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Workfare as "Collateral": The case of the National Rural Employment Guarantee Scheme (NREGS) in India*

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Abstract

This paper argues that a major beneficial impact of workfare programs is through their role in allowing participants to improve their access to "credit". Sustained program participation serves as "collateral" for households' acquisition of informal credit, leading to the improvement in economic security and poverty reduction. Using a three-round household panel dataset in India in 2009-2012, we produce robust evidence that continuous participation in NREGS facilitates credit acquisition, increases income and consumption, and reduces consumption variability. A conceptual framework using an infinitely repeated trilateral stage game among lender, workfare participant, and local politician is developed to support our empirical findings.

Key Words: Workfare, collateral, NREGS impact, consumption, credit.
JEL Codes: C23, I38, O12

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INTRODUCTION

The National Rural Employment Guarantee Scheme (NREGS), the most ambitious program in the history of India's state-sponsored anti-poverty initiatives, came in operation in 2006. Given India's dual problem of poverty and unemployment[1], its main objective is to enhance livelihood security and tackle poverty by providing at least 100 days of guaranteed employment to every rural household that demands unskilled manual work. Beyond this immediate goal, the long-term aim is to reduce chronic poverty by creating durable infrastructure and empowering the poor by making employment a right. While the idea of using workfare to tackle poverty is not new, the NREGS is unique on several counts. First, its scale is unprecedented. According to Ambasta et al. (2008), it is the "largest ever public employment program visualized in human history" (p.41) and, in terms of household coverage, it is the largest public-works programme by any country.[2] Second, it embodies a right-based approach, which has occupied an important place in international development discourse in the last decade (Cornwall and Nyamu-Musembi, 2004). Third, the issues of accountability are well incorporated into the program design and the scheme calls for community-led social audits (Burra, 2008). For instance, Village Councils or *Gram Panchayats (GP)*, which constitute the lowest tier of rural governance, are entrusted with the implementation of the program, and the funds are made available directly to them. The program also makes unprecedented use of information technology.[3]

Bearing in mind its salient features, we will analyse NREGS with focus on its impact on household economic outcomes to achieve the following three objectives. First, we will identify the role of NREGS in ensuring the household economic security. More specifically, we will test whether (cumulative) participation in NREGS has any effect on household's economic outcomes, such as informal credit access, income, food and non-food consumption expenditure, and consumption fluctuations. This will be tested by using the

three rounds (2009, 2010 and 2012) of household-level longitudinal data based on our primary surveys in one of the Indian states, West Bengal. Second, we will examine the relative magnitude of the effect of NREGS on different outcome variables. It is confirmed that the impact on informal credit is the largest among various variables. Related to this, the link between scheme participation and political activeness is found to be the key to household access to credit. Third, we will distil our empirical findings and provide a theoretical framework to explain why cumulative participation in NREGS impacted on credit. More specifically, an infinitely repeated trilateral stage game will be applied to three players – a lender, a NREGS participant, and a local politician.

Our work builds upon the empirical literature on the impact evaluations of employment guarantee schemes or rural public works in low-income countries (e.g. Devereux and Solomon, 2006; Subbarao, 1997, 2003) and the growing literature on impact evaluations of NREGS (e.g. Jha et. al 2011, 2012; Deininger and Liu, 2013; Ravi and Englar 2015; Imbert and Papp, 2015). Jha et al. (2011) applied IV to the cross sectional data in 2007-8 in Rajasthan, Andhra Pradesh and Maharashtra and found a significant positive effect of NREGS on nutrient intakes. Using the household panel in 2004, 2006, and 2008 from Andhra Pradesh and the triple difference approach (with two pre-programme rounds) with propensity score matching, Deininger and Liu (2013) found a significant impact of NREGA participation on consumption expenditure, protein intake and calorie consumption. They also found that direct impacts are concentrated on households from scheduled casts and tribes and those relying on the casual labour market. Ravi and Englar (2015) applied the triple-difference estimator to the household panel in 2007 and 2009 in Andhra Pradesh and found that NREGS participation significantly increases food and non-food expenditure as well as savings. Using the NSS data, Imbert and Papp (2015) have shown that NREGS increases private sector wages despite the crowding-out effect. However, no studies to our

knowledge have examined the effects on credit using the panel data. Using more recent panel data in West Bengal, our paper contributes to the literature by (i) confirming the positive impact of NREGS on household economic outcomes found by earlier studies, (ii) providing the first robust evidence on the positive effect of cumulative participation in NREGS on informal credit access provided by informal money lender (like grocery shop owners), and (iii) showing that access to NREGS help households smooth consumption.

In our empirical analysis, specific attention has been paid to the issue of self-selection bias and endogeneity associated with participation in a self-selected employment guarantee program. By applying versions of Fixed-Effects model (with/without IV or PSM) to take account of the endogeneity issue, we have shown that cumulative days of participation in NREGS significantly increase credit access, consumption expenditure (food expenditure in particular) and income, as well as reduce consumption variability where the largest effect is found on credit. To offer a theoretical background for this empirical finding, a game theoretic model is presented to explain how participation in a workfare programme may relax credit constraints for poor households. Using a trilateral stage game between lender, scheme participant, and local politician, we show how sustained participation in workfare programme like NREGS can work as proxy for "collateral" in accessing informal credit from the local shop owners or moneylenders, to tackle temporal adverse income spell and smooth out consumption shock. Backed up by the theoretical model, our study has made a unique contribution to the empirical literature of impact evaluations of NREGS by using the household panel data which are rarely available in the Indian context.

The rest of the paper is organized as follows. In Section I we discuss the design of the survey and data. Section II emphasises the empirical/estimation methodologies and underlying intuition of our reduced form econometric model. Results and discussions are summarised in Section III. Section IV presents a conceptual framework to provide an

explanation for empirical findings. Using an infinitely repeated trilateral game among lender, scheme participant, and local politician, we show how NREGS participation can enhance the creditworthiness of the program participants. Section V offers the concluding observation.

I. DESIGN OF SURVEY AND DATA

Household panel surveys were carried out by one of the authors during the period from July to November in 2009, 2010 and 2012. The data were collected for sample of 500 households and 2249 individuals, drawn from 53 villages (in the local context it is called *Gram Sansad,* a ward of a rural municipality) of 13 rural municipalities (called *Gram Panchayat* or village council, the lowest tier of decentralized democratic governance structure in India) located in Birbhum district of West Bengal, India. Out of 500 households, we got the same sets of information all across the rounds for 477 households with a relatively low attrition rate (4.6%). The major focus of this survey was to collect the data on household participation in NREGS and its functioning as well as households' livelihood, income, expenditure, saving, indebtedness, average monthly volume of regular transactions on credit, livestock, assets (including production and consumer durables) and other socio-economic and demographic variables.

The sampling approach within the district was designed to yield a sample representative at the district level. First, Gram Panchayats (GPs) were chosen on the basis of a stratified sampling procedure and thereafter, within each stratum, households were chosen on the basis of random sampling. There was no eligibility restriction for the responding households to participate in the NREGS programme, as this is a self-selected universal programme where everyone in the village can participate. However, as the scheme requires unskilled manual labour, only the poor are supposed to participate in the scheme if the local

government sets a work requirement in such a way that only the poor have incentives to participate and the non-poor do not (*screening argument*, Besley and Coate 1992). To participate in NREGS work, one has to have a job card which is a free booklet available from the GP. A job card is the document which keeps note of days of work by a household under NREGS in a year and helps us - identify the participation status. We had a good mixture of participants and non-participants in each round of survey.[4]

Given the low attrition rate, we will use a balanced panel in this study. In the pooled data, we have 1475 observations. The main explanatory variable is *cumulative days of participation (CD)*, the total cumulative days worked under NREGS since inception. We analyse the effect of *CD* on the following outcome variables: log of monthly per-capita consumption expenditure (*lnmpce*), log of monthly food expenditure (*lnmfe*), log of monthly non-food expenditure (*lnmnfe*), log of gross volume of monthly credited transaction (*lngvc*)[5] and log of monthly per-capita income adjusted after NREGS earnings (*lnmpi_nregs*).[6] [7] In our dataset, out of 500 households in the first round, 304 households participated at least for one day in NREGS work, i.e. 304 were participants and 196 were non-participants. Within the latter, 91 households were involuntary non-participants who applied for NREGS jobs but did not get it, and 105 were voluntary non-participants who did not apply for NREGS work. In the second (third) round, out of 487 (488) households, 312 (299) households were participants, with at least one day NREGS work, and 175 (189) were non-participants, including 84 (116) involuntary non-participants and 91 (73) voluntary non-participants. Therefore, in the pooled data, we have 915 participating households and non-participating 560 households (291 involuntary and 269 voluntary non-participants). In our surveyed region we observed a significant number of involuntary non-participants. In impact evaluations, such involuntary non-participants can serve as a credible control group.

We have first compared the mean values of our main variables for these three categories of households, viz. '*participant'*, '*involuntary non-participant*', and '*voluntary non-participants*' (Table 1). Expenditure (both food and non-food) and income of the voluntary non-participants are much higher than those of participants and involuntary non-participants. This indicates that those who remained as voluntary non-participants were non-poor, and they may not need any income support program. On the other hand, the differences of expenditure and income between participants and involuntary non-participants are not as large as those between participants and voluntary non-participants. The values for involuntary non-participants are slightly higher than those for participants for most of the outcome variables.

(Table 1 to be inserted)

II. ECONOMETRIC MODEL

The main purpose of our econometric model is to test whether (cumulative) NREGS household participation improves the economic security, that is, the participation increases household (total, food or non-food) consumption expenditure, income, or informal credit, and decreases fluctuation of household consumption or income. It should be noted that a simple statistical comparison of the outcome variables between participants and involuntary non-participants cannot be used as evidence of the impact for a number of reasons related to the non-random placement of the program and its self-selection nature (Ravallion, 2007). Moreover, the direction of causality may be reversed in which the lower consumption (or a higher level of poverty) results in longer days of participation, making the interpretation of the coefficient estimate for the NREGS participation days difficult. In our paper, we will employ (a) household fixed-effects (FE) model (with time and household fixed effects), (b) household FE model with PSM (Propensity Score Matching) (*i.e.*, using the sample where

participants are matched with involuntary non-participants by PSM applied for each round based on the observed characteristics so that the observations outside the region of common support are dropped) and (c) household FE IV model with PSM to address the endogeneity issue.

Fixed Effects Model

To analyse the effect of NREGS days of participation on the household level economic variable, we start with the following model specification:

$$y_{it} = \beta_1 CD_{it} + \beta X_{it} + \eta_t + \gamma_r + \mu_i + \varepsilon_{it} \quad (1)$$

Here, y_{it} is the main outcome variable (viz. *lnmpce*, *lnmfe*, *lnmnfe*, *lngvc* or *lnmpi_nregs*), *i* refers to household, and *t* refers to year. All these outcome variables are in real terms (adjusted by CPI), and in logarithm. We use *CD,* cumulative days of NREGS participation as a main explanatory variable to examine the effect of continuous participation in NREGS on outcome variables.[8] X_{it} is the vector of other explanatory variables (see Appendix 1). η_t is the year dummy which captures time fixed-effect. γ_r is a region or GP level fixed effect to capture the area heterogeneity. μ_i is the household specific time-invariant heterogeneity term. ε_{it} is an idiosyncratic error term. Since our data come from 53 villages under 13 GPs, standard errors are clustered at the village level to avoid any correlations among the outcome variable at the village level.

