive	IV Second Stage	Naive	IV Second Stage	Naive	IV Second Stage
Demand Rate	0.378***	-1.024	0.184**	-0.420	0.195***	-0.368	0.277**	-0.959
	(0.080)	(0.760)	(0.078)	(0.305)	(0.041)	(0.314)	(0.131)	(0.835)
Whether UPA won any seat in the district (1=Yes)	0.064	0.090	0.089	0.113	0.013	0.024	0.101	0.134
	(0.055)	(0.081)	(0.060)	(0.070)	(0.022)	(0.031)	(0.071)	(0.093)
Proportion of constituencies under UPA	-0.100	-0.150	-0.148*	-0.194**	-0.042	-0.062	-0.120	-0.170
	(0.075)	(0.107)	(0.083)	(0.096)	(0.032)	(0.042)	(0.096)	(0.121)
Share of UPA votes	-0.009	-0.012**	0.001	-0.001	-0.007***	-0.008*	-0.010	-0.012
	(0.008)	(0.005)	(0.012)	(0.011)	(0.002)	(0.004)	(0.012)	(0.008)
Years since election	0.018**	0.023**	0.020**	0.021**	0.014***	0.016***	0.017*	0.019*
	(0.007)	(0.010)	(0.008)	(0.008)	(0.004)	(0.004)	(0.010)	(0.011)
Survey year is an election year (1=Yes)	0.002	0.058	0.019	0.042*	0.021**	0.044**	-0.017	0.026
	(0.019)	(0.038)	(0.020)	(0.024)	(0.009)	(0.017)	(0.027)	(0.042)
Polling percentage (divided by 10)	0.017	0.053	0.011	0.018	-0.013	0.001	-0.004	0.020
	(0.040)	(0.057)	(0.037)	(0.043)	(0.019)	(0.025)	(0.052)	(0.065)
Proportion of seats reserved for SC/ST candidates	0.157	0.029	0.298	0.189	0.135	0.084	0.074	-0.054
	(0.189)	(0.211)	(0.217)	(0.225)	(0.107)	(0.105)	(0.296)	(0.299)
Monthly per capita expenditure (INR `000)	-0.086	-0.211**	-0.025	-0.046	-0.109***	-0.159***	-0.085	-0.198
	(0.055)	(0.098)	(0.059)	(0.067)	(0.023)	(0.041)	(0.090)	(0.122)
Absolute value of negative deviation of rainfall	0.041***	0.068***	0.047***	0.062***	0.018***	0.029***	0.044***	0.067***
	(0.006)	(0.016)	(0.006)	(0.010)	(0.003)	(0.007)	(0.008)	(0.017)
Positive deviation of rainfall	0.006	0.006	0.006	0.006	0.001	0.002	0.003	0.003
	(0.004)	(0.005)	(0.004)	(0.004)	(0.002)	(0.002)	(0.006)	(0.006)
Proportion of targets achieved in sanitation	0.019	0.237	-0.012	0.109	0.037	0.124*	0.135	0.316
	(0.106)	(0.173)	(0.092)	(0.114)	(0.037)	(0.068)	(0.151)	(0.202)
Number of commercial bank branches (`000s)	-0.022***	-0.038***	-0.024***	-0.031***	0.001	-0.005	-0.028***	-0.042***
	(0.001)	(0.012)	(0.006)	(0.008)	(0.003)	(0.005)	(0.009)	(0.015)
Number of job cards (`00,000)	-3.272	-4.691	-3.371	-4.856*	-1.084	-1.654	-1.592	-2.880
	(2.033)	(2.881)	(2.222)	(2.509)	(0.977)	(1.158)	(2.744)	(3.322)
Constant	0.116		0.009		0.048		0.411	
	(0.301)		(0.285)		(0.140)		(0.419)	
N	1054	1026	1030	984	1054	1026	1072	1060
Test of endogeneity		5.59***		4.56**		4.195***		2.919*
Underidentification test: Kleiberg Paap rank LM statistic		9.20***		19.82***		9.20***		10.8***
Weak instrument test: Cragg-Donald Wald F statistic		9.1		28.18		9.103		10.55
KleibergPaap Wald F statistic		9.65		26.95		9.648		11.21

Stock and Yogo critical values	8.96 (15% maximal IV size)	16.38 (10% maximal IV size)	8.96 (15% maximal IV size)	8.96 (15% maximal IV size)

See Appendix 1 for details on computation of the weighted rationing rate. In all the IV regressions we use as the instrument for demand rate the number of days that the temperature was above the optimal threshold for the dominant crop in the district over the cropping season for that year.

Supplementary Materials

The "Discouraged Worker Effect" in Public Works Programs: Evidence from the MGNREGA in India

Sudha Narayanan, Upasak Das, Yanyan Liu, Christopher B. Barrett

Appendix Table 1 : Correlates of rationing and propoor rationing –District level cross section analysis to test relevance of administrative staff capacity (2011-12)

	Rationing rate		Rationing rate among the poor	
	With state dummies b/t	Without state dummies b/t	With state dummies b/t	Without state dummies b/t
Demand Rate	0.201***	-0.240***	0.082	-0.224***
	(3.23)	(-3.90)	-1.58	(-4.18)
Staff Capacity				
Block level MGNREGA staff per village	-0.215***	-0.128***	-0.262***	-0.108*
	(-2.92)	(-2.72)	(-3.16)	(-1.78)
Proportion of MGNREGA positions at the village level that are filled	-0.0000014*	0.001	-0.019**	-0.007
	(-1.96)	(0.27)	(-2.39)	(-1.00)
Proportion of total MGNREGA positions at the block level that are vacant	Neg.	0.001	Neg.	0.001
	(-0.09)	(1.15)	(-0.59)	(1.1)
Elections and political party affiliation of successful candidates				
UPA victory in the district	0.019	-0.015	0.007	-0.021
	(0.70)	(-0.43)	(0.25)	(-0.57)
Proportion won by UPA	0.025	0.118**	0.012	0.115**
	(0.61)	(2.49)	(0.28)	(2.21)
Ratio of UPA votes to non-UPA votes	0.001	Neg.	0.007	0.005
	(-0.16)	(Neg.)	(1.00)	(0.57)
Years elapsed since previous election	0.002	-0.016**	0.005	-0.015*
	(0.32)	(-2.12)	(0.62)	(-1.82)
Election coincides with survey year (=1 if Yes)	-0.012	-0.008	0.003	0.009
	(-0.56)	(-0.37)	(0.14)	(0.42)
Proportion of electorate who votes	-0.001	-0.002**	-0.001	-0.003**
	(-1.01)	(-2.23)	(-0.78)	(-2.32)
Share of Assembly Constituencies reserved for Scheduled Castes or Tribes	-0.093**	-0.142***	-0.091**	-0.156***
	(-2.45)	(-3.89)	(-2.19)	(-4.01)
Others				
Average MPCE (Rs.`0000)	-0.106***	-0.152***	-0.096**	-0.120***
	(-2.81)	(-4.87)	(-2.28)	(-3.36)
Absolute negative deviation in rainfall (in standard deviation units)	0.032***	0.035***	0.037***	0.039***
	(5.46)	(6.51)	(5.68)	(6.85)
Positive deviation in rainfall (in standard deviation units)	-0.003	-0.007**	-0.002	-0.005
	(-0.84)	(-1.97)	(-0.49)	(-1.29)
Proportion of toilets constructed relative to targets in the three years ending 2011-12	0.003	-18.574	-14.731	0.905
	(Neg.)	(-0.18)	(-0.15)	(0.01)
Number of bank branches (hundred thousand)	13.160	31.585***	7.100	25.554**
	(1.43)	(3.06)	(0.71)	(2.21)
Number of job cards (hundred thousand)	-57.030***	-33.686***	-44.901***	-22.851**
	(-5.19)	(-3.75)	(-3.78)	(-2.35)
Number of blocks in the district	0.002	-0.001	0.001	-0.002
	(0.58)	(-0.42)	(0.40)	(-0.73)
Number of panchayats (villages) in the district (ten thousand)	0.159	-0.097	-0.152	-0.146
	(0.28)	(-0.21)	(-0.25)	(-0.28)
Number of blocks reporting data	0.006	-0.001	Neg.	-0.005
	(0.87)	(-0.23)	(0.01)	(-1.15)
Constant	-0.404	0.761**	0.246	1.118**
	(-0.55)	(2.17)	(-0.31)	(-2.48)
State Dummies	Yes	No	Yes	No
Number of observations	849	868	828	846
R-squared	0.421	0.213	0.396	0.198
F-statistic	13.631	15.97	11.95	14.351

Notes: State dummies are not listed here for convenience. Neg. means negligible. Coefficients along with t-statistics are reported in the parenthesis. . $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$

Appendix Table 2: The Discouraged Worker Effect: Household level IV Probit Analysis Second Stage (Model 1)

Dependent variable is Household Demand for MGNREGA work in 2011-12
Instruments: Proportion of total block level position that lies vacant (for lagged rationing rate and proportion of payments delayed over 90 days), Bank expansion in preceding 2 years Block level MGNREGA staff per village (for delay interacted with absolute value of negative deviation in rainfall), 2011-12

	All Households		Poor households	
	All household	All households(with interaction effects)	All households	All households(with interaction effects)
Lagged Rationing Rate (2009-10)	-2.549***	-2.648***	-2.338***	-2.467***
	(-5.59)	(-6.11)	(-4.48)	(-3.71)
Proportion of payments delayed over	-0.078	-0.063	-0.064	-0.080
90 days (rescaled dividing by 10)	(-0.35)	(-0.32)	(-0.31)	(-0.31)
Interaction of absolute value of		-0.089		-0.146
negative deviation in rainfall and		(-0.36)		(-0.37)
average delay in payments.				
Delayed Payments (missing)	0.081	0.485	0.160	0.749
	(0.19)	(0.64)	(0.42)	(0.59)
Social Group (Ref. Upper Castes)				
Scheduled Tribe	0.239***	0.242***	0.207**	0.215***
	(3.19)	(3.39)	(2.30)	(2.62)
Scheduled Caste	0.335***	0.343***	0.222***	0.240***
	(5.26)	(6.11)	(2.97)	(3.88)
Other Backward Castes	0.089**	0.092**	0.023	0.041
	(2.08)	(2.23)	(0.39)	(0.66)
Religion (Ref. Hindus)				
Muslims	0.007	0.023	-0.013	0.003
	(0.13)	(0.37)	(-0.20)	(0.05)
Other religions	0.246***	0.267***	0.113	0.156
	(2.72)	(2.74)	(0.99)	(0.88)
Land Cultivated Groups (Ref. Big-above 1 ha)				
Landless	0.147**	0.159***	0.178*	0.206***
	(2.57)	(3.16)	(1.94)	(2.66)
Marginal (below 1 ha)	0.322***	0.323***	0.337***	0.347***
	(5.15)	(5.22)	(3.35)	(3.72)
Small (1 ha to 2 ha)	0.231***	0.232***	0.249***	0.258***
	(4.90)	(5.01)	(2.72)	(3.02)
Household type (Ref. Agricultural and other labour)				
Self employed in non-agriculture	-0.517***	-0.517***	-0.512***	-0.511***
	(-8.46)	(-9.09)	(-7.27)	(-7.01)
Self-employed in agriculture	-0.406***	-0.393***	-0.377***	-0.359***
	(-7.69)	(-7.74)	(-7.56)	(-5.19)
Others	-0.809***	-0.809***	-0.725***	-0.724***
	(-9.43)	(-10.25)	(-7.36)	(-7.18)

