E-governance, Accountability, and Leakage in Public Programs: Experimental Evidence from a Financial Management Reform in India

Banerjee, Duflo, Imbert, Mathew, Pande (Oct 2016)

Presented by: Vittoria Dicandia

December 11, 2018

The project in a nutshell

- Field experiment of (temporary) reform in within-state fund-flow of India's federal workfare program MGNREGS.

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- Evaluate impact of increased transparency on corruption
- Reform features:
    - linked fund flow to incurred expenditures
    - reduced numbers of intermediaries involved in fund disbursement
- Findings:
    - lower fund leakage
    - no negative impact on real outcomes
    - no improvement in responding to villager needs

Relevant literature

- Implementation bottlenecks constrain effectiveness of social programs
- Empirical studies on corruption:
  - effects of info disclosure, increase in monitoring, monetary incentives [Ferraz and Finan, 2011]
  - effects of change in number of functionaries and jurisdictions [Burgess et al., 2012]
  - effects of reducing bureaucratic discretion [Duflo et al., 2011]
- other aspects of bureaucratic architecture are rarely studied!

The project's contribution

- Growing literature on administrative reforms in settings with limited state capacity [Bo et al. (2013), Duflo et. al (2013)]
- Recent works on use of information technology or e-governance
- Most related study: Muralidharan et al. (2014)
  - same program, but different reform in different state
  - focus on disbursement process rather than fund flow

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- Ability to use multiple data sources (including administrative data) and to exploit large scale experimental administrative reform

Background - Decentralized programs

- Involve transfer from higher level of government to local implementing body
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- Standard practice: cash-advance systems
  - communication is time-consuming with low quality infrastructure
  - delays in payments make programs not implementable
- Local authorities have power over transfers
  - slows the process down
  - increases rent-seeking

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- Local Gram Panchayat (GP) officials:
    - register beneficiaries
    - provide them work on local infrastructure projects
- largest social protection program in the world
- heterogeneity in implementation quality across states
- focus on Bihar, poor state with poor MGNREGS performance

Fiscal architecture

1. Tranche-wise transfers from central government to state
   - first based on anticipated demand and previous year
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Fiscal architecture

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   - funds move down the administrative hierarchy:
     state $\implies$ district $\implies$ block $\implies$ GP $\implies$ workers

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   - funds move down the administrative hierarchy:
     state $\implies$ district $\implies$ block $\implies$ GP $\implies$ workers
   - discretion in passing on funds
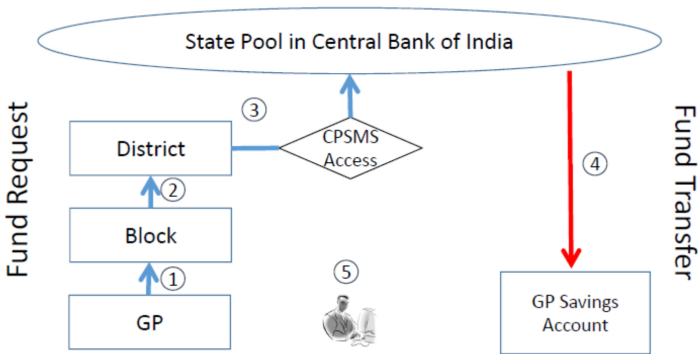   - some units lack funds, others accumulate idle amounts

Sample

- Selected 12 districts in the state State map
  - rural population of 33 million
  - more than 900 thousand MGNREGS workers

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  - rural population of 33 million
  - more than 900 thousand MGNREGS workers
- $\frac{1}{3}$ blocks per district selected for treatment
- 69 treatment and 126 control block
- Analysis from July 2011 till January 2014:
  - Pre-reform: 2011 - 2012
  - Reform: 2012 - 2013
  - Post Reform: 2013 - 2014