Fixed Effects with PSM

We also deploy the fixed-effect estimation technique after running PSM between participants and involuntary non-participants in each round by controlling for the initial conditions as well as for time-varying factors that would influence the availability of NREGS jobs (i.e. the program placement) and subsequent change of outcome variable over

time [9] (Ravallion and Chen 2007; Chen et al., 2008, Imai and Azam 2012). PSM reconstructs the panel by running the probit model for control (i.e. involuntary non-participants) and treatment (i.e. participants) groups in the first stage. Based on the propensity scores derived by the first stage probit, two groups are matched in the second stage, for example, by Kernel matching which we have adopted among other alternatives (Becker and Ichino, 2002). PSM is applied for each round and we have dropped the households outside the common support region[10] in all of the three rounds. In Appendix 2 we plot the propensity score, or the estimated probability of participating in NREGS for participants and (involuntary) non-participants for three waves. As participants and involuntary non-participants are made strictly comparable after PSM, FE-PSM model is preferable to FE model for our purpose. The balanced panel has been reconstructed for 1050 households in the region of common support for all the three rounds, to which FE model has been applied.

Fixed Effects IV Model with PSM

The above model can address only household-specific time-invariant heterogeneity terms for the sample households of 'participants' and 'controls' matched in terms of household characteristics. But if the main explanatory variable (*CD*) is endogenous, e.g. through self-selection (i.e. Cov($CD_{it}, \varepsilon_{it}$) $\neq 0$), we cannot deny the possibility that its coefficient estimate is inconsistent. To address this problem, we have estimated FE IV model with PSM. That is, we have reconstructed the panel by PSM and have run FE-IV. The first stage equation is specified as:

$$CD_{it} = \beta_1' Z_{1it} + \beta_2' Z_{2it} + \beta_3' X_{it} + \delta_t + \upsilon_r + \lambda_i + e_{it} \qquad (2)$$

Here, CD_{it} is instrumented by instrumental variables, Z_{1it} and Z_{2it}, requiring exclusion restrictions $Cov(Z_{1it}, e_{it}) = 0$, $Cov(Z_{2it}, e_{it}) = 0$ and $Cov(CD_{it}, Z_{jit}) \neq 0$, while the time effect (δ_t), the regional fixed effect (υ_r), and the household fixed effect (λ_i) are included.[11]

We use two instrumental variables, "*regime_change"*, Z_{1it} and "*Village_avegCD*". Z_{2it}. The former (*regime_change*) captures whether there was a change in the GP-level dominant party[12] position from election year to election year during our survey time. The latter (*Village_avegCD*) is a continuous variable that shows the village-level average of CD where the household's own *CD* is not included.

In Appendix 3 we illustrate in detail the construction of *"regime_change*". Since our unit of observation is household, *regime_change* takes 1 if the household resides in a GP where regime change took place (in terms of the change of the GP-level dominant party) and 0 otherwise. One question is whether the regime at the GP level has changed on annual basis because, if not, then this variable will drop automatically in the fixed-effects model. Our close examination of the data shows that the regime has changed from one wave to another during our survey period. We use 4 election years (2008, 2009, 2011, and 2013) to construct "*regime_change*". Around our survey years (i.e. 2009, 2010, 2012), respondents have experienced 4 elections, *viz.*, West Bengal Panchayat Election in 2008, National Parliamentary Election in 2009 and West Bengal State Assembly Election in 2011 and again West Bengal Panchayat Election in 2013. Along with our household-level survey data, we collected the data on the GP-level dominant party position after each election. GP-level ruling party was formed through the Panchayat Elections as it happened in 2003, 2008, and 2013 (Panchayat Election years). However, we could also trace (from our surveys and election-booth wise results available at the office of the district election returning officer) the GP-level dominant party position after Parliamentary and Assembly elections. At the

time of our first round survey in 2009, we managed to identify the GP-level ruling party based on 2008 Panchayat elections and also GP level dominant party based on 2009 Parliamentary election (see Appendix 3). After the first round survey, a GP was supposed to experience the regime change if the ruling party after 2008 Panchayat election and dominant party after 2009 Parliamentary election differ for that particular GP, accordingly *regime_change* takes the value 1 for a household living in that GP. Similarly, for our second round survey (in 2010), we construct "*regime_change*" using the 2009 Parliamentary election and the 2011 State Assembly election. If the GP-level dominant party after 2009 election changes in 2011 election (see Appendix 3), then that GP is a "regime changed" GP where *regime_change* takes the value of 1 for a household living within that GP and 0 otherwise. Finally, to construct *regime_change* variable for our third round of survey (in 2012), we compare the GP-level dominant party in 2011 and 2013 elections. One important point to note here is that our *regime_change* variable is constructed by using the idea of GP-level dominant party, but *not* the GP-level ruling party which remained same during the period between 2008 and 2013. The GP-level ruling party cannot change from year to year, while the GP-level dominant party can change with different elections (Appendix 3).

It can be surmised here that *regime_change* will satisfy the exclusion restrictions. "*regime_change*" can influence the household *CD* through the political pressure imposed on the GP-level ruling party by a strong non-ruling/opponent party without affecting household economic outcomes. It is implied that the election was very competitive in the GP area where the regime changed in successive election years, i.e., the GP-level dominant party position kept changing in those years in a short span of time. In other words, there has been always, at any point of time, a strong non-dominant party existed that could potentially become a dominant party in the next election. So the presence of strong GP-level non-dominant party, typically an opponent party, always put an upward pressure, or compelled

the GP level ruling party to perform better in the implementation of NREGS at the GP level, which was likely to lead a better institutional functioning at GP level. It appears that *regime_change* works as a supply side push factor at the GP level which could increase NREGS uptake at the household level. This explains why the average value of CD is higher for households with *regime_change* = 1 than those with *regime_change* = 0, whereas most of the other variables do not show any statistically significant differences (see Appendix 4). It could be argued that household's changing political affiliation over the years can differently interact with the regime change variable and can bring the household specific source of variation in CD within a GP, which explains the household's specific source of variation within a GP.[13] In the meantime, it is unlikely that frequent *regime_change* has any direct effect on the outcome variable, such as consumption, income, informal credit access from the local grocery shop owner or money lender. "*regime_change*" happens mostly in a random way to a household and it cannot influence the labour, credit or commodity market in the short run unless the election is fully captured or rigged. To support these arguments, the first stage results of our IV estimation results show that "*regime-_change*" is highly significant and F-statistics on the excluded instrument after the first stage is sufficiently large (12.19 to 23.59, Appendix 5), suggesting that there is no problem of weak instruments. We also compare averages of outcome variables and other key variables for household living in a *regime_change* GP i.e. *regime_change=1* and household living in a non-regime change GP i.e. *regime_change*=0 by simple t-tests (Appendix 4). While the differences between mean values of the outcome and other variables are statistically insignificant, *CD* (or *D*), our proxy for NREGS participation, is significantly higher for household living in regime change GP, which is consistent with the external validity of *regime_change* as an instrument for *CD*.

The second instrumental variable (i.e. *village_avgCD*), Z_{2it}, is a continuous variable that shows the village-level average of *CD* where the household's own *CD* is not included (Appendix 1). Given the small size of the village, *village_avgCD* well proxies the outlay of the programme at the village level, that is, roughly how much budget the politician has allocated to each village over the years.[14] If a household member comes to know that many people outside its own household in the village have participated in NREGS, he or she may have more incentives to participate, e.g., through networking with friends in the village, than in the case where the programme has not become available.[15]

The validity of these instruments is statistically verified. First, the first-stage F-statistics for excluded instruments is high and they are statistically significant in the first stage (Appendix 5). Second, the instruments have passed specification tests, such as Sargan test for over-identification[16], the under-identification test, and the test of endogeneity (i.e. the Davidson and Mackinnon (1993) test and the Durbin-Wu-Hausman test), which shows that *CD* is endogenous (Table 4 and Appendix 5). Given these results, we will focus mainly on the results of fixed-effects IV estimation with PSM as well as fixed-effects with PSM in discussing the effect of NREGS participation days on objective variables.[17] In the result section and in Appendix 5 we separately report the IV results as 'Case a' and 'Case b' with two IVs (i.e. *regime_change and village_avgCD*) at a time and one IV (i.e. only *regime_change*) at a time respectively.

It is noted here that in the first stage regression, we include the variable called *"Political"* (a dummy showing whether the household took part in the election campaigns in favour of the GP level ruling party) to separate the effect of political activeness (on *CD*) from that of *regime_change*. This is significant and positive (coef. est.; 13.27, t-value; 2.59) for *CD*, implying that a high correlation between political activeness and *CD*. Table 2 shows that *CD* or *D* is significantly larger for politically active households than those

apolitical. However, there is no statistically significant difference for landholding, consumption expenditure, food or non-food expenditure, income (adjusted by subtracting own NREGS income) or the number of non-NREGS days of employment. Though statistically insignificant, the mean of credit is higher for "*Political*" households. In sum, households which explicitly supported the GP-level ruling party through political campaign participated more in NREGS over time and managed to obtain more credit. *"Political"* is also inserted in the second stage regression to take account of its direct effect on informal credit or other outcome variables to separate out the selection mechanisms through our IVs. In the second stage, "*Political*" is statistically significant except for non-food expenditure.

[Table 2 to be inserted]

OLS & IV for the cross-sectional data for examining the consumption smoothing effect

As an extension, we examine the effect of NREGS days of participation on the variability of household's consumption expenditure, food and non-food expenditure, gross volume of monthly credit, and household income. We have first constructed the proxy for variability of these outcome variables by taking their standard deviations (*sd*) and coefficient of variation (*cv*) across different years. We have then generated the cross-sectional data by using the time-series means of all the covariates ('*mean'*) as well as '*sd'* and '*cv'* for the outcome variables. Then we run OLS and IV - using the same instruments - to see how NREGS participation influences the variation in consumption, food and non-food expenditure, gross volume of monthly credit and income over time.

III. RESULTS

Before presenting our main econometric results, we will briefly examine the relation between the days of NREGS participation and the proxies for household's economic

prosperity. In Table 3 we have examined how the average 'Current Days of NREGS participation' (i.e. *D*) and the average 'Cumulative Days of NREGS Participation' (i.e. *CD*) change for different classes of monthly per-capita consumption expenditure (MPCE) as well as landholding. The days of participation in both current and cumulative terms are found to decrease with the rise in the consumption expenditure as well as in land holding, which suggests the good targeting performance of NREGS.