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	All Households		Poor households	
	All households	All households (with interaction effects)	All households	All households (with interaction effects)
Education of the Head (Ref. illiterate)				
Below Primary	0.012	0.006	0.067	0.061
	(0.32)	(0.17)	(1.24)	(1.22)
Primary & Middle	-0.014	-0.018	-0.057	-0.058
	(-0.45)	(-0.63)	(-1.57)	(-1.64)
Secondary & Higher Secondary	-0.055	-0.056	0.006	0.011
	(-1.59)	(-1.64)	(0.12)	(0.21)
Above Higher Secondary	-0.068	-0.079*	-0.023	-0.030
	(-1.31)	(-1.68)	(-0.39)	(-0.52)
Other household characteristics				
Age of household head (years)	0.014***	0.013***	0.018**	0.016**
	(2.67)	(2.76)	(2.53)	(2.42)
Square of age of household head (/100)	-0.015***	-0.014***	-0.020***	-0.018***
	(-2.91)	(-2.97)	(-2.78)	(-2.78)
Household head is female (=1)	-0.077**	-0.082***	-0.079*	-0.088*
	(-2.32)	(-2.83)	(-1.70)	(-1.81)
Log of Monthly per capita consumption	-0.525***	-0.529***	-0.398***	-0.436***
	(-12.11)	(-12.87)	(-4.09)	(-3.72)
Number of adult earning age members	0.043***	0.045***	0.042***	0.046***
	(6.35)	(6.01)	(4.09)	(2.98)
District level characteristics				
Proportion of people from the Scheduled Castes	0.269	0.177	0.603	0.576
	(0.54)	(0.44)	(1.38)	(1.33)
Proportion of people from the Scheduled Tribes	0.062	-0.023	0.002	-0.091
	(0.21)	(-0.08)	(0.01)	(-0.24)
Literacy rate	0.721**	0.588	0.691**	0.418
	(2.28)	(1.44)	(2.01)	(0.53)
Integrated Action Plan district (=1 if yes)	-0.055	-0.061	0.012	0.009
	(-0.31)	(-0.36)	(0.07)	(0.05)
MGNREGA Phase 2 district	0.065	0.050	0.065	0.043
	(0.73)	(0.66)	(0.76)	(0.51)
MGNREGA Phase 3 district	0.123*	0.128*	0.070	0.068
	(1.68)	(1.70)	(0.92)	(0.90)
Positive deviation of rainfall in 2009-10	0.018	0.023	Neg.	0.007
	(1.09)	(1.28)	(-0.01)	(0.27)
Absolute value of negative deviation of rainfall (2009-10)	0.056	0.049	0.043	0.025
	(1.53)	(0.93)	(1.40)	(0.32)
Proportion of target achieved over the past three years	-0.037	-0.018	-0.404	-0.294
	(-0.31)	(-0.19)	(-1.06)	(-0.88)
Difference between NREGA wages and top decile wages (Rs. `00) in 2011-12	-0.072	-0.095	-0.023	-0.058
	(-0.48)	(-0.60)	(-0.16)	(-0.32)
Constant	2.732***	2.571***	1.975**	2.027**
	(4.26)	(4.90)	(2.20)	(2.07)
N	47,131	47,131	15,476	15,476
Wald test of exogeneity	Chi-2(2) 4.9*	Chi-2(3) 16.08***	Chi-2(2) 3.73*	Chi-2(3) 7.63*

Notes: Neg. means negligible. Coefficients along with t-statistics are reported in the parenthesis. . *$p<0.10$, **$p<0.05$, ***$p<0.01$

Appendix Table 3: The Discouraged Worker Effect: Household level IV Probit Analysis, First Stage Estimates, All households (Model 1)

Dependent variable is Household Demand for MGNREGA work in 2011-12 Instruments: Proportion of total block level position that lies vacant (for lagged rationing rate and proportion of payments delayed over 90 days), Bank expansion in preceding 2 years Block level MGNREGA staff per village (for delay interacted with absolute value of negative deviation in rainfall), 2011-12

	Without interaction term		With interaction term		
	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Interaction of absolute value of negative deviation in rainfall and average delay in wage payments
Proportion of total block level position that lies vacant	-0.068	0.575*	-0.069	0.580*	0.176
	(-1.04)	(1.81)	(-1.07)	(1.84)	(0.79)
Bank expansion in 2 years preceding 2011-12	-0.003***	Neg.	-0.004***	0.002	0.004
	(-2.91)	(-0.08)	(-3.17)	(0.45)	(1.47)
Block level MGNREGA staff per village			-0.069	0.373	-0.219
			(-1.21)	(1.64)	(-1.27)
Delayed Payments (missing)	0.026	-1.856***	0.036	-1.908***	4.105***
	(0.86)	(-13.55)	(1.14)	(-13.32)	(37.15)
Social Group (Ref. Upper Castes)					
Scheduled Tribe	-0.037**	-0.087	-0.030**	-0.126**	0.112**
	(-2.38)	(-1.53)	(-1.99)	(-2.24)	(2.38)
Scheduled Caste	-0.006	-0.101**	-0.006	-0.101**	0.095***
	(-0.56)	(-2.37)	(-0.57)	(-2.38)	(2.64)
Other Backward Castes	-0.008	-0.052	-0.008	-0.053	0.038
	(-0.49)	(-0.79)	(-0.50)	(-0.80)	(0.70)
Religion (Ref. Hindus)					
Muslims	0.001	-0.108*	0.005	-0.128**	0.190***
	(0.05)	(-1.93)	(0.24)	(-2.23)	(4.38)
Other religions	0.117***	-0.053	0.111***	-0.022	0.089
	(3.53)	(-0.34)	(3.42)	(-0.14)	(0.83)
Land Cultivated Groups (Ref. Big-above 1 ha)					
Landless	0.023	-0.121	0.024	-0.126	0.066
	(1.31)	(-1.53)	(1.39)	(-1.60)	(1.23)
Marginal (below 1 ha)	-0.023	-0.027	-0.021	-0.035	0.025
	(-1.27)	(-0.38)	(-1.19)	(-0.49)	(0.47)
Small (1 ha to 2 ha)	-0.008	-0.013	-0.008	-0.011	0.003
	(-0.66)	(-0.25)	(-0.69)	(-0.21)	(0.09)
Household type (Ref. Agricultural and other labour)					
Self employed in non-agriculture	0.003	0.047	0.005	0.036	-0.008
	(0.44)	(1.29)	(0.73)	(1.00)	(-0.31)
Self-employed in agriculture	0.021**	-0.082**	0.020**	-0.082**	0.086***
	(2.42)	(-2.57)	(2.41)	(-2.54)	(3.51)
Others	0.003	0.045	0.004	0.041	-0.021
	(0.39)	(1.22)	(0.48)	(1.13)	(-0.90)

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	Without interaction term		With interaction term		
	Lagged Rationing Rate (2009-10)	**Proportion of payments delayed over 90 days**	**Lagged Rationing Rate (2009-10)**	**Proportion of payments delayed over 90 days**	**Interaction of absolute value of negative deviation in rainfall and average delay in wage payments**
Education of the Head (Ref. illiterate)					
Below Primary	0.003	0.083	0.005	0.077	-0.051
	(0.30)	(1.51)	(0.41)	(1.41)	(-1.33)
Primary & Middle	0.003	0.067	0.006	0.051	-0.031
	(0.37)	(1.43)	(0.73)	(1.11)	(-0.91)
Secondary & Higher Secondary	0.013	0.034	0.013	0.030	-0.028
	(1.24)	(0.82)	(1.33)	(0.73)	(-0.85)
Above Higher Secondary	-0.000	0.103	0.002	0.089	-0.079*
	(-0.02)	(1.64)	(0.18)	(1.45)	(-1.81)
Other household characteristics					
Age of household head (years)	Neg.	0.016***	-0.000	0.015***	-0.011***
	(-0.17)	(2.80)	(-0.08)	(2.71)	(-2.93)
Square of age of household head (/100)	Neg.	-0.015***	v	-0.014**	0.010***
	(0.10)	(-2.62)	(0.01)	(-2.54)	(2.67)
Household head is female (=1)	-0.029***	0.062	-0.029***	0.062	-0.031
	(-3.25)	(1.31)	(-3.27)	(1.33)	(-0.94)
Log of Monthly per capita consumption	-0.017	-0.054	-0.020	-0.038	-0.021
	(-1.30)	(-0.86)	(-1.52)	(-0.62)	(-0.46)
Number of adult earning age members	0.008***	-0.002	0.007***	Neg.	0.014***
	(4.21)	(-0.30)	(4.02)	(0.06)	(2.58)
District level characteristics					
Proportion of people from the Scheduled Castes	-0.450**	1.200*	-0.449**	1.192*	-0.570
	(-2.37)	(1.78)	(-2.40)	(1.76)	(-1.06)
Proportion of people from the Scheduled Tribes	-0.392***	0.415	-0.378***	0.337	-0.420**
	(-4.82)	(1.59)	(-4.66)	(1.28)	(-1.97)
Literacy rate	-0.189	0.307	-0.149	0.091	-0.990**
	(-1.37)	(0.54)	(-1.06)	(0.16)	(-2.38)
Integrated Action Plan district (=1 if yes)	0.064	0.516***	0.063	0.520***	-0.132
	(1.27)	(2.75)	(1.23)	(2.78)	(-0.85)
MGNREGA Phase 2 district	Neg.	0.222	-0.001	0.229	-0.176
	(Neg.)	(1.40)	(-0.04)	(1.45)	(-1.42)
MGNREGA Phase 3 district	0.056	-0.017	0.051	0.009	-0.105
	(1.53)	(-0.10)	(1.41)	(0.06)	(-0.83)
Positive deviation of rainfall in 2009-10	0.021***	0.023	0.021***	0.023	0.015
	(3.30)	(0.90)	(3.35)	(0.89)	(0.82)
Absolute value of negative deviation of rainfall (2009-10)	0.027***	-0.132***	0.028***	-0.139***	-0.122***
	(3.17)	(-3.33)	(3.37)	(-3.49)	(-4.17)
Proportion of target achieved over the past three years	0.051***	-0.036	0.045***	-0.003	-0.033
	(2.85)	(-0.48)	(2.72)	(-0.05)	(-0.44)
Difference between NREGA wages and top decile wages (Rs. `00) in 2011-12	-0.139***	-0.115	-0.144***	-0.089	-0.165
	(-2.73)	(-0.45)	(-2.85)	(-0.35)	(-0.83)
Constant	0.370**	2.496***	0.375**	2.469***	-1.856***
	(2.11)	(3.19)	(2.16)	(3.19)	(-3.18)