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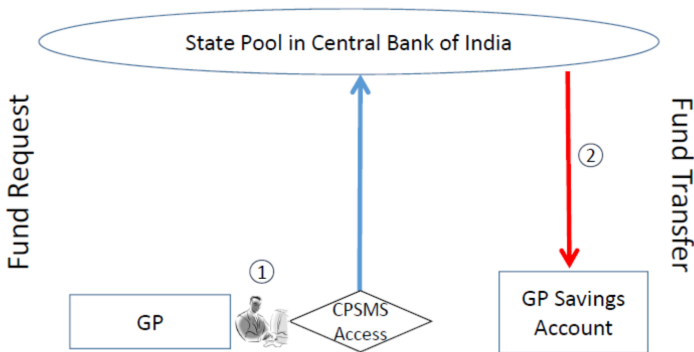# Pre - reform system (2011-2012)

Figure 1: MGNREGS Fund-flow in Control Blocks

Post - reform system (2012-2013)

Figure 2: MGNREGS Fund-flow in Treatment Blocks

Reform implementation

Unaffected elements:

- GP send checks and list of beneficiaries to local bank/post office which credits workers' accounts
- state made payments for materials through CPSMS with districts and blocks as intermediaries
- GP officials required to document jobs spells

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Implementation wasn't easy nor straightforward

1. lack of adequate IT infrastructure
2. government froze program, GP functionaries were on strike
3. banks slowed down payments process
4. ...

Status quo regime - Set up

- Official at tier i of administrative hierarchy:
  P (GP), B (block), D (district), S (state)

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  - exerting $\frac{1}{2}cs^2$ non-contractible non-pecuniary effort cost
  - with penalty $\pi^T s$ in expectation

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- B and D:
  - sign off on fund claim
  - commit ex-ante to price p_i for approving every rupee of funds skimmed by P

Status quo regime

- P chooses s to maximize for $i = B, D$:

$$(1 - \pi^T)s - p_i s - p_{-i} s - \frac{1}{2}cs^2$$

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$$Y^{iT}(\pi^T) = p_i s = \frac{(1 - \pi^T)^2}{9c}$$

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- P earns from skimming: Utility

$$Y^{PT}(\pi^T) = s(1 - 2p_i) = \frac{(1 - \pi^T)(1 + 2\pi^T)}{9c}$$

New regime - Case 1

1. We have $\pi^N > \pi^T$
2. P doesn't have technological capacity to unilaterally claim the money: **need to collude with** B

- D is cut out, i.e. $p_D = 0$
- Repeating steps as in the status quo regime:

$$Y^{BN}(\pi^N) = \frac{(1 - \pi^N)^2}{4c}$$

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and

$$Y^{PN}(\pi^N)\frac{(1-\pi^N)(1+2\pi^N)}{4c}$$

Comparison

$$Y^{BT} = \frac{(1 - \pi^T)^2}{9c} \quad vs. \quad Y^{BT} = \frac{(1 - \pi^N)^2}{4c}$$

$$Y^{PN} = \frac{(1 - \pi^T)(1 + 2\pi^T)}{9c} \quad vs. \quad Y^{PN} = \frac{(1 - \pi^N)(1 + 2\pi^N)}{4c}$$

2 countervalling effects:

- negative from increase in penalty from skimming
- positive from not having to pay D (decrease in denominator)

For corruption to decrease, increase in π must be very large in proportional terms

New regime - Case 2

1 $\pi^N > \pi^T$

2 D extracts rents with probability $\alpha < 1$

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Unrealistic: if $\alpha \longrightarrow 0$, $p_D \longrightarrow \infty$

$\implies P$ will pay large amounts out ot pocket whenever D has chance to extract rents

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- B now maximizes:

$$p_B \frac{1 - \pi^N - p_B - \alpha \bar{p}_D}{c}$$

- Repeating same procedure as before:

$$Y^{BN}(\pi^N, \alpha) = \frac{(1 - \pi^N - \alpha \bar{p}_D)^2}{4c}$$

New regime - Case 2, Realistic

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New regime - Case 2, Realistic

For $\pi^N < 1 - \alpha \bar{p}^D$:

- increase in π^N reduces skimming and earnings for B and P
- decrease in α increases all 3

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Who is affected the most?

$$\frac{Y^{BN}(\pi^N, \alpha)}{Y^{PN}(\pi^N, \alpha)} = \frac{1 - \alpha\bar{p}_D + \pi^N}{1 - \alpha\bar{p}_D - \pi^N}$$

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Ambiguous effect again! $\implies$ increase in transparency doesn't necessarily reduce corruption