[Table 3 to be inserted]

Table 4 summarises the effect of *CD* on five different objective variables (namely Case (A): *'monthly per-capita consumption expenditure',* (B): *'monthly food expenditure',* (C): *'monthly non-food expenditure',* (D) *'monthly per-capita income adjusted by subtracting NREGS earnings'*, and (E) '*gross volume of monthly credit'* by the household. In each table, three cases are shown – (1) FE model, (2) FE-PSM model, and (3) FE-IV-PSM (Cases a and b).[18]

[Table 4 to be inserted]

In the case of FE model (Column (1) of Cases A to E, Table 4), the effect of cumulative days of NREGS participation is positive and significant on *'monthly per-capita consumption expenditure', 'monthly food expenditure', 'gross volume of monthly credit by the household'*, but the coefficient is statistically insignificant on '*monthly non-food expenditure'* and *'monthly per-capita income adjusted after NREGS earnings'*. On the other hand, in the case of "FE-PSM" (Column (2)) and "FE-IV-PSM" (Column (3)), *CD* is positive and significant in all the cases except for '*monthly non-food expenditure'*. Below our attention will be mainly drawn to "FE-IV-PSM" (Column (3) of case A to E), our preferred case whereby *CD* is treated as endogenous by instrumenting it with 2 instruments (Case a). It is observed, for instance, from Column (3) of Case A, that if cumulative NREGS days of participation increases by 1 day then their monthly per-capita consumption

expenditure (which include food and non-food expenditures) would increase by 0.5 %, other things being equal. The average monthly per-capita consumption expenditure for participating households is found to be INR 663.25 (Table 1). Now 0.5% increase of this average value will be INR 3.32. This implies that if a household has 5 members then their monthly consumption expenditure would rise by INR 16.60. On the other hand, one extra day of work in NREGS can transfer on average roughly around INR 105.40 during our survey time (Table 1). In other words, if politicians transfer INR 105.40 through NREGS, a participating household by working one additional day in NREGS after forgoing other opportunity, can increase monthly consumption by INR 16.60. It should be noted that this is 'a net effect' derived as the mean conditional marginal change of consumption expenditure in response to one day increase in NREGS participation after considering the foregone income, which is non-negligible for participants in workfare scheme (Datt and Ravallion 1994; Jalan and Ravallion 2003). Given that the difference between NREGS wage i.e. INR 105.40 and INR 85.50 (the mean open market unskilled wage rate, Table 1) is only INR 19.90, the estimated consumption increase (INR 16.60) is likely to be non-negligible. More importantly, this is statistically significant and supports the evidence for the poverty reducing effect of NREGS.

From Column (3) of Case B, we observe that if cumulative NREGS days of participation increase by 1 day, their monthly food expenditure would significantly increase by 0.5%. However, we do not find any significant effect of *CD* on non-food expenditure, which imply that NREGS earnings have been mainly spent on food-consumption - given the high intensity of manual labour. This is in line with the scheme's main objective of poverty alleviation. Case D points to a positive effect of NREGS days of participation on monthly per-capita income adjusted after NREGS earnings.

The most striking and important results are observed in Column (3) of Case E. In this case, if *CD* increases by 1 day, then in the current period, the gross volume of monthly credit or credited transaction (mainly for daily food and non-food items for subsistence) that the household can get from the local grocery owner (or from non-poor neighbour) increases by 3.6% with statistical significance at 5 % level. The effect of *CD* on informal credit is substantial in the context of poor rural households and by far the largest - in terms of percentage among the five outcome variables. The result implies that the credit-worthiness of the NREGS participating household increased with the increase of their previous accumulated days of participation, which appears a remarkable achievement of the program.

During our field work we conducted a few case studies. We found that, if a household member was occasionally working in a stone crushing belt or illegal coal-digging unit or in any uncertain farm/non-farm level daily work (which was one of the major alternative sources of livelihood in our survey region) with a most unstable stream of earnings, then he was denied credited transaction from the local grocery for purchasing daily grocery items. However, when the same person was working in the NREGS for a considerable period of months or in a sustained way in the last few years (indicating that he was a regular participant rather than a new joiner or quitter), then he was provided with grocery items in credit by the grocery owner with the expectation that the credited amount would be repaid.[19]

Collating all the pieces of evidence, we can conclude that a rise in cumulative previous participation in NREGS enhances the credit worthiness of poor households. With the sustained participation in NREGS, households can signal themselves as a good borrower who has the capacity to repay the credit without providing any physical collateral. Essentially, cumulative days of NREGS participation (which is quite visible, as the works are only available in close vicinity), rather than the current period participation, serve as "collateral" in such a way that poor households can obtain small credit to cope with income

shocks. On the other hand, prospective lenders (i.e. grocery shop owners) can see the strategic relation between a participant and a politician - which is suggested by Table 2 - to make sure that the stream of NREGS jobs will continue to be provisioned for the participant. This will relax the credit constraints to achieve higher levels of consumption and income (Table 4). However, it should be noted that this effect is not observed for non-food consumption (Case C of Table 4).

Further extending our analyses, we have estimated the effect of NREGS days of participation on the variability of consumption and income (Table 5). The results from OLS estimation show that with an increase in the cumulative days of participation the variability of these outcome variables decreases. The coefficients of estimates under OLS are significant and negative except for income. On the other hand statistically significant and negative results are found in all the cases except non-food expenditure where *CD* is instrumented. In the IV results, with one day increase in *CD*, the variability of per-capita consumption expenditure reduces by 1.51 standard deviation (*sd*) point, the variability of monthly food expenditure reduces by 2.26 *sd* point, and the variability of monthly per-capita income (adjusted after NREGS earnings) reduces by 1.94 *sd* point. Here we can conclude that NREGS days of participation reduces the fluctuation in total consumption, food consumption and income. This is consistent with the role of NREGS in smoothing consumption or income.

[Table 5 to be inserted]

IV. A CONCEPTUAL FRAMEWORK

We have shown in the last section that cumulative participation in NREGS - which is significantly associated with political activeness - facilitates household's access to informal credit and smooth out consumption fluctuations. In this section we will provide a possible

conceptual framework consistent with our empirical results using a set of bilateral and trilateral stage game with grim trigger strategy. Here we argue how a workfare programme can make beneficiaries more creditworthy in the eyes of the potential lender. This may add a new argument for workfare (*"credit" argument*), to the existing ones well established in its theoretical literature, such as *"screening" argument* and *"deterrent" argument* (Besley and Coate, 1992).

In a rural agrarian economy of a developing country, the poor worker in the casual labour market tends to face income uncertainty due to the temporary/seasonal nature of the work, lack of job securities, and fluctuations in wages. Under these circumstances, an informal lender, such as a grocery shop owner, will not provide a loan for a poor household unless he is convinced of the borrowers' future income streams.[20] Sustained participation in NREGS over the past years will serve as a signal for the potential borrower to prove that he is a credible borrower to secure informal credit. Also, politicians in charge of allocating NREGS works need a political support from potential participants in their constituencies to get re-elected in the next election.

To reflect this setting, our model consists of three players, namely *Participant*, *Politician* (i.e. peoples' representative in charge of allocating NREGS work at the village level) and *Lender* (e.g. a local grocery owner).[21] We make the following assumptions.

A1: *Participant* has no collateral and has an incentive to participate in NREGS (or to obtain public goods) by supporting *Politician*. *Participant* also values NREGS jobs as he has sporadic job opportunities in the farm and non-farm sector with his wage lower than the programme wage.

A2: *Politician* wants to get re-elected and thus values the support from *Participant.* Accordingly, he allocates NREGS jobs to increase the chance for getting re-elected.

A3: *Lender* has an incentive to sell his grocery items on credit because he can charge an extra price margin for credited transaction without any physical collateral.

A4: *Participant* values a loan from *Lender* (or values an opportunity to make a grocery transaction on credit at higher prices) in the lean period or during the spell of unemployment. A loan is used for smoothing consumption and not for investment.

A5: A1 to A4 are common knowledge among the three players.

First, we will present two simple games, namely (i) Patron-Client game and (ii) no-collateral Lender-Borrower game, to show that *Politician* can facilitate no-collateral lending between *Lender* and *Participant* by conditioning *Participant*'s access to NREGS, contingent on repayment of his loan. In return, *Participant* provides political support for *Politician* in the form of vote, party donation, attending election campaign or party meeting or rallies, postering or wall writing. We develop this game as an infinitely-repeated stage game between *Participant*, *Lender* and *Politician* and derive the condition under which access of credited transaction, access of NREGS job and access of political support can be obtained as equilibrium. Each stage game has two components: a bilateral Patron-Client game and a bilateral Lender-Borrower game. Under the bilateral Patron-Client game, *Politician* chooses whether to give *Participant* access to NREGS work and *Participant* chooses whether to support the *Politician*. Here we assume that *Politician* serves as a patron and *Participant* as a client and hence the game is called a bilateral Patron-Client game. On the contrary, in the bilateral Lender-Borrower game, *Lender* chooses whether to make no-collateral credit to *Participant* and *Participant* chooses whether to repay the loan or credited amount. We will first show how, under these two bilateral stage games, the adoption of a bilateral grim trigger strategy can lead to an optimal solution separately for *Politician* and *Participant* in Patron-Client game and for *Participants* and *Lender* in Lender-Borrower game.

Structure of the game[22]

Participant has his value parameters characterized as: the value of NREGS Job as $V_N \in [0,\infty)$, the value of credit as a borrower as $V_B \in [V_L(1-r),\infty)$ where V_L = monetary volume of credited transaction, discount factor as $\delta^B \in [0,1)$. On the other hand, *Politician* is characterized by his value parameter: the value of political support by *Participants* as $V_P \in [0,\infty)$ and discount factor as $\delta^P \in [0,1)$. The severer the competition in the last election was, the higher the V_P is. *Lender* offers a loan for *Participant* with an implicit interest rate, *r*, where 0<*r*<1.[23] All the three players have complete information about the parameter of the values $V_N, V_B, V_P, \delta^B, \delta^P, r$, and can observe all the past actions.

As a baseline, the following two separate bilateral games are presented. Game A is played between *Lender* and *Participant* as Bilateral lender-borrower game, where *Lender* decides whether to give a loan to *Participant*, and *Participant* decides whether to repay that loan to *lender*. Game B is played between *Politician* and *Participant* as Bilateral patron-client game where *Politician* as patron decides whether to provide NREGS jobs to prospective client as *Participant*, and client decides whether to extend explicit support to *Politician* to increase his chance of getting re-elected.

Game A: Bilateral lender-borrower game

Lender chooses whether to give V_L unit of money's worth of credited goods to *Participant* with a price mark-up *r*. *Participant* consumes V_L (monetary volume of credited goods) and accrues a value of $V_L(1-r)$. *Participant* repays V_L to *lender* during the spell of NREGS work. For simplicity, we collapse this process of lending and borrowing into a single-stage game where *Lender* chooses whether to provide a loan and *Participant* chooses his repayment strategy, as shown by the pay-off matrix in Figure 1.