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N	47,131	47,131	47,131	47,131	47,131
Bic		217088.92			294349.37
Aic		216151.52			293044.02

Notes: State dummies are not listed here for convenience. Neg. means negligible. Coefficients along with t-statistics are reported in the parenthesis. .$^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$

Appendix Table 4 :The Discouraged Worker Effect: Household level IV Probit Analysis First Stage Estimates, Poor Households (Model 1)

Dependent variable is Household Demand for MGNREGA work in 2011-12

Instruments: Proportion of total block level position that lies vacant (for lagged rationing rate and proportion of payments delayed over 90 days), Bank expansion in preceding 2 years Block level MGNREGA staff per village (for delay interacted with absolute value of negative deviation in rainfall), 2011-12

	Without interaction term		**With interaction term**		
	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Interaction of absolute value of negative deviation in rainfall and average delay in wage payments
Proportion of total block level position that lies vacant	-0.121*	0.832*	-0.125*	0.867**	-0.007
	(-1.78)	(1.94)	(-1.85)	(2.03)	(-0.02)
Bank expansion in 2 years preceding 2011-12	-0.004***	0.002	-0.004***	0.004	0.003
	(-3.28)	(0.57)	(-3.37)	(0.95)	(1.03)
Block level MGNREGA staff per village			-0.034	0.279	-0.145
			(-0.96)	(1.62)	(-1.05)
Delayed Payments (missing)	0.047	-1.810***	0.052	-1.853***	4.152***
	(1.49)	(-11.79)	(1.63)	(-11.65)	(32.86)
Social Group (Ref. Upper Castes)					
Scheduled Tribe	-0.005	-0.156**	Neg.	-0.193***	0.110*
	(-0.23)	(-2.11)	(Neg.)	(-2.63)	(1.77)
Scheduled Caste	0.008	-0.184***	0.008	-0.185***	0.147***
	(0.48)	(-3.24)	(0.50)	(-3.30)	(3.09)
Other Backward Castes	0.019	-0.144**	0.019	-0.140**	0.119**
	(0.99)	(-2.07)	(0.97)	(-2.02)	(1.99)
Religion (Ref. Hindus)					
Muslims	-0.003	-0.098	-0.002	-0.111*	0.147***
	(-0.15)	(-1.58)	(-0.07)	(-1.79)	(3.30)
Other religions	0.115***	-0.067	0.111***	-0.029	0.177*
	(2.79)	(-0.50)	(2.73)	(-0.21)	(1.70)
Land Cultivated Groups (Ref. Big-above 1 ha)					
Landless	0.019	-0.274**	0.019	-0.274**	0.185**
	(0.88)	(-2.17)	(0.88)	(-2.18)	(2.37)
Marginal (below 1 ha)	-0.016	-0.189*	-0.016	-0.186*	0.105
	(-0.72)	(-1.77)	(-0.73)	(-1.76)	(1.54)
Small (1 ha to 2 ha)	-0.025	-0.139*	-0.026	-0.128	0.089*
	(-1.49)	(-1.65)	(-1.58)	(-1.53)	(1.78)
Household type (Ref. Agricultural and other labour)					
Self employed in non-agriculture	0.004	0.076	0.005	0.063	-0.026
	(0.37)	(1.37)	(0.54)	(1.15)	(-0.66)
Self employed in agriculture	0.010	-0.098**	0.011	-0.099**	0.098***
	(0.90)	(-2.22)	(0.92)	(-2.26)	(2.68)
Others	0.011	0.068	0.011	0.069	-0.045
	(1.02)	(1.53)	(1.02)	(1.55)	(-1.36)

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	Without interaction term		With interaction term		
	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Interaction of absolute value of negative deviation in rainfall and average delay in wage payments
Education of the Head (Ref. illiterate)					
Below Primary	0.009	0.117	0.010	0.110	-0.057
	(0.63)	(1.49)	(0.70)	(1.43)	(-1.02)
Primary & Middle	-0.007	0.026	-0.005	0.006	-0.002
	(-0.68)	(0.46)	(-0.45)	(0.11)	(-0.05)
Secondary & Higher Secondary	0.013	0.021	0.014	0.014	0.019
	(0.99)	(0.43)	(1.06)	(0.29)	(0.46)
Above Higher Secondary	-0.002	0.084	-0.001	0.073	-0.046
	(-0.11)	(0.93)	(-0.04)	(0.80)	(-0.80)
Other household characteristics					
Age of household head (years)	0.003	0.025***	0.004	0.024***	-0.016***
	(0.19)	(3.18)	(0.23)	(3.15)	(-2.92)
Square of age of household head (/100)	-0.001	-0.025***	-0.001	-0.024***	0.015***
	(-0.43)	(-3.27)	(-0.49)	(-3.24)	(2.83)
Household head is female (=1)	-0.037***	0.052	-0.036***	0.049	-0.035
	(-3.32)	(0.91)	(-3.31)	(0.87)	(-0.86)
Log of Monthly per capita consumption	-0.060	0.108	-0.059	0.102	-0.196
	(-1.54)	(0.61)	(-1.53)	(0.58)	(-1.50)
Number of adult earning age members	0.008***	0.004	0.008***	0.006	0.020**
	(3.81)	(0.33)	(3.73)	(0.50)	(2.34)
District level characteristics					
Proportion of people from the Scheduled Castes	-0.348*	0.827	-0.346*	0.811	0.081
	(-1.74)	(1.05)	(-1.74)	(1.03)	(0.13)
Proportion of people from the Scheduled Tribes	-0.319***	0.249	-0.309***	0.166	-0.294
	(-3.81)	(0.83)	(-3.67)	(0.55)	(-1.16)
Literacy rate	-0.241	0.666	-0.224	0.523	-1.590***
	(-1.55)	(0.90)	(-1.42)	(0.72)	(-2.99)
Integrated Action Plan district (=1 if yes)	0.063	0.502**	0.062	0.514**	-0.143
	(1.31)	(2.29)	(1.27)	(2.36)	(-0.82)
MGNREGA Phase 2 district	-0.005	0.204	-0.008	0.224	-0.183
	(-0.14)	(1.15)	(-0.21)	(1.28)	(-1.34)
MGNREGA Phase 3 district	0.043	-0.019	0.040	0.004	-0.087
	(1.12)	(-0.10)	(1.05)	(0.02)	(-0.59)
Positive deviation of rainfall in 2009-10	0.014**	0.007	0.014**	0.004	0.031
	(1.98)	(0.23)	(2.05)	(0.12)	(1.41)
Absolute value of negative deviation of rainfall (2009-10)	0.024***	-0.126***	0.025***	-0.135***	-0.129***
	(2.59)	(-2.79)	(2.72)	(-2.97)	(-3.90)
Proportion of target achieved over the past three years	0.072	-0.288	0.061	-0.199	0.218
	(1.55)	(-0.88)	(1.38)	(-0.70)	(0.73)
Difference between NREGA wages and top decile wages (Rs. `00) in 2011-12	-0.104*	-0.051	-0.110*	-0.007	-0.167
	(-1.84)	(-0.14)	(-1.94)	(-0.02)	(-0.64)
Constant	0.741**	1.307	0.724**	1.450	-0.619
	(2.36)	(0.96)	(2.31)	(1.07)	(-0.61)

N	15,476	15,476	15,476	15,476	15,476
Bic		74963.736			100624.199
Aic		74145.502			99484.789

Notes: State dummies are not listed here for convenience. Neg. means negligible. Coefficients along with t-statistics are reported in the parenthesis. . $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$

Appendix Table 5 : Discouraged Worker Effect: Household level Linear Probability Model, Second Stage Results (Model 1a)

Dependent variable is Household Demand for MGNREGA work in 2011-12 Instruments: Proportion of total block level position that lies vacant (for lagged rationing rate and proportion of payments delayed over 90 days), Bank expansion in preceding 2 years Block level MGNREGA staff per village (for delay interacted with absolute value of negative deviation in rainfall), 2011-12

	All Households		Poor households	
	All households	All households(with interaction effects)	All households	All households(with interaction effects)
Lagged Rationing Rate (2009-10)	-0.891***	-0.922***	-0.853***	-0.920***
	(-17.64)	(-16.91)	(-9.97)	(-7.34)
Proportion of payments delayed over 90 days (rescaled dividing by 10)	-0.043**	-0.040**	-0.029	-0.038
	(-2.34)	(-2.46)	(-1.05)	(-1.06)
Interaction of absolute value of negative deviation in rainfall and average delay in wage payments		-0.020		-0.055
		(-0.88)		(-0.82)
Delayed Payments (missing)	-0.004	0.083	0.053	0.269
	(-0.10)	(1.07)	(1.08)	(1.16)
Social Group (Ref. Upper Castes)				
Scheduled Tribe	0.065***	0.066***	0.071***	0.075***
	(7.01)	(7.09)	(4.40)	(4.62)
Scheduled Caste	0.094***	0.096***	0.076***	0.083***
	(13.51)	(13.76)	(5.57)	(5.80)
Other Backward Castes	0.013***	0.014***	0.007	0.013
	(2.68)	(2.79)	(0.62)	(1.08)
Religion (Ref. Hindus)				
Muslims	-0.008	-0.004	-0.010	-0.003
	(-1.11)	(-0.50)	(-0.78)	(-0.22)
Other religions	0.088***	0.094***	0.040**	0.058**
	(9.53)	(8.84)	(2.17)	(1.99)
Land Cultivated Groups (Ref. Big-above 1 ha)				
Landless	0.034***	0.036***	0.053***	0.062***
	(3.97)	(4.33)	(2.80)	(3.15)
Marginal (below 1 ha)	0.085***	0.085***	0.108***	0.111***
	(10.92)	(10.87)	(6.11)	(6.38)
Small (1 ha to 2 ha)	0.059***	0.059***	0.078***	0.080***
	(6.71)	(6.69)	(3.96)	(4.09)
Household type (Ref. Agricultural and other labour)				
Self employed in non-agriculture	-0.183***	-0.183***	-0.188***	-0.189***
	(-29.28)	(-29.37)	(-18.57)	(-18.63)
Self-employed in agriculture	-0.148***	-0.145***	-0.144***	-0.139***
	(-20.07)	(-19.74)	(-11.69)	(-10.72)
Others	-0.254***	-0.254***	-0.252***	-0.253***
	(-39.69)	(-39.78)	(-21.06)	(-21.01)