Data sources

1 Daily financial database associated with CPSMS system

Financial database

- daily credits and debits of each GP savings account
- no distinction between material and labor expenses
- no identification of transfer recipients

Data sources

1 Daily financial database associated with CPSMS system
2 Public accessible electronic data collection system (nrega.nic.in)

nrega.nic.in

- category-wise expenditures at the aggregate fiscal year level:
    - unskilled labor
    - material
    - skilled labor
    - administrative expenses
- beneficiary details
    - who has worked in household
    - duration and dates of work
    - wages paid

Data sources

1 Daily financial database associated with CPSMS system
2 Public accessible electronic data collection system (nrega.nic.in)
3 Socio-Economic Caste Census (SECC)

SECC

Content:

- conducted in 2012, covers 16480 villages in 195 blocks
- include name and age of members of each household

Use:

- match villages with those in dataset 2
- match household names with job-cards in dataset 2

Possibility for errors, but no reason for consistent differences between treatment and control groups

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2 Public accessible electronic data collection system (nrega.nic.in)
3 Socio-Economic Caste Census (SECC)
4 Affidavit data on GP and block official assets

Affidavit data

Self-reported data on

- personal assets, both movable and immovable
- for all employees of GP and block official assets

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Caution needed but it's still a useful signal

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4 Affidavit data on GP and block official assets
5 Independent survey conducted by authors

Independent survey

Main feature:

- Conducted in May-July 2013
- randomly sampled 2 GP per block and 25 households per GP
- total of 10,036 in 390 GPs
- goal to measure participation, employment and payments in MGNREGS

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- total of 10,036 in 390 GPs
- goal to measure participation, employment and payments in MGNREGS

Caveats:

- Low participation in that period
- small sample size leads estimated effects to be imprecise

Randomization check

$$X_{pd} = \alpha + \beta T_p + \eta_d + \varepsilon_p$$

regress GP treatment dummy and district FE on vector of baseline
characteristics of GP p in district d
β: pre-treatment differences

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Randomization check

$$X_{pd} = \alpha + \beta T_p + \eta_d + \varepsilon_p$$

regress GP treatment dummy and district FE on vector of baseline characteristics of GP p in district d

β: pre-treatment differences

- no significant differences in Census and survey data
- 13% higher labor expenditure for treatment GP in public access database
- but spending was similar for CPSMS and no statistically significant difference in work days, workers or material exp
- conclude it's a reporting error Table 1

Financial data

$$Y_{pdt} = \alpha + \beta T_p + \eta_d + \varepsilon_{pt}$$

- Y_{pdt} are balances, expenditures and total debit data
- errors are clustered at block level
- no other controls included
- perform this analysis using both CPSMS and public data portal

Financial data - CPSMS

	Before	Set up	Intervention Period			After
	Sept 2011 - June 2012	July- August 2012	Sept-Dec 2012	Jan - Mar 2013	Whole Period	Apr 2013 - Jan 2014
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Total Debit from GP Accounts						
Treatment	-0.502	0.0472	-1.039***	-1.267***	-2.259***	-0.345
	(0.729)	(0.291)	(0.315)	(0.280)	(0.759)	(0.895)
Observations	3,025	3,025	3,025	3,025	3,025	3,025
Mean in Control	14.37	4.122	5.394	4.146	13.66	16.03
Panel B: Closing Balance in GP Accounts						
Treatment	-0.0843	0.191	-1.007***	-1.277***	-1.277***	-0.117
	(0.245)	(0.220)	(0.240)	(0.244)	(0.244)	(0.235)
Observations	3,025	3,025	3,025	3,025	3,025	3,025
Mean in Control	4.147	4.407	4.099	4.274	4.274	4.236
Panel C: Total Credit to GP Accounts						
Treatment	-0.179	0.251	-2.192***	-1.249***	-3.190***	0.896
	(0.830)	(0.338)	(0.367)	(0.335)	(0.781)	(0.883)
Observations	3,025	3,025	3,025	3,025	3,025	3,025
Mean in Control	15.27	4.282	5.146	4.006	13.43	15.97

Note: The unit of observation is a Gram Panchayat (GP). In Panel A the dependent variable is the sum of debits from the savings account of each GP for each period (in lakhs Rupees). In Panel B the dependent variable is the closing balance on the savings account of each GP at the end of each period (in lakhs Rupees). In Panel C the dependent variable is the sum of credits made to the savings account of each Panchayat for each period (in lakhs Rupees). Treatment is a dummy which is equal to one for the blocks selected for the intervention. All specifications include district fixed effects. Standard errors are clustered at the block level.