[Figure 1 to be inserted]

In this game, *Lender* chooses either to lend (denoted as 'L') or not to lend ('NL') and *Participant* chooses either to repay ('R'), or not to repay ('NR'). Note that (NL, R) and (NL, NR) have the same outcome, since participant's choice to repay is only relevant if the lender provides a loan in the first choice. This stage game is then repeated infinitely with the participant's discounting between each round at factor δ^B. We assume here that the players will adopt their *grim trigger strategy* profile i.e. *Lender* chooses 'L' if and only if *Participant* has chosen 'R' in all previous rounds, and *Participant* chooses 'R' if and only if *Lende*r has chosen 'L' in all previous rounds, making (L, R) as cooperation. Now we are imposing individual rationality (IR) constraint for both players under infinitely repeated game. IR constraint with the grim trigger strategy profile for *Participant* is described as follows: 'the sum of present discounted values of defection must be lower than the sum of the present discounted value of cooperation'. Alternatively, V_L,i.e., the sum of the present discounted values of defecting to (L, NR) from cooperation (L, R) in the current round and then receiving the (NL, NR), i.e., '0' in subsequent rounds, must be lower than $\frac{V_L(1-r)}{1-\delta^B}$, the present discounted value of cooperation in the current round and also in all future rounds. *IR* for *Participant* is:

$$V_L \leq \frac{V_L(1-r)}{1-\delta^B} \Rightarrow 1 \leq \frac{1-r}{1-\delta^B} \Rightarrow (1-\delta^B) \leq (1-r) \Rightarrow \delta^B \geq r \qquad (3)$$

Since grim trigger strategy profile results in (L, R) and sanctions the maximum possible punishment for deviation, if (L, R) is not a sub-game perfect Nash equilibrium, then (L, R) cannot be the result of such equilibrium. On the other hand, IR for *Lender* is to stick to (L, R), as he could receive a higher pay-off from cooperation (L, R) than he does from defecting outcome to (NL, R). This implies the inequality (3) is necessary and sufficient to ensure that (L, R) can occur only in bilateral equilibrium.

Game B: Bilateral patron-client game

In this game, *Politician* is the patron and *Participant* is the client (Figure 2). *Politician* as patron chooses whether to provide (P) or not provide (NP) NREGS job for *Participant* who values NREGS job as $V_N \geq 0$. *Participant* as client chooses whether to support (S) or not support (NS) *Politician* who values political support as $V_P \geq 0$. The program participation incurs opportunity costs for both *Politician* and *Participant*, which can be set as 1 for both for simplicity.

[Figure 2 to be inserted]

As in Game A, this is played infinitely, with discount factors δ^B and δ^P for participant and politician respectively. Grim trigger strategy is assumed to be taken by both players. In this game (P, S) is the cooperative solution and, if (P, S) is not an equilibrium, then (P, S) cannot be a sub-game perfect solution. As before, each player will adopt his rational choice considering his opponent's trigger strategy. IR constraint for both players is similar in the sense that the sum of the present discounted value of defection cannot be greater than the sum of the present discounted value of cooperation. Accordingly, we will get the following two conditions to reach (P, S) as an equilibrium solution.

IR for Politician: $$V_P \leq \frac{V_P - 1}{1-\delta^P} \Rightarrow (1-\delta^P) \leq \frac{V_P - 1}{V_P} \Rightarrow (1-\delta^P) \leq (1-\frac{1}{V_P}) \Rightarrow \delta^P \geq \frac{1}{V_P} \qquad (4)$$

IR for Participant: $$V_N \leq \frac{V_N - 1}{1-\delta^B} \Rightarrow (1-\delta^B) \leq \frac{V_N - 1}{V_N} \Rightarrow (1-\delta^B) \leq (1-\frac{1}{V_N}) \Rightarrow \delta^B \geq \frac{1}{V_N} \qquad (5)$$

Under (4) and (5), (P, S) is a Pareto efficient outcome.

(3) (or (4) and (5)) is (are) the necessary and sufficient condition(s) for (L, R) (or (P, S)) to be equilibrium solution for Game A (or Game B). Conditions (3), (4) and (5) are thus the rationality conditions for three different players in two separate games. We have so far considered these two bilateral games separately, but for the NREGS participation to ensure provision of credit, we need to have {(L, R),(P, S)} as a single sub-game perfect Nash

equilibrium solution with no other Pareto-efficient equilibria. In a proper institutional context, we could assume that *Politician-Participant* cooperation outcome (i.e. having sustained NREGS job against assured political support) could be used as "collateral" in the lender-borrower game and thereby *Politician* can act as a credible negotiator between *Participant* and *Lender*. Using the *trilateral game,* we can show that, if *Politician* values *Participant*'s support, then, with respective trilateral grim trigger strategies in response to a defection, there would be a single Pareto-optimal sub-game perfect Nash equilibrium for all the three players. The idea is that a default in one arena (credit repayment, or political support) is punished in the other and this additional punishment threat would lead to a larger set of supported equilibria.

Game C: Trilateral Community Enforcement game

In Game C, in each round, all the three actors simultaneously play both bilateral stage games (sub-games A and B) in such a way that they play "the community game" involving three players. Our objective is to find the condition under which (L, R) in Game A and (P, S) in Game B will be achieved simultaneously and whether the relationship between *Politician* and *Participant* improves enforcement of the infinitely repeated game between *Lender* and *Borrower*. This is possible under a trilateral game with *trilateral grim trigger strategy* profile, resulting in the fully cooperative outcome (L, R, P, S). This trilateral grim trigger strategy assumes that *Lender* chooses 'L' if and only if *Participant* has chosen 'R' and 'S' in all previous rounds, and if *Politician* has chosen 'P' in all previous rounds. *Participant* chooses 'R' and 'S' if and only if *Lender* has chosen 'L' and *Politician* has chosen 'P' respectively in the previous rounds. Likewise, *Politician* chooses 'P' if and only if *Lender* has chosen 'L' and participant has chosen 'R' and 'S' in all previous rounds. Essentially, this trilateral grim trigger strategy imposes a restriction that trustworthiness is not only

important between two players, but important at the community level, to reach the community-level optimal solution, which can be reasonably justified in our settings of the small village community. To use these strategy profiles to reach equilibrium, each player must satisfy his respective IR constraint defined earlier.

IR for *Lender* is always to choose 'L' over 'NL' to run the game. *Politician* suffers the same consequence from defection in trilateral game as he does in the bilateral patron-client game, so his IR constraint will remain the same as (2) i.e. $\delta^P \geq \frac{1}{V_P}$. But *Participant* will face a new IR constraint where defection of either game (i.e. defaulting loan and taking out support from *Politician*) causes him to be penalized or lose the potential benefits of all future cooperative outcomes in both the games. New IR for *Participant* is:

$$V_L + V_N \leq \frac{V_L(1-r)+(V_N-1)}{1-\delta^B} \Rightarrow (1-\delta^B) \leq \frac{V_L + V_N - V_L r - 1}{V_L + V_N}$$

$$\Rightarrow (1-\delta^B) \leq 1 - \frac{(1+V_L r)}{V_L + V_N} \Rightarrow \delta^B \geq \frac{1+V_L r}{V_L + V_N} \qquad (6)$$

(4) and (6) are the conditions for the fully cooperative solution i.e. {(L, R),(P, S)}which is also a sub-game perfect Nash equilibrium of this trilateral game where participation in NREGS contingent on extending political support ensures no-collateral credit from *Lender*.

The right hand side of (4) i.e. ($\delta^P \geq \frac{1}{V_P}$) can be interpreted as:

$$\frac{1}{V_P} = \frac{(Opportunity\ cost\ of\ providing\ NREGS\ job\ by\ Politician)}{(Politician's\ value\ of\ political\ support\ by\ Participant)}$$

Now we set $0 \leq \delta^P \leq 1$, i.e., δ^P is a fraction. This implies $\frac{1}{V_P} < 1 \Rightarrow 1 < V_P$. This suggests that the opportunity cost of providing a NREGS job for *Politician* is smaller than *Politician*'s value of political support by *Participant.* This will be more likely to hold, e.g., if *Politician*

needs more political support from *Participant*, i.e. if there is political competition at a high level. The right hand side of (6) can be interpreted as:

$$\frac{1+V_L r}{V_L+V_N}=\frac{(Opportunity\ cost\ of\ \ Political\ \ support)+(cost\ of\ \ credit\ in\ terms\ of\ \ implicit\ \ \ interest\ \ rate\ )}{(Volume\ of\ \ lending\ \ in\ credit\ \ )+(Value\ of\ \ NREGS\ \ job)}$$

Now we set $0 \le \delta^B \le 1$, i.e. δ^B is a fraction. This implies $\frac{1+V_L r}{V_L+V_N} < 1 \Rightarrow (1+V_L r) < (V_L+V_N)$.

That is, the aggregate cost for *Participant* (the sum of opportunity cost for political support and the cost of credit, in terms of implicit interest rate) is smaller than the aggregate benefit for *Participant* (the sum of value of lending and the value of the NREGS job). This condition is more likely to hold, for instance, if *Participant* is poor, and thus values the NREGS job or credit more, and his opportunity cost for political support is low, or the implicit interest rate is low. The conditions (4) and (6) are more likely to hold, if, for instance, *Politician* needs more political support from *Participant*, *Participant's* valuation of NREGS job is high, and/or cost of credit is relatively low. Under these conditions, the community's cooperative outcome will hold where *Participant* will continuously obtain NREGS jobs from *Politician* and informal credit from *Lender*, while he supports *Politician* over time. This infinitely repeated trilateral game supports our empirical and field findings and explains why sustained participation in NREGS enhances informal credit access of the poor participating households which have continuously supported politicians.

A comparison of the constraints for discount factor δ^B for *Participant* under Game A and Game C would provide some useful insight into the community enforcement in Game C. With a condition $r \succ \frac{1}{V_N}$,[24] the right hand side of inequality (3) i.e. r is greater than that of inequality (6) i.e. $\frac{1+V_L r}{V_L+V_N}$, meaning that the IR constraint for *Participant* is less likely to

bind under the trilateral game than the bilateral lender-borrower game. This implies that an additional threat under the trilateral game leads to a larger set of supported equilibria and improves enforcement of the repeated game between lender and borrower, making *Participant*'s access to credit easier if he provides support for *Politician*. This is in line with our empirical result that political activeness is highly correlated with continuous participation in NREGS.

V. CONCLUSION

The main purpose of this paper is to shed new light on workfare programs in developing countries taking the National Rural Employment Guarantee Scheme (NREGS) in India as an example. It shows that sustained participation in workfare over the years can serve as "collateral" for households' acquisition of informal credit ("credit" argument for workfare). This credit can then lead to an improvement in households' economic security and poverty reduction.

We have first examined whether participation in NREGS work has any specific effect on the household-level economic variables, such as, monthly per-capita overall consumption, monthly food and non-food consumption, gross monthly credit and monthly income of the participating households using three waves (2009, 2010, 2012) of household level panel data. This dataset is based on our primary surveys conducted in West Bengal. Specific attention has been paid to the issues of self-selection bias and endogeneity by using different models, namely Fixed Effect, Fixed Effect with PSM and Fixed Effect-IV with PSM. We have also investigated the effect of NREGS days of participation on the variability of consumption and income to examine consumption/income-smoothing effects of NREGS.