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	All Households		Poor households	
	All households	**All households(with interaction effects)**	**All households**	**All households(with interaction effects)**
Education of the Head (Ref. illiterate)				
Below Primary	0.006	0.005	0.025*	0.023*
	(0.81)	(0.66)	(1.84)	(1.73)
Primary & Middle	-0.001	-0.002	-0.020**	-0.021**
	(-0.23)	(-0.39)	(-2.02)	(-2.09)
Secondary & Higher Secondary	-0.013**	-0.013**	0.002	0.004
	(-2.00)	(-2.04)	(0.14)	(0.29)
Above Higher Secondary	-0.012	-0.014*	-0.008	-0.010
	(-1.46)	(-1.70)	(-0.49)	(-0.62)
Other household characteristics				
Age of household head (years)	0.004***	0.004***	0.006***	0.005***
	(5.12)	(4.83)	(3.69)	(3.27)
Square of age of household head (/100)	-0.005***	-0.004***	-0.007***	-0.006***
	(-5.40)	(-5.13)	(-4.04)	(-3.70)
Household head is female (=1)	-0.024***	-0.026***	-0.027**	-0.031***
	(-4.13)	(-4.44)	(-2.47)	(-2.62)
Log of Monthly per capita consumption	-0.156***	-0.157***	-0.134***	-0.148***
	(-27.98)	(-27.63)	(-5.54)	(-5.12)
Number of adult earning age members	0.013***	0.014***	0.015***	0.016***
	(9.67)	(9.38)	(5.74)	(4.70)
District characteristics				
Proportion of people from the Scheduled Castes	0.036	0.007	0.206***	0.195***
	(0.88)	(0.21)	(3.38)	(3.24)
Proportion of people from the Scheduled Tribes	-0.005	-0.027	-0.012	-0.049
	(-0.19)	(-0.99)	(-0.30)	(-0.85)
Literacy rate	0.226***	0.197***	0.264***	0.162
	(9.03)	(5.55)	(5.53)	(1.31)
Integrated Action Plan district (=1 if yes)	-0.003	-0.005	0.012	0.013
	(-0.24)	(-0.40)	(0.52)	(0.55)
MGNREGA Phase 2 district	0.023***	0.019***	0.020*	0.012
	(3.26)	(2.88)	(1.78)	(0.96)
MGNREGA Phase 3 district	0.043***	0.043***	0.024**	0.023**
	(7.03)	(7.01)	(2.24)	(2.09)
Positive deviation of rainfall in 2009-10	0.009***	0.010***	Neg.	0.003
	(6.10)	(5.73)	(0.13)	(0.75)
Absolute value of negative deviation of rainfall (2009-10)	0.016***	0.015***	0.013***	0.006
	(5.50)	(3.50)	(3.24)	(0.54)
Proportion of target achieved over the past three years	0.002	0.004	-0.077**	-0.060*
	(0.39)	(0.63)	(-2.36)	(-1.83)
Difference between NREGA wages and top decile wages (Rs. `00) in 2011-12	-0.034***	-0.041***	-0.006	-0.021
	(-2.94)	(-3.06)	(-0.30)	(-0.78)
Constant	1.389***	1.356***	1.202***	1.232***
	(18.56)	(19.93)	(6.09)	(5.87)
Kleibergen-Paaprk LM statistic	414.11***	735.44***	153.82***	98.33***
Kleibergen-Paaprk Wald F statistic	203.024	257.696	81.878	16.186
N	47,131	47,131	15,476	15,476

Notes: State dummies are not listed here for convenience. Neg. means negligible. Coefficients along with t-statistics are reported in the parenthesis. . $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$.

Appendix Table 6 Discouraged Worker Effect: Household level Linear Probability Model, First Stage Results, All households (Model 1a)

Dependent variable is Household Demand for MGNREGA work in 2011-12 Instruments: Proportion of total block level position that lies vacant (for lagged rationing rate and proportion of payments delayed over 90 days), Bank expansion in preceding 2 years Block level MGNREGA staff per village (for delay interacted with absolute value of negative deviation in rainfall), 2011-12

	Without interaction term		With interaction term		
	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Interaction of absolute value of negative deviation in rainfall and average delay in wage payments
Proportion of total block level position that lies vacant	-0.068***	0.575***	-0.069***	0.580***	0.176***
	(-10.57)	(18.38)	(-10.79)	(18.65)	(7.77)
Bank expansion in 2 years preceding 2011-12	-0.003***	-0.000	-0.004***	0.002***	0.004***
	(-32.75)	(-0.78)	(-35.41)	(4.36)	(12.63)
Block level MGNREGA staff per village			-0.069***	0.373***	-0.219***
			(-11.85)	(15.84)	(-12.17)
Delayed Payments (missing)	0.026***	-1.856***	0.036***	-1.908***	4.105***
	(8.82)	(-132.37)	(11.81)	(-131.04)	(356.53)
Social Group (Ref. Upper Castes)					
Scheduled Tribe	-0.037***	-0.087***	-0.030***	-0.126***	0.112***
	(-6.83)	(-3.73)	(-5.54)	(-5.37)	(5.81)
Scheduled Caste	-0.006	-0.101***	-0.006	-0.101***	0.095***
	(-1.47)	(-5.27)	(-1.49)	(-5.30)	(6.57)
Other Backward Castes	-0.008**	-0.052***	-0.008**	-0.053***	0.038***
	(-2.32)	(-3.57)	(-2.32)	(-3.64)	(3.40)
Religion (Ref. Hindus)					
Muslims	0.001	-0.108***	0.005	-0.128***	0.190***
	(0.22)	(-6.50)	(1.10)	(-7.80)	(16.91)
Other religions	0.117***	-0.053**	0.111***	-0.022	0.089***
	(19.95)	(-2.16)	(19.25)	(-0.91)	(5.04)
Land Cultivated Groups (Ref. Big-above 1 ha)					
Landless	0.023***	-0.121***	0.024***	-0.126***	0.066***
	(3.99)	(-4.71)	(4.17)	(-4.93)	(3.65)
Marginal (below 1 ha)	-0.023***	-0.027	-0.021***	-0.035	0.025
	(-4.28)	(-1.15)	(-4.01)	(-1.50)	(1.48)
Small (1 ha to 2 ha)	-0.008	-0.013	-0.008	-0.011	0.003
	(-1.25)	(-0.47)	(-1.32)	(-0.39)	(0.13)
Household type (Ref. Agricultural and other labour)					
Self employed in non-agriculture	0.003	0.047***	0.005	0.036**	-0.008
	(0.91)	(2.73)	(1.49)	(2.08)	(-0.61)
Self employed in agriculture	0.021***	-0.082***	0.020***	-0.082***	0.086***
	(4.81)	(-4.17)	(4.81)	(-4.17)	(5.72)
Others	0.003	0.045**	0.004	0.041**	-0.021
	(0.82)	(2.35)	(1.00)	(2.17)	(-1.53)

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Education of the Head (Ref. illiterate)					
Below Primary	0.003	0.083***	0.005	0.077***	-0.051***
	(0.76)	(3.93)	(1.04)	(3.66)	(-3.28)
Primary & Middle	0.003	0.067***	0.006*	0.051***	-0.031***
	(0.89)	(4.17)	(1.75)	(3.19)	(-2.58)
Secondary & Higher Secondary	0.013***	0.034*	0.013***	0.030*	-0.028**
	(3.04)	(1.92)	(3.26)	(1.69)	(-2.04)
Above Higher Secondary	-0.000	0.103***	0.002	0.089***	-0.079***
	(-0.04)	(4.04)	(0.43)	(3.51)	(-4.24)
Other household variables					
Age of household head (years)	-0.000	0.016***	-0.000	0.015***	-0.011***
	(-0.44)	(6.68)	(-0.21)	(6.46)	(-6.74)
Square of age of household head (/100)	0.000	-0.015***	0.000	-0.014***	0.010***
	(0.24)	(-6.11)	(0.02)	(-5.91)	(6.05)
Household head is female (=1)	-0.029***	0.062***	-0.029***	0.062***	-0.031**
	(-7.91)	(3.47)	(-7.96)	(3.49)	(-2.36)
Log of Monthly per capita consumption	-0.017***	-0.054***	-0.020***	-0.038**	-0.021*
	(-4.86)	(-3.30)	(-5.72)	(-2.35)	(-1.73)
Number of adult earning age members	0.008***	-0.002	0.007***	0.000	0.014***
	(8.69)	(-0.53)	(8.19)	(0.11)	(4.83)
District level variables					
Proportion of people from the Scheduled Castes	-0.450***	1.200***	-0.449***	1.192***	-0.570***
	(-24.04)	(16.16)	(-24.27)	(16.15)	(-9.79)
Proportion of people from the Scheduled Tribes	-0.392***	0.415***	-0.378***	0.337***	-0.420***
	(-41.17)	(11.88)	(-39.89)	(9.71)	(-14.00)
Literacy rate	-0.189***	0.307***	-0.149***	0.091	-0.990***
	(-13.33)	(5.13)	(-10.22)	(1.52)	(-22.03)
Integrated Action Plan district (=1 if yes)	0.064***	0.516***	0.063***	0.520***	-0.132***
	(12.30)	(24.56)	(11.93)	(24.87)	(-7.27)
MGNREGA Phase 2 district	-0.000	0.222***	-0.001	0.229***	-0.176***
	(-0.02)	(14.19)	(-0.37)	(14.69)	(-14.14)
MGNREGA Phase 3 district	0.056***	-0.017	0.051***	0.009	-0.105***
	(15.35)	(-0.99)	(14.14)	(0.55)	(-8.17)
Positive deviation of rainfall in 2009-10	0.021***	0.023***	0.021***	0.023***	0.015***
	(33.31)	(8.88)	(33.66)	(8.87)	(8.02)
Absolute value of negative deviation of rainfall (2009-10)	0.027***	-0.132***	0.028***	-0.139***	-0.122***
	(32.37)	(-30.85)	(34.11)	(-32.50)	(-39.06)
Proportion of target achieved over the past three years	0.051***	-0.036***	0.045***	-0.003	-0.033***
	(26.05)	(-4.68)	(24.64)	(-0.46)	(-4.34)
Difference between NREGA wages and top decile wages (Rs. `00) in 2011-12	-0.139***	-0.115***	-0.144***	-0.089***	-0.165***
	(-26.24)	(-4.63)	(-27.43)	(-3.59)	(-8.23)
Constant	0.370***	2.496***	0.375***	2.469***	-1.856***
	(11.55)	(17.14)	(11.76)	(17.10)	(-17.23)
N	47,131	47,131	47,131	47,131	47,131