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Financial data - program public data

	Pre-intervention Apr 2011-Mar 2012	Set up and intervention Apr 2012-Mar 2013	Post-intervention Apr 2013-Mar 2014
	(1)	(2)	(3)
Panel A: GP Expenditures on labor from nrega.nic.in			
Treatment	0.996**	-2.270***	-0.271
	(0.495)	(0.760)	(0.729)
Observations	2,950	2,947	2,954
Mean in Control	7.551	13.83	13.66
Panel B: GP Expenditures on material from nrega.nic.in			
Treatment	0.508	-1.077**	0.315
	(0.432)	(0.526)	(0.534)
Observations	2,950	2,947	2,954
Mean in Control	6.504	7.717	8.377

Note: The unit of observation is a Gram Panchayat (GP) The dependent variables are expenditures from MIS reports for financial years 2011-12, 2012-13, 2013-14 (in lakhs Rupees). Data was downloaded from the MGNREGS website (nrega.nic.in) in November 2014. The intervention started in September 2012 and ended on March 31st, 2013. Treatment is a dummy which is equal to one for the blocks selected for the intervention. All specifications include district fixed effects. Standard errors are clustered at the block level.

Beneficiary outcomes

Was there less work done or just less ghost work?

	Pre intervention	Set up	Intervention Period			Post intervention
	April 2011 - June	July-August	Sept-Dec	Jan - Mar	Whole	Apr 2013 - March
	2012	2012	2012	2013	Period	2014
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Days worked (nrega.nic.in)						
Treatment	91.88	-130.3	-404.6*	-267.8	-672.4*	-859.5
	(530.3)	(111.5)	(227.6)	(163.3)	(363.6)	(542.7)
Observations	2,959	2,959	2,959	2,959	2,959	2,959
Mean in Control	10313	1058	2759	2269	5028	10603
Panel B: Days per working household (nrega.nic.in)						
Treatment	-0.0269	-0.712	-0.286	0.187	-0.00410	-0.308
	(1.010)	(0.605)	(0.805)	(0.701)	(0.930)	(0.838)
Observations	2,952	2,514	2,728	2,717	2,868	2,945
Mean in Control	36.85	17.35	29.14	25.14	33.65	39.54
Panel C: Number of working households (nrega.nic.in)						
Treatment	2.988	-3.132	-10.02	-8.342	-13.60*	-15.03
	(12.49)	(5.151)	(6.233)	(5.700)	(8.150)	(10.33)
Observations	2,959	2,959	2,959	2,959	2,959	2,959
Mean in Control	273.6	59.92	91.68	90.37	140.2	257.2

Note: The unit of observation is a Gram Panchayat (GP). In Panel A the dependent variable is the total number of days provided. In panel B the dependent variable is the total number of days provided to households reported to have worked. In panel C the dependent variable is the number of households reported to have worked. In panel D the dependent variable is the number of days worked by households who could not be matched with survey households. In Panel E the dependent variable is the number of days worked by households matched with survey households. The data was extracted from Job card information on the nrega.nic.in server. It covers the period from July 2011 to Sept 2013. Treatment is a dummy which is equal to one for the blocks selected for the intervention. All

Incidence of ghost workers

- For each GP compute match rate of job cards with names in SECC

- regress:

$$Y_{vd} = \alpha + \beta T_v + \eta_d + \varepsilon_{vt}$$

  1. for all reported working in MGNREGS
  2. for those only during intervention period
  3. for those working in post-reform period

- increase in math rate for single-worker households significant only in first 2 cases (1.87 p.p. and 1.81 p.p. respectively)

Creation of physical assets

	Number Registered		Number found	
	All Projects	Ongoing	All Projects	Ongoing
	(1)	(2)	(3)	(4)
Treatment	0.0494	-0.210	0.309	0.0271
	(0.263)	(0.413)	(0.239)	(0.267)
Observations	390	390	385	385
Mean in Control	13.80	11.69	11.79	9.819