We have found that cumulative days of NREGS participation since inception of the program have significantly increased per-capita monthly consumption expenditure, monthly food expenditure and per-capita monthly income adjusted by subtracting own NREGS earnings. However, the largest effect of sustained participation is found for informal credit. That is, the households with sustained program participation over the years managed to access a greater volume of gross monthly credited transactions. Improvement in credit worthiness may indirectly relax the budget constraint of the participating households and hence increase consumption - food consumption in particular - and smooth out consumption. We have also found a statistically significant association between political activeness and sustained participation. That is, sustained household participation in NREGS - contingent on providing continuous political support - has been found to facilitate credit access and reduce consumption poverty as well as variability in consumption and food.

To support these findings, a conceptual framework has been provided for our empirical work. We have sketched an infinitely repeated trilateral stage game among lenders, scheme participants, and local politicians to underscore how participation in NREGS matters for securing informal credit from the local shop owners or moneylenders. Under some conditions, the community's cooperative outcome is achieved where the participant will continuously obtain NREGS jobs from the politician and informal credit from the lender.

An interesting finding of this study is that current period participation does not appear to be a significant predictor of higher consumption and income. Rather, it is the cumulative days of participation in NREGS which are the significant predictor of higher consumption and higher income and also lower variability of consumption and income. This suggests that NREGS can reduce poverty (defined in monetary terms, income and consumption) only when members in the poor households have participated in NREGS for a considerable number of days over the years, rather than participating NREGS only for a short period.

This finding suggests that impact evaluations of NREGS or workfare programs should span several years, rather than just one or two. This study concludes that - at least in the surveyed region i.e. in Birbhum district of West Bengal - the NREGS has already established a significant positive effect on participants with longer participation on consumption expenditure, income and credit worthiness.

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Table 1

Summery Statistics of important variable: Comparison between Participant and non-participant

Description of variable	*Participant (P)*		*In voluntary Non-participant (INP)*		*Std. Error of mean diff. of P & INP*	*Voluntary Non-Participant (VNP)*	
	Mean	*Std. Dev*	*Mean*	*Std. Dev*		*Mean*	*Std. Dev*
Per-capita household expenditure	663.25	361.54	738.27	491.85	(31.19)**	1274.93	1059.03
Per-capita monthly income	625.41	583.52	768.36	974.6	(60.25)**	1996.3	2191.61
Per-capita monthly income (after NREGS income)	559.67	584.52	768.36	974.6	(60.26)***	1996.3	2191.61
Per- capita Monthly food exp.	440.69	197.89	484.99	326.7	(20.22)**	605.87	340.18
Per-capita Monthly non-food exp.	57.45	112.25	75.23	96.74	(6.77)***	173.05	228.82
Gross Monthly Credit	517.6	1272.9	869.4	2292.0	(140.69)**	1903.9	4966.8
Annual Savings	3221.8	19203.36	2935.44	11203.2	(913.12)	40605.6	106719
Main occupation days	254.54	267.65	298.34	201.33	(14.74)**	372.98	258.17
Main occupation income	23696	38172.57	37162.9	62370.6	(3864.9)***	105372.7	140469
Subsidiary occupation days	74.96	94.90	58.63	86.38	(5.95)***	33.3	71.16
Subsidiary occupation income	5531.2	7653.61	5362.17	9264.7	(598.74)	4411	10896.96
Non-NREGS days of employment	322.9	201.37	355.58	199.03	(13.42)**	401.03	244.328
Income from Non-NREGS days of employment	28997	38826.97	42477	63409.5	(3929.5)***	110874.8	142060.9
NREGS days of employment	32.09	25.75	0	0	(-)	0	0
Income from NREGS days of employment	3516.2	3131.885	0	0	(-)	0	0
Wage rate in NREGS	105.40	24.52	0	0	(-)	0	0
Open market unskilled wage rate	85.50	22.55	87.37	24.19	(1.50)	88.96	58.44
Age of the head of the household	47.56	12.44	49.06	13.95	(0.91)	53.07	13.39
Landholding (in acre)	0.6679	1.15	0.6881	1.12	(0.076)	1.27	1.74
Value of live stock index (based on PCA)	0.0648	0.072	0.666	0.10	(0.006)	0.0596	0.077
% of male headed household	88	0.3175	89	0.313	(0.021)	85	0.360
% of female headed household	12	0.3175	11	0.313	(0.021)	15	0.360
% of household with illiterate head	46.5	0.499	37.8	0.485	(0.033)**	14.86	0.356
% of - with primary educated head	27.5	0.446	24	0.428	(0.029)	11.89	0.324
% of - with upper primary educated head	14	0.3481	18.2	0.386	(0.025)	16.73	0.373
% of - with Secondary educated head	7.5	0.264	9.9	0.3	(0.0196)	20.82	0.406
% of - with higher secondary educated head	1.7	0.1311	5.5	0.228	(0.014)***	8.18	0.274
% of - with 12+ educated head	2.5	0.1566	4.6	0.206	(0.0132)	27.52	0.447
% of General (Bramhin) household	2	0.1426	2.4	0.153	(0.010)	14.51	0.352
% of General Household (non-Bramhin)	37.8	0.4851	49.48	0.5	(0.033)***	62.45	0.485
% of OBC household	4.8	0.2140	10.31	0.304	(0.019)***	7.07	0.256
% of SC household	50.27	0.5	34.71	0.476	(0.0325)***	14.86	0.356
% of ST household	5	0.218	3.1	0.173	(0.0124)	1.11	0.105
% of Hindu household	81.2	0.39	78.7	0.41	(0.027)	82.5	0.380
% of Muslim Household	18.8	0.39	21.3	0.41	(0.027)	17.5	0.380
% of *"Political"* Household	18.58	-	19.24	-	-	8.92	-
% of *"Apolitical"* Household	81.42	-	80.76	-	-	91.08	-
No of observation in pooled data	915		291		-	269	

Source: Our primary survey between 2009 and 2012

Table 2

Mean difference of the main variables by the binary classification "Political" after PSM

Variables	Mean		|Difference|	|t|
	"Political=1"	**"Political=0"**		
CD (Cumulative Days of NREGS Participation)	**137.96**	**86.61**	**51.34**	**(9.61)*** **
D (Current days of participation in NREGS)	**32.36**	**24.07**	**8.29**	**(4.14)** **
Landholding in acre	0.643	0.597	0.046	0.55
mpce (Monthly per-capita consumption expenditure)	644.81	660.9	16.08	0.59
pcmfe (per-capita monthly food expenditure)	443.07	439.89	3.18	0.19
Pcmnfe (per-capita monthly non-food expenditure)	55.39	57.25	1.86	0.23
Gross volume annual credit	6058.75	6681.00	622.25	0.52
mpi_nregp (monthly per-capita income adjusted after nregp income)	491.13	560.19	69.06	1.83*
No of non-nregp days of employment	333.59	329.16	4.43	0.29
Total size of the sample (=1050)	216	834		

Source: *Our primary survey between 2009 and 2012*; Key results are shown in bold.

Table 3

NREGS Days of Participation-Consumption class & land holding- an exploration

MPCE Class	Number of HH	Average D	Average CD	Average Land holding (in acre)
0 – 350	129	26.11	98.86	0.3626
350 – 700	745	22.19	82.87	0.6147
700 – 1050	357	19.26	72.69	0.8847
1050 – 1400	118	14.65	51.87	1.1268
1400 – 1750	53	8.37	33.16	1.4926
1750 – 2100	22	9.68	39.45	1.2899
2100 – 2450	13	6.76	25.07	1.7104
2450 – 2800	10	2	11.1	1.6390
2800 – 3150	9	2.11	16.77	2.9344
3150 – above	19	4.21	5.78	2.0250
Total	1475	19.91	74.49	0.7827
Total (if D>0)	915	32.09	107.34	0.6679

Source: Based on Field survey: 2009-2012.

Table 4

Effect of NREGS participation on household consumption expenditure, income and credit

	Case (A) Log of real Monthly per-capita consumption exp.				Case (B) Log of real Monthly food exp.				Case (C) Log of real Monthly non-food exp.				Case (D) Log of real Monthly per-capita income adjusted after NREGS earnings				Case (E) log of real value of Gross Volume of Monthly Credit			
	(1) Fixed Effect	(2) Fixed Effect with PSM	(3) Fixed Effect-IV with PSM		(1) Fixed Effect	(2) Fixed Effect with PSM	(3) Fixed Effect-IV with PSM		(1) Fixed Effect	(2) Fixed Effect with PSM	(3) Fixed Effect-IV with PSM		(1) Fixed Effect	(2) Fixed Effect with PSM	(3) Fixed Effect-IV with PSM		(1) Fixed Effect	(2) Fixed Effect with PSM	(3) Fixed Effect-IV with PSM	
			a	b			a	b			a	b			a	B			a	b
Instruments	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Regime_change	×	×	✓	✓	×	×	✓	✓	×	×	✓	✓	×	×	✓	✓	×	×	✓	✓
Village_avgCD	×	×	✓	×	×	×	✓	×	×	×	✓	×	×	×	✓	×	×	×	✓	×
Selected Explanatory variable																				
CD (Cumulative Days)	**0.001**	**0.004**	**0.005**	**0.005**	**0.001**	**0.009**	**0.005**	**0.005**	**0**	**0**	**0.005**	**0.005**	**0**	**0.004**	**0.006**	**0.005**	**0.002**	**0.048**	**0.036**	**0.034**
	[0.000]* **	**[0.002]** **	**[0.002]*** **	**[0.002]*** **	**[0.001]* **	**[0.005]** **	**[0.002]*** **	**[0.002]** **	**[0.000]**	**[0.001]**	**[0.003]**	**[0.003]**	**[0.000]**	**[0.002]* **	**[0.002]*** *	**[0.002**]**	**[0.001]** **	**[0.018]** *	**[0.017]** **	**[0.17]****
Land Holding	0.048	0.045	0.057	0.057	0.108	0.033	0.050	0.049	0.033	0.119	0.131	0.131	0.118	0.155	0.170	0.169	-0.158	-0.153	-0.032	-0.037
	[0.016]** *	[0.019]** *	[0.023]** *	[0.023]** *	[0.036]** **	[0.019]** *	[0.018]** **	[0.018]** **	[0.016]** *	[0.046]** **	[0.042]** **	[0.041]** **	[0.022]** **	[0.025]** **	[0.027]*** *	[0.027]***	[0.128]	[0.158]	[0.142]	[0.141]
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1475	1050	1050	1050	1475	1050	1050	1050	1475	1050	1050	1050	1475	1050	1050	1050	1475	1050	1050	1050
Number of Cluster	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
No. of excluded instruments	-	-	2	1	-	-	2	1	-	-	2	1	-	-	2	1	-	-	2	1
R^2	0.12	0.146	-	-	0.125	0.121	-	-	0.102	0.145	-	-	0.179	0.224	-	-	0.105	0.108	-	-
F (Joint significance)	7.223	6.495	11.90	12.07	7.597	5.45	4.25	4.28	6.061	6.799	12.71	12.75	11.588	10.91	9.51	9.75	6.25	4.62	2.79	2.83
F (Weak identification test/ test for excluded Instruments)	-	-	12.19	23.59	-	-	12.19	23.59			12.19	23.59			12.19	23.59			12.19	23.59
Over identification test (p-value)	-	-	0.3455	-	-	-	0.2956	-	-	-	0.2477	-	-	-	0.2400	-	-	-	0.2440	-
Under identification test (p-value)	-	-	0.000	0.000	-	-	0.000	0.000	-	-	0.000	0.000	-	-	0.000	0.000	-	-	0.000	0.000

Note: Standard errors in brackets* p<0.10, ** p<0.05, *** p<0.01. Volume of Gross credit in a month (in real terms)here refers to gross monthly amount of credit accumulated by household for procuring daily subsistence items (food & non-food like rice, wheat, cooking oil, spices, vegetables, soap, dress material, shoes etc. from local grocery) in a month. -Key results are shown in bold.