Notes: State dummies are not listed here for convenience. Neg. means negligible. Coefficients along with t-statistics are reported in the parenthesis. .* $p< 0.10$, ** $p< 0.05$, *** $p< 0.01$

Appendix Table 7 :Discouraged Worker Effect: Household level Linear Probability Model, First Stage Results, Poor Households (Model 1a)

Dependent variable is Household Demand for MGNREGA work in 2011-12 Instruments: Proportion of total block level position that lies vacant (for lagged rationing rate and proportion of payments delayed over 90 days), Bank expansion in preceding 2 years Block level MGNREGA staff per village (for delay interacted with absolute value of negative deviation in rainfall), 2011-12

	Without interaction term		With interaction term		
	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Interaction of absolute value of negative deviation in rainfall and average delay in wage payments
Proportion of total block level position that lies vacant	-0.121***	0.832***	-0.125***	0.867***	-0.007
	(-10.67)	(13.33)	(-11.07)	(13.95)	(-0.16)
Bank expansion in 2 years preceding 2011-12	-0.004***	0.002***	-0.004***	0.004***	0.003***
	(-22.71)	(3.60)	(-23.39)	(6.05)	(6.10)
Block level MGNREGA staff per village			-0.034***	0.279***	-0.145***
			(-7.11)	(12.11)	(-7.77)
Delayed Payments (missing)	0.047***	-1.810***	0.052***	-1.853***	4.152***
	(9.16)	(-73.84)	(10.06)	(-74.21)	(198.95)
Social Group (Ref. Upper Castes)					
Scheduled Tribe	-0.005	-0.156***	Neg.	-0.193***	0.110***
	(-0.47)	(-3.77)	(Neg.)	(-4.68)	(3.12)
Scheduled Caste	0.008	-0.184***	0.008	-0.185***	0.147***
	(0.99)	(-5.17)	(1.02)	(-5.26)	(5.36)
Other Backward Castes	0.019***	-0.144***	0.019***	-0.140***	0.119***
	(2.84)	(-4.94)	(2.78)	(-4.85)	(5.22)
Religion (Ref. Hindus)					
Muslims	-0.003	-0.098***	-0.002	-0.111***	0.147***
	(-0.44)	(-3.23)	(-0.22)	(-3.71)	(7.25)
Other religions	0.115***	-0.067	0.111***	-0.029	0.177***
	(9.89)	(-1.56)	(9.56)	(-0.66)	(5.45)
Land Cultivated Groups (Ref. Big-above 1 ha)					
Landless	0.019	-0.274***	0.019	-0.274***	0.185***
	(1.64)	(-4.91)	(1.64)	(-4.92)	(4.82)
Marginal (below 1 ha)	-0.016	-0.189***	-0.016	-0.186***	0.105***
	(-1.42)	(-3.62)	(-1.46)	(-3.59)	(2.89)
Small (1 ha to 2 ha)	-0.025**	-0.139**	-0.026**	-0.128**	0.089**
	(-1.98)	(-2.32)	(-2.09)	(-2.14)	(2.13)
Household type (Ref. Agricultural and other labour)					
Self employed. in non-agriculture	0.004	0.076***	0.005	0.063**	-0.026
	(0.62)	(2.73)	(0.91)	(2.26)	(-1.24)
Self employed in agriculture	0.010	-0.098***	0.011	-0.099***	0.098***
	(1.50)	(-2.99)	(1.53)	(-3.05)	(3.82)
Others	0.011	0.068*	0.011	0.069*	-0.045*
	(1.49)	(1.89)	(1.49)	(1.91)	(-1.66)

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	Without interaction term		With interaction term		
	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Lagged Rationing Rate (2009-10)	Proportion of payments delayed over 90 days	Interaction of absolute value of negative deviation in rainfall and average delay in wage payments
Education of the Head (Ref. illiterate)					
Below Primary	0.009	0.117***	0.010	0.110***	-0.057**
	(1.20)	(3.08)	(1.32)	(2.93)	(-2.02)
Primary & Middle	-0.007	0.026	-0.005	0.006	-0.002
	(-1.20)	(0.96)	(-0.77)	(0.22)	(-0.09)
Secondary & Higher Secondary	0.013*	0.021	0.014*	0.014	0.019
	(1.83)	(0.65)	(1.95)	(0.44)	(0.77)
Above Higher Secondary	-0.002	0.084*	-0.001	0.073	-0.046
	(-0.20)	(1.78)	(-0.06)	(1.53)	(-1.36)
Other household characteristics					
Age of household head (years)	Neg.	0.025***	Neg.	0.024***	-0.016***
	(0.33)	(5.96)	(0.41)	(5.87)	(-5.16)
Square of age of household	-0.001	-0.025***	-0.001	-0.024***	0.015***
head (/100)	(-0.76)	(-5.98)	(-0.84)	(-5.88)	(4.91)
Household head is female (=1)	-0.037***	0.052	-0.036***	0.049	-0.035
	(-5.81)	(1.57)	(-5.77)	(1.49)	(-1.43)
Log of Monthly per capita	-0.060***	0.108	-0.059***	0.102	-0.196***
consumption	(-4.10)	(1.61)	(-4.07)	(1.54)	(-3.89)
Number of adult earning age	0.008***	0.004	0.008***	0.006	0.020***
members	(5.63)	(0.54)	(5.48)	(0.82)	(3.76)
District level variables					
Proportion of people from the	-0.348***	0.827***	-0.346***	0.811***	0.081
Scheduled Castes	(-10.51)	(6.07)	(-10.49)	(5.97)	(0.75)
Proportion of people from the	-0.319***	0.249***	-0.309***	0.166***	-0.294***
Scheduled Tribes	(-19.85)	(3.98)	(-19.23)	(2.65)	(-5.27)
Literacy rate	-0.241***	0.666***	-0.224***	0.523***	-1.590***
	(-9.37)	(5.73)	(-8.60)	(4.56)	(-18.26)
Integrated Action Plan district (=1	0.063***	0.502***	0.062***	0.514***	-0.143***
if yes)	(8.00)	(13.98)	(7.75)	(14.42)	(-4.83)
MGNREGA Phase 2 district	-0.005	0.204***	-0.008	0.224***	-0.183***
	(-0.91)	(7.51)	(-1.34)	(8.32)	(-8.41)
MGNREGA Phase 3 district	0.043***	-0.019	0.040***	0.004	-0.087***
	(6.86)	(-0.63)	(6.42)	(0.14)	(-3.77)
Positive deviation of rainfall in	0.014***	0.007	0.014***	0.004	0.031***
2009-10	(11.96)	(1.49)	(12.34)	(0.78)	(8.83)
Absolute value of negative	0.024***	-0.126***	0.025***	-0.135***	-0.129***
deviation of rainfall (2009-10)	(16.34)	(-16.44)	(17.05)	(-17.53)	(-22.98)
Proportion of target achieved over	0.072***	-0.288***	0.061***	-0.199***	0.218**
the past three years	(6.70)	(-3.09)	(6.73)	(-2.70)	(2.20)
Difference between NREGA	-0.104***	-0.051	-0.110***	-0.007	-0.167***
wages and top decile wages (Rs.	(-10.94)	(-0.99)	(-11.53)	(-0.13)	(-4.16)
`00) in 2011-12					
Constant	0.741***	1.307***	0.724***	1.450***	-0.619*
	(7.19)	(2.78)	(7.03)	(3.10)	(-1.75)
N	15,476	15,476	15,476	15,476	15,476

Notes: State dummies are not listed here for convenience. Neg. means negligible. Coefficients along with t-statistics are reported in the parenthesis. . $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$

Appendix Table 8: The Discouraged Worker Effect: District level analysis with Difference in Demand Rates

This is a naïve least squares model. The 2SLS and Control Function Approaches (Models 2 & 3) are presented in Appendix 3.

	Naive Model (full sample)	Naive Model (subsample of nonmissing values)
	b/t	b/t
Lagged Rationing Rate (2009-10)	-0.260***	-0.251***
	(-13.70)	(-8.97)
Percentage of payments with over 90 days delay in 2009-10 (rescaled *100)	Neg. (-1.19)	Neg. (-0.93)
Percentage of wage payments delayed (2009-10)	0.001*	0.001**
	(1.93)	(2.37)
Approximate average delay in payment (days) in 2009-10	-0.047	-0.175
	(-0.27)	(-0.92)
Interaction of absolute value of negative deviation in rainfall and average delay in wage payments (2011-12)	-2.456*** (-3.00)	-3.191*** (-3.37)
Demand Rate (2009-10)	-0.639***	-0.680***
	(-19.79)	(-13.56)
Proportion of people from the Scheduled Castes	0.181***	0.269***
	(2.62)	(2.73)
Proportion of people from the Scheduled Tribes	0.243***	0.266***
	(7.27)	(5.64)
Literacy rate	0.273***	0.427***
	(5.09)	(4.92)
Integrated Action Plan district (=1 if yes)	-0.051**	-0.055*
	(-2.51)	(-1.87)
MGNREGA Phase 1 district	-0.017	-0.015
	(-1.17)	(-0.69)
MGNREGA Phase 2 district	-0.015	-0.018
	(-1.15)	(-1.07)
Absolute negative deviation of rainfall in 2011-12	0.008**	0.004
	(2.08)	(0.52)
Positive deviation of rainfall in 2011-12	0.004**	0.003
	(2.00)	(0.99)
Difference in average monthly per capita expenditure	-0.033	0.014
	(-1.27)	(0.41)
Proportion of target achieved over the past three years in toilet construction	-0.106 (-1.27)	-0.121 (-1.03)
Change in the number of jobcards (in hundred thousand)	14.576*	35.859***
	(1.82)	(2.89)
Missing data on job cards (=1)	-0.110**	-0.104*
	(-2.41)	(-1.84)
Change in the proportion engaged in agriculture	0.134**	0.148*
	(2.15)	(1.85)
Change in the proportion engaged in casual farm work	0.343***	0.303**
	(3.66)	(2.40)
Change in the proportion engaged in non-agricultural occupations	-0.028	0.019
	(-0.39)	(0.19)
Change in the proportion engaged in casual non-farm work	0.133**	0.246***
	(2.07)	(2.83)
Change in casual wage-MGNREGA wage differential for top decile (Rs. `000)	-0.070 (-1.38)	-0.141 (-1.43)
Change in casual wage-MGNREGA wage differential for bottom decile (Rs. `000)	0.089 (0.60)	0.222 (1.31)

Bank branches in hundred per million job cards (2011-12)	-0.004	-0.001
	(-1.47)	(-0.45)
Post offices per hundredthousand job cards (2011-12)	-0.000***	-0.000***
	(-3.04)	(-2.79)
Bank expansion in 2 years preceding 2011-12 (rescaled X100)	0.000***	0.000***
	(2.86)	(3.63)
Bank expansion over 2009-10 to 2011-12 interacted with bank	0.065	-0.084
presence in 2009-10	(1.19)	(-1.45)
Missing data dummy (=1)	0.078*	
	(1.92)	
Constant	-0.104	-0.192**
	(-1.55)	(-2.02)

Notes: State dummies are not listed here for convenience. Neg. means negligible. Coefficients along with t-statistics are reported in the parenthesis. .*p< 0.10, **p< 0.05, ***p< 0.01

Appendix Table 9: Correlates of Administrative rationing : District Panel analysis First Stage Regressions (Model 4, 5, 6, 7)

Dependent variable: Demand Rate	All	Poor subpopulation	Weighted by proportion below poverty line	Weighted by inverse monthly per capita expenditure
Number of days above temperature threshold 2008-09 (lagged year)	-0.004***	-0.008***	-0.004***	-0.004***
	(-3.11)	(-5.19)	(-3.11)	(-3.35)
Whether UPA won any seat in the district (1=Yes)	0.019	0.041	0.019	0.026
	(0.69)	(1.22)	(0.69)	(0.94)
Proportion of constituencies under UPA	-0.037	-0.080*	-0.037	-0.041
	(-0.99)	(-1.73)	(-0.99)	(-1.13)
Share of UPA votes	-0.002	-0.003	-0.002	-0.002
	(-0.35)	(-0.63)	(-0.35)	(-0.33)
Years since election	0.007	0.007	0.007	0.005
	(1.52)	(1.27)	(1.52)	(1.15)
Survey year is an election year (1=Yes)	0.042***	0.043***	0.042***	0.037***
	(4.14)	(3.62)	(4.14)	(3.73)
Polling percentage	0.003	0.002	0.003	0.002
	(1.53)	(0.76)	(1.53)	(1.18)
Proportion of seats reserved for SC/ST candidates	-0.090	-0.177	-0.090	-0.101
	(-0.92)	(-1.37)	(-0.92)	(-1.02)
Monthly per capita expenditure (INR `000)	-0.095***	-0.044	-0.095***	-0.097***
	(-3.20)	(-1.15)	(-3.20)	(-3.40)
Absolute value of negative deviation of rainfall	0.018***	0.022***	0.018***	0.017***
	(5.08)	(5.15)	(5.08)	(4.83)
Positive deviation of rainfall	Neg.	-0.001	Neg.	-0.001
	(-0.13)	(-0.49)	(-0.13)	(-0.30)
Proportion of targets achieved in sanitation	0.159***	0.210***	0.159***	0.151***
	(2.75)	(3.03)	(2.75)	(2.69)
Number of commercial bank branches (`00,000)	-0.001***	-0.001*	-0.001***	-0.001***
	(-2.74)	(-1.94)	(-2.74)	(-2.78)
Number of job cards (`00,000)	-0.907	-2.276	-0.907	-0.914
	(-0.70)	(-1.45)	(-0.70)	(-0.71)
N	1026	984	1026	1060
BIC	-1924.03	-1514.72	-1924.03	-1992.03
AIC	-1993.1	-1583.20	-1993.1	-2061.56
Centered R-squared	0.311	0.311	0.311	0.3147

Notes: State dummies are not listed here for convenience. Neg. means negligible. Coefficients along with t-statistics are reported in the parenthesis. . $^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

Appendix 1: Data Sources and Metrics Used

Variable	Years	Source	Method
Change in Demand rate	2009-10, 2011-12	Employment Unemployment schedule of the 66th and 68th round NSS survey	Demand Rate (D) is defined as the proportion of ru sought work (D for 2011-12)- (D for 2009-10)
Rationing and inverse pce-weighted rationing	2009-10, 2011-12	Employment Unemployment schedule of the 66th and 68th round NSS survey	Rationing rate (R) is the proportion of rural househ did not get work. R=1-(P/D) where P= total numb in MGNREGA in the district Inverse pce-weighted rationing rate (Inv. R) is derived by weighing each household by consumption expenditure (pce) in that district to th dummy of whether the household was rationed is n weighted inverse rationing rate is calculated by sur dividing it over the total rural households that dema $Inv.R_j = \sum[(Med_j / PCE_{ij}).RR_i] / D_j$ where $Inv.R_j$ = inverse pce weighted rationing rate Med_j = Median of pce in district, j. PCE_{ij} = pce of household, i in district, j $RR_i = 1$ if the household is rationed; 0 otherwise i demanding work in district, j
Growing Degree Days	2009-10, 2011-12	NASA	GDD is the sum of excess of the mean average tem temperature specified for the crop over its growing 1. DD= (Tmax-Tmin)/2- Tbase 2. Cumulate the DD for the dates denoting th $GDD_{b□se,opt} = \sum_{t=1}^{N} DD_t$ $DD = \begin{cases} 0 \\ T - T_{base} \\ T_{opt} - T_{base} \end{cases}$
Days above the optimal and threshold temperatures	2009-10, 2011-12	NASA	(i) Number of days in the growing period for the m $T_t > T_{opt}$ (ii)Number of days in the growing period for the m $T_t > T_{high}$
Absolute positive deviation in	2009-10,	NASA, Tropical Rainfall Measuring	A rainfall index for each month was obtained by ca

rainfall (APD) Absolute negative deviation in rainfall (AND)	2011-12	Mission Project http://mirador.gsfc.nasa.gov/collections/TRMM_3B43__007.shtml	month's rainfall from the mean divided by the stan the period 2001-12. Then the rainfall variables are calculated by summi rainfall indices separately. $APD_j = \Sigma PRI_{kj}$ $AND_j = \Sigma NRI_{kj}$ where PRI_{kj} = sum of RI of all the months (index rainfall indices are positive and NRI_{kj} = sum of RI of all the months (indexe indices are negative Here RI_k = (Mean of rainfall for kth month from
Assembly elections	Assembly election data of the states	Election Commission of India http://eci.nic.in/eci_main1/ElectionStatistics.aspx "DETAILED RESULTS OF LATEST ELECTIONS (XLS FORMAT)"	(i) UPA victory in the district: 1 if at least one AC otherwise (ii) Proportion won by UPA: The proportion of AC (iii) Share of UPA votes: The ratio of votes going t to those going to non-UPA parties. (iv) Years elapsed since previous election: 2012- (election year) for 2011-12 data 2010-(election year) for 2009-10 data (v) Election coincides with survey year: 1 if election was held in 2011/2012 for 2011-12 da 2009/2010 for 2009-10 data 0 otherwise A number of Assembly Constituencies (AC) belon straddles districts.
Elections Seat reserved for women	2004 & 2009 elections	Election Commission of India (Same as above)	At least one of the seats reserved for women (this variable is not included in the model)
Election Seat reserved for Scheduled Castes or Tribes (SC/ST)	2004 & 2009 elections	Election Commission of India (Same as above)	At least one of the seats reserved for SC/ST (this variable is not included in the model)
Provisioning of sanitation	2009-10, 2011-12	Department of Water and Sanitation, Government of India. https://data.gov.in/catalog/nirmal-bharat-abhiyan-year-wise-district-level-achievements#web_catalog_tabs_block_10	Proportion of project objectives achieved each yea preceding the survey year.
Bank branches presence	2008-2012	Reserve Bank of India (unpublished	Number of bank branches

		sources)	
Delayed payments	2009-10, 2011-12	nrega.nic.in http://nrega.nic.in/Netnrega/stHome.aspx	(i) Proportion of wage payments delayed (ii) Proportion of muster roll payments delayed bey (iii) Average number of days delayed
Administrative staff details	2011-12	nrega.nic.in	District level, Gram panchayat (village) level and b vacant and total posts. For a few districts we had to was unavailable for earlier years; our assumption is dramatically over this period.
Proportion of people from the Scheduled Castes (SC)	2001	Census 2001, Government of India	Total number of SC population/total population
Proportion of people from the Scheduled Castes (ST)	2001	Census 2001, Government of India	Total number of ST population/total population
Literacy rate	2001	Census 2001, Government of India	Total number of literate population/ total populatio
Integrated Action Plan (IAP) district	2010	Ministry of Rural Development, Government of India http://rural.nic.in/iapdistricts/	IAP= 1 if the district is under the Backward Regio
Monthly per capita expenditure (MPCE)	2009-10 & 2011-12	Consumption Expenditure Schedule of the 66^{th} and 68^{th} round NSS survey	Average MPCE of the households in a district (in R excluded.

Appendix 2: Threshold temperatures for computing the Growing Degree Days (GDD)

Crop	T-base	T-low	T-opt	T-high
	Base	Optimum low	Optimum high	Highest threshold
Arhar (Tur)	10	25	35	
Bajra	10	21	33	45
Barley	10	21	33	45
Black pepper	10	23	32	40
Castor seed	15	20	28	
Coconut		21	32	
Cotton(lint)	15			40
Dry chillies	13	27	32	
Gram	2	21	30	40
Groundnut	10	16	30	32
Guar seed	15	20	28	
HorseGram	2	21	30	40
Jowar	8	21	30	33
Jute	20	24	38	
Maize	8	21	30	33
Masoor	10	25	35	
Mesta	20	24	38	
Other Kharif Pulses	10	25	35	
Peas & Beans (Pulses)	10	25	35	
Potato	10	15	20	
Ragi	10	21	33	45
Rapeseed &Mustard	5			30
Rice	10			40
Small millets	10	21	33	45
Soyabean	10			30
Sugarcane	18	25	34	38
Tapioca	10	24	32	
Urad	10	25	35	
Wheat	10	5		20

Notes:

1. Tbase will vary for each crop but same across regions.
2. T max and Tmin will vary across districts.
3. Growth period varies across states. These were obtained from the Ministry of Agriculture, Government of India.
4. Where there was no data available for the threshold temperatures we assume those for a competing similar crop.