Table 5

Effect of NREGS participation on Variability of consumption and Income -OLS and IV

	OLS estimation after collapsing the data				IV estimation after collapsing the data			
Covariates as mean value	**SD of monthly per-capita consumption exp.**	**SD of Monthly food exp.**	**SD of Monthly non-food exp.**	**SD of Monthly per-capita income adjusted after NREGS earnings**	**SD of monthly per-capita consumption exp.**	**SD of Monthlyper-capitafood exp.**	**SD of Monthly per-capita non-food exp.**	**SD of mpi adjusted after NREGS earnings**
(mean) CD	**-0.64**	**-1.93**	**-0.779**	**-0.516**	**-1.514**	**-2.26**	**-0.781**	**-1.938**
	[0.283]**	**[0.949]****	**[0.267]*****	**[0.342]**	**[0.744]****	**[1.227]****	**[0.711]**	**[1.025]****
(mean) landholding	38.81	156.53	63.82	138.98	31.94	153.95	63.80	127.79
	[25.97]	[69.75]**	[41.53]	[76.65]*	[25.87]	[65.50]**	[41.44]	[70.92]*
(mean) Non-nregp days	0.192	0.855	0.359	0.533	0.161	0.843	0.359	0.483
	[0.175]	[0.366]**	[0.239]	[0.302]*	[0.165]	[0.358]**	[0.227]	[0.29]*
Observations	500	500	500	500	500	500	500	500
Cluster	53	53	53	53	53	53	53	53
R^2	0.267	0.288	0.343	0.297	-	-	-	-
F (Joint Significance)	67.84	11.48	10.17	51.13	48.49	10.45	10.18	39.99
No. of Instrument					2	2	2	2
F (Excluded Instrument)					110.72	110.72	110.72	110.72
Sargan test (p-value)	-	-	-	-	0.1882	0.5822	0.1159	0.1171
Under identification test (p-value)	-	-	-	-	0.0000	0.0000	0.0000	0.0000

Standard errors in brackets; * p<0.10, ** p<0.05, *** p<0.01; Key results are shown in bold.

Figure1. Bilateral lender-borrower game

		Lender	
		L	NL
Participant	R	$V_L(1-r), (V_L)r$	*0,0*
	NR	$V_L, -V_L$	*0,0*

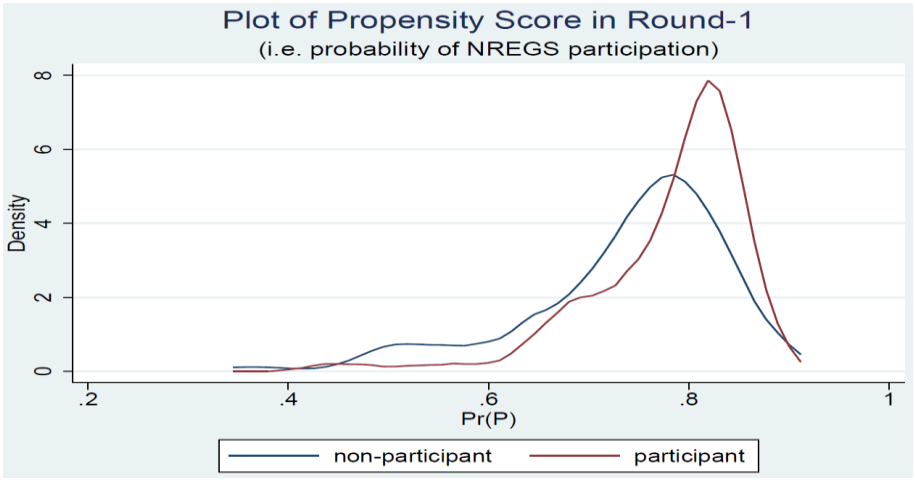
Figure 2. Bilateral Patron-client game

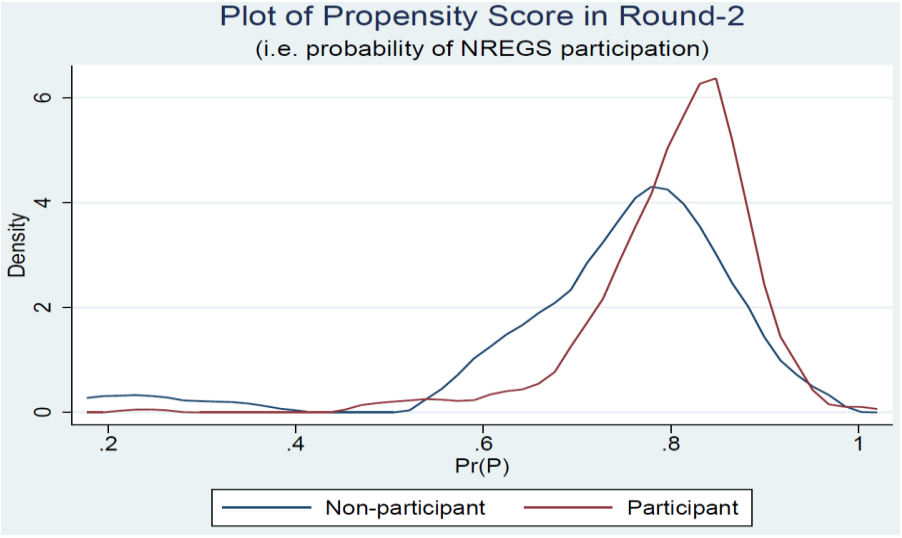
		Politician	
		P	NP
Participant	S	$(V_N-1), (V_P-1)$	$-1, V_P$
	NS	$V_N, \ -1$	*0,0*

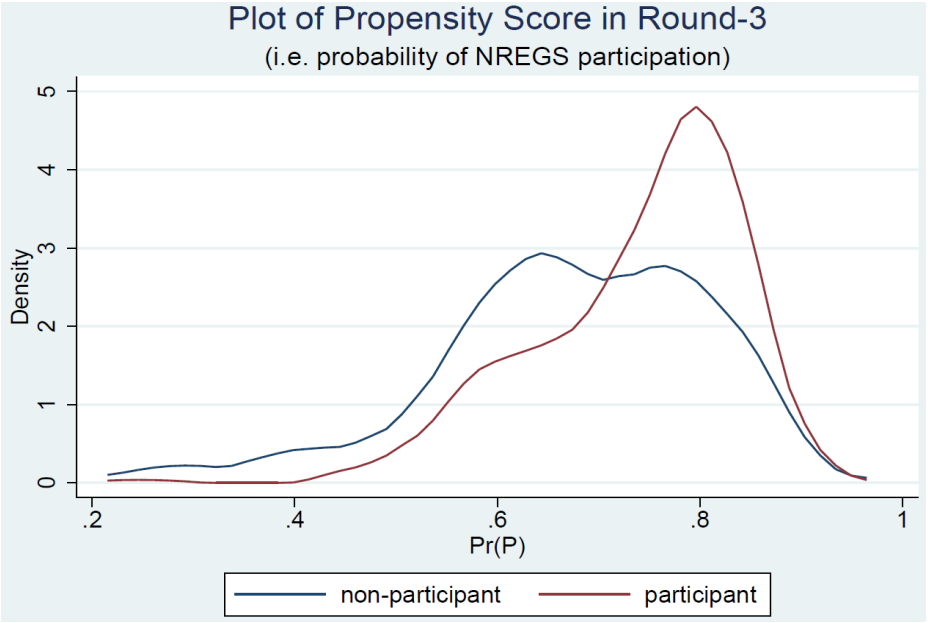
Appendix 1: Definition and illustration of the variables used in the analysis

Dependent Variable	Definition/Illustration
lnmpce	Log of real value of Per-capita monthly consumption expenditure. This includes food and non-food both
lnpmfe	Log of Per-capita monthly food expenditure in real terms.
lnpmnfe	Log of Per-capita monthly non-food expenditure in real terms.
lngmc	Log of Gross monthly credit in real terms. Here '*gmc'* refers to gross average monthly amount of credit accumulated by households for daily subsistence items (food & non-food). We have accumulated different credit amount of the household on daily subsistence till the time of survey during the last one year and then divided it by 12 to derive the monthly equivalent.
lnsavings	Log of annual savings in real terms
lnmpi_nregs	Log of Monthly per-capita income adjusted after NREGS earnings in real terms
sd_mpce	Standard Deviation of Per-capita monthly consumption expenditure in real terms. This includes food and non-food both. This is used to capture the variability of consumption expenditure.
sd_pmfe	Standard deviation of Per-capita monthly food expenditure in real terms.
sd_pmnfe	Standard deviation of Per-capita monthly non-food expenditure in real terms.
sd_gmc	Standard deviation of Gross annual credit in real terms
sd_savings	Standard deviation of annual savings.
Explanatory variables	
CD	Cumulative days of NREGS participation
agehead	Age of head of household
agesqr	Square of Age of head of household
edu_head_hh=1	Education of the head of household= Illiterate (i.e. can't read or write)
edu_head_hh=2	Education of the head of household= Upper Primary level (i.e. up to class-VIII)
edu_head_hh=3	Education of the head of household= Secondary level (up to class-X)
edu_head_hh=4	Education of the head of household= Higher Secondary level (i.e. up class-XII)
edu_head_hh=5	Education of the head of household= Higher Secondary level (i.e. up class-XII)
edu_head_hh=6	Education of the head of household= Above Higher secondary (i.e. above class-XII)
hhsize	Household size i.e. number member of household
Hindu	If the religion of household is Hindu
Muslim	If the religion of household is Muslim
Sexhead	Sex of the head of the household. It is a dummy variable with 1(male) & 0 (female)
socilgroup=General(B)	If the caste of the household is general Brahmin (i.e. highest caste)
socilgroup=General(NB)	If the caste of the household is general Non-Brahmin
socilgroup=OBC	If the caste of the household is Other Backward Caste
socilgroup=SC	If the caste of the household is Schedule Caste
Socilgroup=ST	If the caste of the household is Schedule Tribe
landholding	Land holding of the household in acre
non_nregp_days	Non NREGS days of employment in a year that a household got
Unemployed_ph	Per-head Days of unemployment in a year
relwage	Ratio of NREGS wage to open market wage faced by each household
political	'Political' is a dummy variable and when Political=1 implies member/s from the household took part in the election campaign/s in favour of the GP level ruling party. We treat household with political==1 as Political household and political==0 as apolitical.
wave=1	1st round of survey i.e. the year 2009
wave=2	2nd round of survey i.e. the year 2010
wave=3	3rd round of survey i.e. the year 2012
R1 to R13	Region 1(i.e. Gram Panchayat-1) to Region 13 (Gram Panchayat13)
Regime_change (IV-1)	1st Instrumental variable which captures whether GP level dominant party changes over the election years. *Regime_change*=1 if the household lives a GP where regime changes in terms of dominant party position over the elections years and *regime_change*=0 otherwise
Village_avgCD (IV-2)	2nd Instrumental variable i.e. village-level average value of Cumulative days of NREGS. To get the value, we summed up all household's CD within that village excluding the 'i'th household under consideration, and then we divide that sum by the number of NREGS participants within that village minus 1.

Appendix 2: Plot of Propensity Score for (involuntary) Non-participants and Participants







Appendix 3: Construction of the Instrumental variable *regime_change*

One of the instrumental variables which we used in the "*Fixed effect IV model after PSM*" specification is *regime_change.* Here we are illustrating the construction of this variable. This *regime_change* variable is a dummy variable which captures whether there is a change in the GP level dominant party (as defined in foot note 12) position from elections year to election year around our survey time periods. In the following table-A, we are presenting the GP level dominant party position after different elections in our 13 surveyed GPs. Respective elections and election years are mentioned in the table. This table is constructed on the basis of the election booth wise results available in the office of the District Election Returning Officer, Birbhum District, Government of West Bengal for parliamentary and assembly election and from respective GPs for Panchayat elections.

Appendix Table A: **GP level dominant party position after different election years**

Name of the GP	After 2003 Local Panchayat Election	After 2008 Local Panchayat Election	After 2009 National Parliamentary Election	After 2011 State Assembly Election	After 2013 Local Panchayat Election
Bahiri-Panchsowa	1	1	1	2	2
Bajitpur	1	3	2	2	2
Barrah	1	1	1	2	2
Gonpur	1	2	2	2	2
Harisara	1	1	2	1	2
Joydeb Kenduli	1	1	1	2	2
Khoyrasole	1	1	1	2	1
Kundala	3	1	1	2	4
Mollarpur II	1	1	3	2	2
Panrui	1	2	2	2	2
Parulia	1	1	2	1	2
Rupuspur	1	1	1	1	2
Ulkunda	3	2	2	2	2

Source: Office of the District Election Returning Officer, Birbhum District, Government of West Bengal and our primary survey data from respective GPs

Note: Code: Communist Party of India Marxist (CPIM):1, Trino Mool Congress (TMC): 2, Indian National Congress (INC):3, Bharatiya Janata Party (BJP):4,

Using the above Appendix Table A, we construct the following table B which essentially portrays our *regime_change* variable. Table B shows the value of *regime_change* variable for each of the respective GPs under our study. We use 4 election years (2008, 2009, 2011, 2013) to construct table B. When we run our first round of survey in 2009, we compared GP wise dominant party position based on election year 2008 and 2009. If it changes between

2008 and 2009 for a particular GP then that GP assumes the value of regime_change as 1 and 0 otherwise. Similarly during our second round of survey in 2010 we used two election years as 2009 and 2011 and accordingly constructed the value of regime_change. Finally for our final round of survey in 2012 we used two election years as 2011 and 2013.

Eventually we get enough variation in the values of the *regime_change* variable over the survey years. Under a normal scenario, GP level dominant party position does not change so frequently but the period under consideration in our study (2009 to 20012) has almost matched with the period (2008 to 2013) of gradual political regime change from left political regime to right populist TMC regime and greater political turmoil in West Bengal politics. In that sense we can claim that our Birbhum sample of GPs were a fair representation of the whole state of West Bengal.

Appendix Table B: GP wise value of the *regime_change* variable.

Name of the GP	If Regime_changed in between 2008 & 2009, reflected in round-1 (2009) survey	If Regime_changed in between 2009 & 2011, reflected in round-2 (2010) survey	If Regime_changed in between 2011 & 2013, reflected in round-3 (2012) survey
Bahiri-Panchsowa	0	1	0
Bajitpur	1	0	0
Barrah	0	1	0
Gonpur	0	0	0
Harisara	1	1	1
Joydeb Kenduli	0	1	0
Khoyrasole	0	1	1
Kundala	0	1	1
Mollarpur II	1	1	0
Panrui	0	0	0
Parulia	1	1	1
Rupuspur	0	0	1
Ulkunda	0	0	0

Source: Author's calculation using Appendix Table A.

Since our unit of study is the household therefore for a household regime_change=1 implies that the household resides in a regime change GP in terms of change of dominant party position of the GP.

Appendix 4: Mean difference of the main variables by the "regime_change" dummy (after PSM)

Variables	Mean		|Difference|	|t| from t-stat
	Regime_change=1	Regime_change=0		
CD (Cumulative Days of NREGS Participation)	**108.2473**	**80.09734**	**28.14992**	**6.2156*****
D (Current period days of participation in NREGS)	28.17425	22.07506	6.099194	3.6711***
Real monthly per-capita consumption expenditure.	663.3112	648.7683	14.54284	0.6550
Real per-capita monthly food expenditure	444.7901	434.0102	10.77988	0.7951
Real per-capita monthly non-food expenditure	53.43012	62.17925	8.749132	1.3112
Gross volume of annual credit	6891.649	6030.671	860.9789	0.8764
Monthly per-capita income adjusted after NREGS income	531.5125	568.312	36.79952	1.1811
Age of the head of the household	46.80691	47.87893	1.072027	1.3720
Sex of the head of the household as male	0.9026688	0.874092	0.0285768	1.4541
Non NREGS days in total by the household	339.6766	315.2567	24.41995	1.9632*
Ratio of NREGS wage to open market wage	1.263897	1.259923	0.0039736	0.2766
Percentage of Political household	21.19309	19.61259	1.5805	0.6184
Percentage of SC	48.03768	47.69976	0.0033792	0.1070
Percentage of ST	5.33752	3.63196	1.70556	1.2797
Percentage of Hindu	78.96389	81.59806	2.63417	1.0419
Percentage of Muslim	21.03611	18.40194	2.63417	1.0419
Land holding (in acre)	0.64841	0.5415789	0.1068311	1.5597
Household Size	4.530612	4.271186	0.2594258	2.3289**
RHS Score	33.35667	34	0.643326	1.0325
Total sample of HH (=1050)	637	413		

Source: Author's calculation. Standard errors in brackets; * p<0.10, ** p<0.05, *** p<0.01; Key results are shown in bold.

Appendix 5: Effect of Cumulative days of NREGS participation - Fixed Effects-IV

1st Stage regression result

	Case a FE_PSM_IV (with 2 IV)	Case b FE_PSM_IV (with1 IV)
	Cumulative days of NREGS Participation (CD)	Cumulative days of NREGS Participation (CD)
Age of Head of HH	3.09	3.08
	[1.47]**	[1.47]**
Agesqr	-0.026	-0.03
	[0.016]*	[0.016]
edu_head_hh== 2.0000	2.82	2.57
	[4.35]	[4.32]
edu_head_hh== 3.0000	7.96	7.82
	[6.94]	[6.95]
edu_head_hh== 4.0000	1.93	1.72
	[8.87]	[8.89]
edu_head_hh== 5.0000	-1.17	-1.29
	[17.7]	[17.75]
edu_head_hh== 6.0000	3.74	3.39
	[15.71]	[15.76]
HH size	4.90	4.87
	[2.55]*	[2.55]*
sexhead== 1.0000 (Male)	-0.76	-0.725

	[10.79]	[10.76]
Land Holding	-3.33	-3.36
	[2.04]*	[2.05]*
Livestock_Index_PCA	-42.46	-41.80
	[22.05]*	[21.89]*
Total_Non-NREGP_days_last 1 yr.	-0.0051	-0.0052
	[0.011]	[0.011]
days of unemployment per-head	0.009	0.009
	[0.022]	[0.022]
ratio of NREGS wage to open mkt. wage	-2.58	-2.42
	[6.08]	[6.03]
Political	**13.27**	**13.43**
	[5.12]**	**[5.08]*****
wave== 2.0000	29.75	29.73
	[7.37]***	[7.37]***
wave== 3.0000	64.97	64.95
	[7.57]***	[7.57]***
Z1 (1st Instrumental variable) regime_change	**17.29**	**17.35**
	[3.54]***	**[3.57]*****
Z2 (2nd Instrumental Variable) Village_avegCD	**0.497**	**-**
	[0.305]*	**-**
Observations	1050	1050
Number of Cluster	53	53
Number of Instrument	2	1
Overall R^2	0.4535	0.4533
F (test of excluded instrument)/weak identification test	12.19	23.59
Under Identification test P value	0.0002	0.0001