These data were drawn from the following sources:

Devasahayam S, John Zacharaiah T, Jayashree E, KandiannanK,Prasath D, Santhosh J Eapen, Sasikumar B, Srinivasan V and SuseelaBhai R (2011) Black pepper, ICAR-Indian Institute of Spices Research, Kozhikode

Khavse, Rajesh , R. Singh, N. Manikandan and J. L. Chaudhary (2014) "Influence of Temperature on Rapeseed-Mustard Yield at Selected Locations in Chhattisgarh State",*Current World Environment* Vol. 9(3), 1034-1036 http://dx.doi.org/10.12944/CWE.9.3.59

Krishna Kumar K. N. (2011) Coconut Phenology and Yield Response to Climate Variability and Change, PhD thesis,Faculty of Marine Sciences, Department of Atmospheric Sciences Cochin University of Science and Technology, Kochi, India.

Lofton, Josh , Brenda S. Tubana, Yumiko Kanke, Jasper Teboh, Howard Viator and Marilyn Dalen (2012) "Estimating Sugarcane Yield Potential Using an In-Season Determination of Normalized Difference Vegetative Index", *Sensors*, Vol. 12, 7529-7547; doi:10.3390/s120607529

Minhas, J.S. ,S. Rawat, P.M. Govindakrishnan1 and D. Kumar (2011) "Possibilities of Enhancing Potato Production in non-traditional areas". *Potato Journal* 38 (1): 14-17.

Rani, B. A., &Maragatham, N. (2013) "Effect of Elevated Temperature on Rice Phenology and Yield".*Indian Journal of Science and Technology,* 6(8), 5095-5097.

Severino, Liv S., and Dick L. Auld. (2014) "Study on the effect of air temperature on seed development and determination of the base temperature for seed growth in castor ('Ricinuscommunis' L.)." *Australian Journal of Crop Sciences,* 8(2): 290-295.

Singh, K.K., Ali, M. and Venkatesh, M.S. (2009). Pulses in Cropping Systems. Technical Bulletin, Indian Institute of Pulses Research, Kanpur.

Singh, ManojPratap ,Lallu, and N. B. Singh (2014) "Thermal requirement of indian mustard (*Brassica juncea*) at different phonological stages under late sown condition", *Indian Journal Plant Physiology* 19(3): 238–243. Published online Sep 3, 2014. doi: 10.1007/s40502-014-0072-0

The World Agrometerological Information Service. Agrometeorology of some selected crops. http://www.wamis.org/agm/gamp/GAMP_Chap10.pdf Accessed November, 2014.

Appendix 3: District Level Model: 2SLS and Control Function Approach

For the district level analysis, we attempted to estimate models that address the potential endogeneity of delays in wage payments, rationing rate and demand, relying first on a Two Stage Least Squares (2-SLS) model using instruments for the endogenous variables to achieve identification. We use the same set of instruments as with the household level analysis, with commercial bank branch presence and expansion in the lagged delayed payments equation, GDD for lagged demand rate and number of staff at the block level for lagged rationing rates.

We estimate the following 2SLS model (Model 2), using the same set of controls as for Model 2:

$$\Delta D_{it} = \alpha + \beta R_{it-1} + \gamma P_{it-1} + \delta D_{it-1} + \varphi_1 \Delta Z_{it} + \varphi_2 W_i + \varepsilon_i$$

where

$$P_{it-1} = \pi_{1p} + \pi_{2p} CB_{i\,t-1} + \pi_{3p} \Delta Z_{it} + \pi_{4p} W_i + \epsilon_p$$

$$D_{it-1} = \pi_{1d} + \pi_{2d} GDD_{it-1} + \pi_{3d} \Delta Z_{it} + \pi_{4d} W_i + \epsilon_d$$

$$R_{it-1} = \pi_{1r} + \pi_{2r} BlockStaff_{i\,t-1} + \pi_{3r} \Delta Z_{it} + \pi_{4r} W_i + \epsilon_r$$

The results are presented in Appendix Table 3.1. Tests for overidentifying restrictions suggest the model is invalid.

An alternative solution we attempted is a control function approach as describe below (Model 3)

$$\Delta D_{it} = \alpha + \beta R_{it-1} + \gamma P_{it-1} + \delta D_{it-1} + \varphi_1 \Delta Z_{it} + \varphi_2 W_i + \varepsilon_i + \widehat{\epsilon_p} + \widehat{\epsilon_d} + \widehat{\epsilon_r}$$

where

$$P_{it-1} = \pi_{1p} + \pi_{2p} CB_{it-1} + \pi_{3p} \Delta Z_{it} + \pi_{4p} W_i + \epsilon_p$$

$$D_{it-1} = \pi_{1d} + \pi_{2d} GDD_{it-1} + \pi_{3d} \Delta Z_{it} + \pi_{4d} W_i + \epsilon_d$$

$$R_{it-1} = \pi_{1r} + \pi_{2r} BlockStaff_{i\,t-1} + \pi_{3r} \Delta Z_{it} + \pi_{4r} W_i + \epsilon_r$$

This formulation supposes that the three equations are independent that is somewhat restrictive. The results of this model are presented in Appendix Table 3.2 & 3.3.

Appendix Table 3.1 :The Discouraged Worker Effect: District level analysis Two-Stage Least Squares model (Model 2)

The model consists of five equations – the exogenous variables include those that proxy staff capacity, bank branch expansion and growing degree days (GDD) and days outside the window of threshold temperatures.

Equation 1: Dependent variable: Change in the demand rate for MGNREGA work

	Bootstrapped (full sample)	Bootstrapped; subsample of nonmissing values
	b/t	b/t
Lagged Rationing Rate (2009-10)	-0.400***	-0.334***
	(0.07)	(0.07)
Proportion of payments with over 90 days delay in 2009-10	0.077	1.924
	(2.32)	(1.64)
Proportion of wage payments delayed interacted with absolute value of negative deviation in rainfall in 2009-10	-8.251	-33.446***
	(20.13)	(10.30)
	(-2.24)	(-1.75)
Demand Rate (2009-10)	-0.618***	-0.764***
	(0.05)	(0.08)
Wage payments delay data are missing (=1 if Yes)	0.089***	
	(0.03)	
Proportion of people from the Scheduled Castes	0.186***	0.219**
	(0.07)	(0.09)
Proportion of people from the Scheduled Tribes	0.228***	0.279***
	(0.03)	(0.05)
Literacy rate	0.177***	0.282***
	(0.06)	(0.09)
Integrated Action Plan district (=1 if yes)	-0.058***	-0.069**
	(0.02)	(0.03)
MGNREGA Phase 1 district	-0.010	-0.019
	(0.01)	(0.02)
MGNREGA Phase 2 district	-0.013	-0.018
	(0.01)	(0.02)
Absolute negative deviation in rainfall in 2011-12 (in standard deviation units)	0.008**	0.006
	(Neg.)	(0.01)
Positive deviation in rainfall in 2011-12 (in standard deviation units)	0.004**	0.005*
	(0.00)	(0.00)
Difference in average monthly per capita expenditure	-0.028	0.018
	(0.02)	(0.03)
Proportion of target achieved over the past three years in toilet construction	-0.123*	-0.102
	(0.07)	(0.09)
Change in the number of jobcards (in ten thousand)	21.867**	37.579***
	(8.66)	(14.10)
Data missing for number of jobcards issued (=1 if Yes)	-0.074*	-0.078*
	(0.04)	(0.04)
Change in the proportion engaged in agriculture	0.135**	0.178**
	(0.06)	(0.08)
Change in the proportion engaged in casual farm work	0.346***	0.438***

	(0.09)	(0.12)
Change in the proportion engaged in non-agricultural occupations	-0.030	0.075
	(0.06)	(0.08)
Change in the proportion engaged in casual non-farm work	0.132**	0.330***
	(0.07)	(0.09)
Change in casual wage-MGNREGA wage differential for bottom decile	0.200	0.259
	(0.15)	(0.21)
Absolute negative deviation in rainfall in 2011-12 (in standard deviation units)	0.015**	
	(0.01)	
Positive deviation in rainfall in 2011-12 (in standard deviation units)	0.004	
	(0.00)	
Constant	-0.165*	-0.162*
	(0.10)	(0.09)

Notes: Coefficients along with t-statistics are reported in the parenthesis. . * $p< 0.10$, ** $p< 0.05$, *** $p< 0.01$

Equation 2: Dependent variable: Lagged Rationing Rate (2009-10)

	Bootstrapped (full sample)	Bootstrapped; subsample of nonmissing values
	b/t	b/t
Proportion of total block level positions that lies vacant	-0.0687	-0.0831
	(0.0585)	(0.0859)
Block level MGNREGA staff per village	-0.0199	0.0708
	(0.0321)	(0.0925)
Block level MGNREGA staff per block	-0.0058***	-0.0206***
	(0.0020)	(0.0039)
Block level MGREGA staff per 1000 job cards	0.0116***	0.0788***
	(0.0038)	(0.0240)
Absolute value of negative deviation of rainfall (2009-10 in standard deviation units)	-0.0029	-0.0120
	(0.0074)	(0.0089)
Number of days in the cropping season above optimal higher threshold temperatures current year (2009-10)	0.0004	0.0072***
	(0.0017)	(0.0024)
Number of days in the cropping season above optimal higher threshold temperatures lagged year (wrt. 2009-10)	-0.0004	-0.0085***
	(0.0019)	(0.0026)
Number of days in the cropping season below optimal lower threshold temperatures current year (2009-10)	0.0039**	0.0019
	(0.0016)	(0.0027)
Number of days in the cropping season below optimal lower threshold temperatures lagged year (wrt. 2009-10)	-0.0040**	-0.0037
	(0.0017)	(0.0028)
Growing Degree Days (GDD) current year (2009-10)	-0.3554***	-0.5919***
	(0.1290)	(0.1723)
Growing Degree Days (GDD) lagyear (wrt.2009-10)	0.3536***	0.6027***
	(0.1326)	(0.1780)
Integrated Action Plan district (=1 if yes)	-0.0169	0.0583
	(0.0431)	(0.0615)
Constant	0.6289***	0.7752***
	(0.0998)	(0.1353)

Equation 3: Dependent variable: Proportion of payments with over 90 days delay in 2009-10

	Bootstrapped (full sample)	Bootstrapped; subsample of nonmissing values
	b/t	b/t
Bank branches in hundred per million job cards (2011-12)	-0.0004	-0.0010***
	(0.0003)	(0.0004)
Proportion of total block level MGNRGEA positions that lies vacant	0.0093***	0.0077
	(0.0033)	(0.0054)
Block level MGNREGA staff per village	-0.0016	0.0231***
	(0.0018)	(0.0046)
Bank expansion in the two years preceding 2011-12	-0.0235	0.2209**
	(0.0749)	(0.1022)
Constant	0.0092***	0.0074***
	(0.0018)	(0.0027)

Equation 4: Dependent variable: Average delay interacted with negative rainfall in 2009-10

	Bootstrapped (full sample)	Bootstrapped; subsample of nonmissing values
	b/t	b/t
Bank branches in hundred per million job cards (2011-12)	-0.0000	0.0001**
	(0.0000)	(0.0000)
Proportion of total block level MGNRGEA positions that lies vacant	-0.0008*	-0.0009**
	(0.0005)	(0.0004)
Block level MGNREGA staff per village	0.0009***	-0.0019***
	(0.0002)	(0.0003)
Bank expansion in the two years preceding 2011-12	0.0166	-0.0121
	(0.0102)	(0.0075)
Absolute value of negative deviation of rainfall (2009-10 in standard deviation units)	-0.0003***	-0.0005***
	(0.0000)	(0.0000)
Positive deviation of rainfall (2009-10 in standard deviation units)	-0.0001**	0.0000
	(0.0000)	(0.0000)
Constant	0.0013**	0.0018***
	(0.0005)	(0.0004)

Equation 5: Dependent variable: Demand Rate (2009-10)

	Bootstrapped (full sample)	Bootstrapped; subsample of nonmissing values
	b/t	b/t
Growing Degree Days (GDD) current year (2009-10) rescaled (/100)	0.0718	-0.2180
	(0.0989)	(0.1662)
Growing Degree Days (GDD) lag year (wrt. 2009-10) rescaled(/100)	-0.0812	0.2186
	(0.1006)	(0.1690)
Number of days in the cropping season above optimal higher threshold temperatures current year (2009-10)	0.0041***	0.0045***
	(0.0012)	(0.0017)
Number of days in the cropping season above optimal higher threshold temperatures lagged year (wrt. 2009-10)	-0.0049***	-0.0053***
	(0.0014)	(0.0019)
Number of days in the cropping season below optimal lower threshold temperatures current year (2009-10)	-0.0009	-0.0009
	(0.0012)	(0.0021)
Number of days in the cropping season below optimal lower threshold temperatures lagged year (wrt. 2009-10)	0.0006	0.0010
	(0.0013)	(0.0022)
Number of village level MGNREGA staff per job card	0.0017	0.0042
	(0.0020)	(0.0045)
Administrative expenditure at the village level per job card	-0.0011	0.0001

(Rs.`000)	(0.0007)	(0.0010)
Administrative expenditure at the village level per village (Rs. `000)	-0.0009	-0.0079*
	(0.0009)	(0.0042)
Number of village level MGNREGA staff per village	0.0101	0.0194
	(0.0072)	(0.0126)
Proportion of people from the Scheduled Castes	0.1795	-0.0342
	(0.1266)	(0.1604)
Proportion of people from the Scheduled Tribes	0.1890***	0.1679**
	(0.0511)	(0.0766)
Literacy rate (proportion of total adult population)	-0.3133***	-0.3307**
	(0.1015)	(0.1622)
Integrated Action Plan district (=1 if yes)	0.0156	-0.0249
	(0.0297)	(0.0468)
MGNREGA Phase 1 district (=1 if yes)	0.0523**	0.0640**
	(0.0237)	(0.0313)
MGNREGA Phase 2 district (=1 if yes)	0.0730***	0.0594**
	(0.0233)	(0.0299)
Absolute negative deviation in rainfall in 2009-10 (in standard deviation units)		0.0180**
		(0.0086)
Positive deviation in rainfall in 2009-10 (in standard deviation units)		-0.0052
		(0.0063)
Difference between NREGA wages and bottom decile wages (2009-10; Rs. `000)		0.0009*
		(0.0005)
Difference between NREGA wages and top decile wages (2009-10; Rs. `000)		0.0387
		(0.2028)
MGNREGA-casual wage in Rs. hundred in 2009-10		-0.0009
		(0.0153)
Constant	0.5154***	0.4129***
	(0.0814)	(0.1585)
N	551	284
df_m	62	64
chi2	709.7***	1367.7***

Notes: Coefficients along with t-statistics are reported in the parenthesis. . *$p<0.10$, **$p<0.05$, ***$p<0.01$

Appendix Table 3.2. The Discouraged Worker Effect: District level analysis with Difference in Demand Rates Control Function Approach (Model 3)

	Control function (full sample)	Control function Model (subsample of nonmissing values)
	b/t	b/t
Lagged Rationing Rate (2009-10)	-0.234***	-0.223
	(0.08)	(0.14)
Proportion of payments with over 90 days delay in 2009-10	-0.028	0.374
	(1.32)	(1.91)
Data missing on wage payments delays (=1 if yes)	0.072**	
	(0.03)	
Proportion of wage payments delayed interacted with absolute value of negative deviation in rainfall in 2009-10	-20.391**	-33.280**
	(9.91)	(14.05)
Demand Rate (2009-10)	-0.464***	-0.626***
	(0.09)	(0.15)
Residuals from equation 1	-0.025	-0.052
	(0.08)	(0.14)
Residuals from equation 2	-1.000	-2.135
	(1.42)	(2.19)
Residuals from equation 3	0.334	2.991
	(9.13)	(15.68)
Residuals from equation 4	-0.145*	0.032
	(0.09)	(0.14)
Proportion of people from the Scheduled Castes	0.093	0.146
	(0.10)	(0.15)
Proportion of people from the Scheduled Tribes	0.145***	0.194***
	(0.05)	(0.07)
Literacy rate	0.218***	0.260**
	(0.06)	(0.10)
Integrated Action Plan district (=1 if yes)	-0.028	-0.038
	(0.02)	(0.03)
MGNREGA Phase 1 district	-0.016	-0.020
	(0.02)	(0.02)
MGNREGA Phase 2 district	-0.019	-0.025
	(0.01)	(0.02)
Absolute negative deviation of rainfall in 2011-12	0.007*	0.004
	(0.00)	(0.01)
Positive deviation of rainfall in 2011-12	0.004*	0.004
	(0.00)	(0.00)
Difference in average monthly per capita expenditure (in Rs. `000)	-0.024	0.012
	(0.03)	(0.04)
Proportion of target achieved over the past three years in toilet construction	-0.076	-0.186*
	(0.09)	(0.11)
Change in the number of jobcards	16.336*	30.772**
	(8.34)	(12.89)
Data missing on jobcards (=1 if missing)	-0.075	-0.056
	(0.05)	(0.06)

Change in the proportion engaged in agriculture	0.155**	0.134
	(0.06)	(0.10)
Change in the proportion engaged in casual farm work	0.352***	0.385***
	(0.10)	(0.13)
Change in the proportion engaged in non-agricultural occupations	-0.029	0.001
	(0.07)	(0.10)
Change in the proportion engaged in casual non-farm work	0.152**	0.272***
	(0.07)	(0.10)
Change in casual wage-MGNREGA wage differential for bottom decile	0.050	0.060
	(0.16)	(0.24)
Constant	-0.129	-0.139
	(0.08)	(0.13)
N	522	267
R-squared	0.608	0.649

Notes: Coefficients along with t-statistics are reported in the parenthesis. . $^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

Appendix Table 3.3: Control Function First Stage Results: District level Difference in Demand (Model 3)

	Lagged Rationing Rate (2009-10)	Proportion of payments with over 90 days delay in 2009-10	Demand Rate (2009-10)
	b/t	b/t	b/t
Proportion of total block level positions that lies vacant	-0.0620	0.0044	
	(0.0603)	(0.0034)	
Block level MGNREGA staff per village	-0.0204	-0.0015	
	(0.0323)	(0.0018)	
Block level MGNREGA staff per block	-0.0053**	0.0003**	
	(0.0020)	(0.0001)	
Block level MGREGA staff per 1000 job cards	0.0113***	-0.0004	
	(0.0039)	(0.0002)	
Village level MGNREGA staff per village	0.0005	-0.0011***	0.0090*
	(0.0073)	(0.0004)	(0.0053)
Absolute value of negative deviation of rainfall (2009-10)	0.0008	0.0001	0.0043***
	(0.0018)	(0.0001)	(0.0011)
Number of days in the cropping season above optimal higher threshold temperatures current year (2009-10)	-0.0015	-0.0002	-0.0051***
	(0.0020)	(0.0001)	(0.0012)
Number of days in the cropping season above optimal higher threshold temperatures lagged year (wrt. 2009-10)	0.0038**	-0.0003***	-0.0018*
	(0.0017)	(0.0001)	(0.0011)
Number of days in the cropping season below optimal lower threshold temperatures current year (2009-10)	-0.0039**	0.0003***	0.0017
	(0.0017)	(0.0001)	(0.0011)
Number of days in the cropping season below optimal lower threshold temperatures lagged year (wrt. 2009-10)	-0.3843***	-0.0081	-0.0388
	(0.1245)	(0.0074)	(0.0840)
Growing Degree Days (GDD) current year (2009-10)	0.3841***	0.0076	0.0316
	(0.1279)	(0.0076)	(0.0860)
Growing Degree Days (GDD) lagyear (2009-10)	-0.2862***	-0.0117***	
	(0.0661)	(0.0039)	
Demand Rate (2009-10)	-0.0022	0.0063**	-0.0390
	(0.0430)	(0.0026)	(0.0292)
Integrated Action Plan district (=1 if yes)		-0.0009**	
		(0.0004)	
Bank branches in hundred per million job cards (2011-12)		Neg.	
		(Neg.)	
Post offices per 1000 job cards (2011-12)		-0.0374	
		(0.0603)	
Bank expansion in the two years preceding 2011-12		0.0474***	0.2514**
		(0.0095)	(0.1047)
Proportion of people from the Scheduled Castes		0.0134***	0.2227***
		(0.0040)	(0.0459)
Proportion of people from the Scheduled Tribes		0.0069	-0.2666***
		(0.0078)	(0.0890)
Literacy rate		-0.0010	0.0546***

		(0.0019)	(0.0206)
MGNREGA Phase 1 district		0.0009	0.0616***
		(0.0019)	(0.0204)
MGNREGA Phase 2 district			-0.0118***
			(0.0036)
Positive deviation of rainfall in 2009-10			0.0015***
			(0.0003)
Difference between NREGA wages and bottom decile wages (2009-10)			0.0871
			(0.1163)
Difference between NREGA wages and top decile wages (2009-10)			0.0143
			(0.0087)
MGNREGA-casual wage in Rs. in 2009-10			0.0213***
			(0.0049)
Constant	0.6965***	0.0144*	0.5195***
	(0.0990)	(0.0074)	(0.0944)
N	538	538	523
R-squared	0.1461	0.1667	0.3083

Notes: Coefficients along with t-statistics are reported in the parenthesis. . * $p<0.10$, ** $p<0.05$, *** $p<0.01$