Standard errors in brackets; * p<0.10, ** p<0.05, *** p<0.01

2nd Stage regression result

Explanatory Variables	Case a With 2 IVs					Case b With 1 IV				
	lnmpce	lnpcmfe	lnpcmnfe	lnmpi_nregp	lngmc	lnmpce	lnpcmfe	lnpcmnfe	lnmpi_nregp	lngmc
CD	0.005	0.005	0.005	0.005	0.036	0.005	0.005	0.005	0.005	0.034
	[0.002]***	[0.002]***	[0.003]	[0.002]***	[0.017]**	[0.002]***	[0.002]**	[0.003]	[0.002]**	[0.017]**
Age of Head of HH	-0.013	-0.020	-0.031	-0.021	0.082	-0.013	-0.019	-0.030	-0.020	0.086
	[0.016]	[0.012]	[0.030]	[0.020]	[0.146]	[0.016]	[0.012]	[0.030]	[0.020]	[0.146]
Agesqr	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	0.000	0.000	-0.001
	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]
edu_head_hh== 2.0000	-0.009	-0.040	0.007	-0.011	0.327	-0.009	-0.040	0.007	-0.011	0.328
	[0.035]	[0.037]	[0.099]	[0.059]	[0.277]	[0.035]	[0.036]	[0.099]	[0.058]	[0.273]
edu_head_hh== 3.0000	-0.006	-0.045	-0.014	-0.007	0.830	-0.006	-0.044	-0.012	-0.005	0.841
	[0.052]	[0.056]	[0.149]	[0.085]	[0.472]*	[0.052]	[0.055]	[0.149]	[0.084]	[0.465]*
edu_head_hh== 4.0000	0.025	0.045	0.178	0.048	0.122	0.025	0.044	0.177	0.048	0.119
	[0.086]	[0.102]	[0.215]	[0.118]	[0.930]	[0.086]	[0.101]	[0.215]	[0.117]	[0.921]
edu_head_hh== 5.0000	-0.019	0.058	-0.305	0.017	0.981	-0.019	0.058	-0.305	0.017	0.981
	[0.121]	[0.122]	[0.401]	[0.189]	[1.623]	[0.120]	[0.120]	[0.401]	[0.188]	[1.620]
edu_head_hh== 6.0000	0.394	0.053	-0.005	0.377	0.597	0.393	0.052	-0.006	0.375	0.587
	[0.090]***	[0.150]	[0.431]	[0.228]*	[2.224]	[0.090]***	[0.150]	[0.432]	[0.224]*	[2.237]
HH size	-0.122	-0.118	-0.171	-0.140	0.011	-0.121	-0.117	-0.170	-0.138	0.020
	[0.020]***	[0.024]***	[0.032]***	[0.029]***	[0.169]	[0.020]***	[0.024]***	[0.032]***	[0.029]***	[0.166]
sexhead== 1.0000 (Male)	-0.025	-0.006	0.284	-0.010	-0.184	-0.024	-0.005	0.285	-0.009	-0.179
	[0.129]	[0.128]	[0.253]	[0.170]	[0.849]	[0.128]	[0.128]	[0.253]	[0.171]	[0.839]
Land Holding	0.058	0.050	0.131	0.170	-0.032	0.057	0.049	0.131	0.169	-0.037
	[0.023]**	[0.019]***	[0.042]***	[0.027]***	[0.142]	[0.023]**	[0.019]***	[0.041]***	[0.027]***	[0.142]
Livestock_Index_PCA	0.218	0.104	0.071	0.360	2.281	0.215	0.098	0.065	0.349	2.227
	[0.234]	[0.341]	[0.487]	[0.346]	[2.128]	[0.234]	[0.339]	[0.487]	[0.347]	[2.119]
Total_Non-NREGP_days_last 1 yr.	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.001
	[0.000]***	[0.000]**	[0.000]**	[0.000]***	[0.001]	[0.000]***	[0.000]**	[0.000]**	[0.000]***	[0.001]
days of unemployment per-head	-0.000	-0.000	-0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.000	0.000
	[0.000]*	[0.000]*	[0.000]	[0.000]**	[0.001]	[0.000]*	[0.000]*	[0.000]	[0.000]**	[0.001]
ratio of NREGS wage to open mkt wage	-0.130	-0.182	0.084	-0.151	0.260	-0.130	-0.182	0.083	-0.152	0.255
	[0.087]	[0.098]*	[0.121]	[0.098]	[0.605]	[0.087]	[0.098]*	[0.121]	[0.097]	[0.602]
Political	-0.137	-0.132	-0.016	-0.143	0.190	-0.136	-0.130	-0.013	-0.138	0.213
	[0.046]***	[0.054]**	[0.117]	[0.056]**	[0.365]	[0.046]***	[0.053]**	[0.117]	[0.056]**	[0.356]
wave== 2.0000	-0.179	-0.174	-0.361	-0.256	-1.133	-0.177	-0.169	-0.356	-0.247	-1.087
	[0.063]***	[0.070]**	[0.168]**	[0.085]***	[0.650]*	[0.063]***	[0.070]**	[0.168]**	[0.087]***	[0.645]*
wave== 3.0000	-0.176	-0.226	0.011	-0.424	-3.957	-0.170	-0.214	0.023	-0.403	-3.853
	[0.134]	[0.141]	[0.273]	[0.152]***	[1.275]***	[0.136]	[0.141]	[0.276]	[0.156]***	[1.265]***
Observations	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050
Number of Cluster	53	53	53	53	53	53	53	53	53	53
F (after second stage)	11.901	4.255	12.713	9.512	2.794	12.071	4.284	12.754	9.750	2.828
Number of group	350.000	350.000	350.000	350.000	350.000	350.000	350.000	350.000	350.000	350.000
Over identification test P value	0.3455	0.2956	0.2477	0.2400	0.2440	-	-	-	-	-

Standard errors in brackets; * p<0.10, ** p<0.05, *** p<0.01

NOTES

[1] The all-India head count poverty rate, based on US$1.25 a day, is 29.8% in 2009-10 (with a rural poverty rate of 33.8%, based on NSS 66th round). As per the census of 2011, India has more than 60% non-working population. Within the working population, most of them work in the agricultural sector and contribute less than 15% of national GDP.

[2] Annual outlay of NREGS has expanded from 0.31% of GDP ($ 2.5 billion), covering 21 million households in 2006-7, to 1.29% of GDP ($8.91 billion) for 54.95 million households in 2011-12, and has then reduced to 0.70% of GDP ($6.25 billion), covering 47.48 million households in 2013-14 (www.nrega.nic.in, section NREGA Statistics National Overview).

[3] See more detailed discussions about salient features as well as inherent problems of NREGS for Ambasta et al. (2008), Dey and Bedi (2010), and Shankar and Gaiha (2013).

[4] Households are classified into four categories in terms of whether they hold a Job Card, whether they applied for the job, and whether they got the job. That is, there are households without any job card (Category A), those with a job card who did not apply for a job (B), those with a job card who applied for a job but did not get a job (C), and those with a job card who applied for a job and got a job (D). Now, in the context of the NREGS program, Category D households can be treated as the '*Participants*' and categories A and B are '*Voluntary non-participants'* in the program, as they intended not to participate in the program. Category C households are *'Involuntary non-participants'* as they opted for the program but did not end up receiving the jobs.

[5]This is the sum of the total monetary volume of average monthly transactions (for monthly food and non-food items) which the households made on credit from local groceries or tiny shops. This is different from debt because this captures items purchased on credit and repaid

once the household earns income. We collected the gross monthly volume of credited transactions, not the net amount of credit outstanding at the end of each month after repaying a portion of that. During our survey we managed to trace this credited transaction data from a credit register (called *BAKIR KHATA*), available with most of the households and a duplicate copy with local grocery/shop owners.

[6] The descriptions and definitions of all the variables are found in Appendix S1.

[7] All outcome variables are in real terms (i.e. adjusted with consumer price index) and in logarithm.

[8] A question arises as to whether the use of *CD* as a main explanatory variable is a proper specification. As robustness checks, we have tried *D* (current days of participation), *LD* (lagged days of participation) and *LCD* (lagged cumulative days participation) as alternatives. The coefficient estimates for *D* are mostly negative and statistically significant in a few cases such as, the case where a dependent variable is monthly food consumption. This may simply suggest a good targeting performance of the program, that is, the effect of the poor households' self-selection into the program may be dominant or their participation just in the current period is insufficient for alleviating poverty in the same period. The coefficient estimates for *LD* are mostly insignificant, as cumulative effects are not captured in this case. The results for *LCD* are mostly similar to those for *CD*. As our primary focus is on the effect of sustained NREGS participation on poverty, only the results for *CD* are presented. The results for *D*, *LD* and *LCD* will be provided on request.

[9] Household-level variables which have been used to estimate the propensity score include: landholding, value of livestock index, age of head of household, age square, household size, head's education dummies, caste dummies, sex of head of household, non-NREGS days of employment, average days of unemployment per head, NREGS to non-NREGS wage ratio and wave dummies.

[10] The region of common support after estimating the propensity score for participants and non-participants in 3 subsequent rounds are [0.4211, 0.8933], [0.4203, 0.9999], [0.24613, 0.9334] respectively and distributions of two samples in the common support region are reasonably dense. There are 1050 observations left all together in 3 rounds within the common support region after propensity score match.

[11] Given that we use the panel data, the first stage IV regression at least partly takes account of non-random programme placement or rolling-out which reflects village-level heterogeneity by including a few village-level variables.

[12] A dominant party is defined as the party which won in the majority of the election booths within the GP in respective elections.

[13] We have clustered the standard error at the village level as some variables are likely to be highly correlated within the GPs.

[14] Though this is a demand driven programme, village-level budget allocation of fund heavily depends on the ward-level politician's own discretion and his relation with the village council president. See Dutta et al. (2014) for the evidence of rationing and politically-biased allocations of NREGS jobs in Bihar and Das (2015) for the evidence of political clientilism in West Bengal.

[15] Increase in the availability of NREGS work outside the household i.e. increase in the provision of NREGS jobs in the village may have a general equilibrium effect on consumption or credit of the non-participating households, but this is an indirect and long-term effect not being realised in the short term.

[16] Sargan test statistics show that over-identifying restrictions are valid in all the cases.

[17] *Regime_change* and *village_avgCD* appear to be the best instruments given the data limitations, but the results are robust to other choices of instruments. For instance, if a dummy variable on whether a household member attended ward council meeting (*Sansad*

meeting) is used instead of *regime_change,* similar results are obtained. It has been observed that those who attend *Sansad meeting* are not self-selected or politically motivated as the meeting is well advertised and open to anybody in the village. The instruments are validated by specification tests. The results are robust if we replace it by the variable on whether a household resides within one kilometre distance from GP office from which participants have access to various information on NREGS. The results will be provided on request.

[18] A full set of econometric results of FE-IV-PSM model, including its first stage regression result, are shown in Appendix 5. Here all the instruments are statistically significant and instruments have been validated.

[19] Such anecdotes have been frequently featured in local newspapers and have motivated our study.

[20] This typical scenario can also be discussed in light of the wider literature on credit market and imperfect information in the context of the developing countries (e.g. Hoff and Stiglitz 1990).

[21] The main program implementing agency (i.e. PIA) for NREGS is called GP, or rural municipality or village council. There are normally 10 to 15 wards or village level constituencies within each GP, and generally one political representative is chosen by electoral vote by the residents of the ward as their representative in every 5 years. The politician is responsible for assigning NREGS work at the village level. NREGS participant is one of the voters of this ward and can choose his or her representative. One ward (called *Gram Sansad*) is a village which is a habitation of a small number of households, ranging from 200 to 300. The lender in this field setting is typically a local grocery owner who could provide NREGS participants with small loans for their daily purchase of food and non-food.

[22] Our model draws upon a 'community enforcement' game (Kandori 1992; Takahashi 2010) in which any mutually-beneficial outcome of a stage game can be sustained as a subgame-perfect equilibrium in an infinitely-repeated game between the same set of players. Folk theorem in the repeated game literature (Rubintein 1979; Fudenberg and Maskin 1986) provides a formal model of personal enforcement showing that any mutually beneficial outcome can be sustained as subgame-perfect equilibrium if the same set of players frequently plays the same stage game infinitely. In our setting, the mutually beneficial outcome is for three players simultaneously, instead of two players, and it refers to equilibrium where access of credited transaction, access of NREGS job and access of political support are taking place at same point of time (e.g. Goldston, 2012; Besley and Coate, 1995).

[23] r can be a price mark-up or extra price margin included in the price of goods under credited transaction from the local grocery. Alternatively, it could represent a psychological cost of borrowing.

[24] The condition $r \succ \frac{1}{V_N}$ is likely to hold in a developing country context where the interest rate is relatively high and V_N (i.e. value of workfare programme) is also high as wages under workfare programmes are generally higher than the open market unskilled wages (e.g. Imbert and Papp, 2015).