Note: the unit of observation is a Gram Panchayat (GP). The dependent variables are the number of projects registered in the public data portal (nrega.nic.in) on May 15, 2013 (1), the number of projects declared as ongoing in nrega.nic.in (2), the number of registered (3) and ongoing (4) projects found by surveyors in June-July 2013. Out of 5390 projects registered in nrega.nic.in for the 390 GP of the survey sample, a random sample of 3900 projects were surveyed (10 per GP). The number of projects found in the survey is scaled up using the number of registered projects divided by the number of sampled projects rate. 5 GP (28 projects) could not be surveyed. All specifications include district fixed effects.

Assets of MGNREGS functionaries

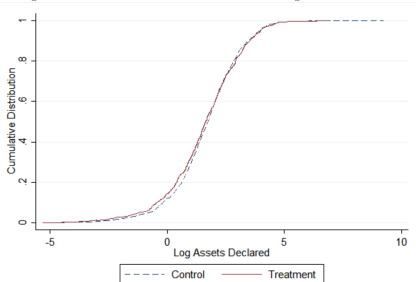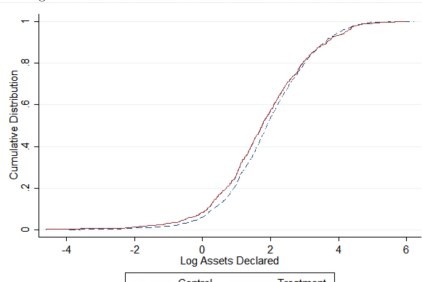Figure 5: Asset of MGNREGS functionaries: during the intervention

Figure 6: Asset of MGNREGS functionaries: after the intervention

Summary of findings

- theoretical predictions were ambiguous as per the effect of this reform
- financial data shows that for treatment GPs there was a decline in spending and in number of workdays and workers hired
- decline in spending is mainly driven by a decrease in workers and there is direct evidence of decline in ghost workers
- not accompanied by a decline in MGNREGS assets
- suggestive evidence that patterns are accounted for by reduction in corruption
- seems to be corroborated by wealth reduction for GP and block officials

Introduction
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Program and RCT
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Theoretical predictions
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Data
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Analysis
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Conclusion
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E-governance, Accountability, and Leakage in Public Programs: Experimental Evidence from a Financial Management Reform in India

Banerjee, Duflo, Imbert, Mathew, Pande (Oct 2016)

Presented by: Vittoria Dicandia

December 11, 2018
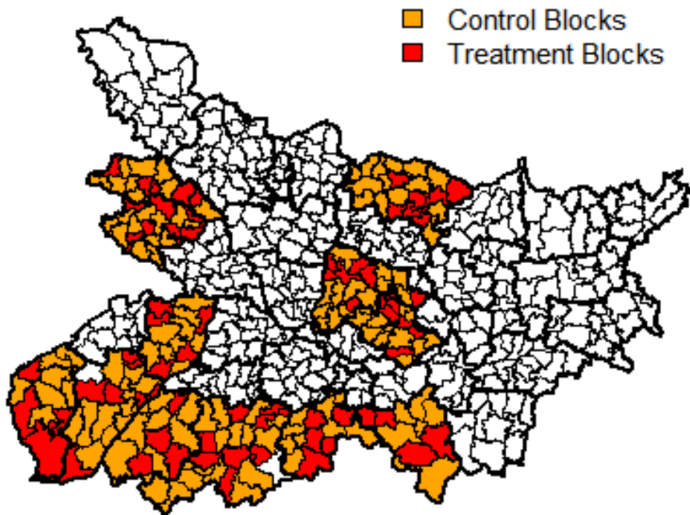
P maximizes:

$$(1 - \pi^T)s - p_i s - p_{-i} s - \frac{1}{2}cs^2$$

Can be rewritten as:

$$s(1 - 2p_i) - \pi^T s - \frac{1}{2}cs^2$$

Given:

$$Y^{PT}(\pi^T) = s(1 - 2p_i)$$

P's utility

$$U^{PT}(\pi^T) = Y^{PT}(\pi^T) - \pi^T s - \frac{1}{2}cs^2$$

	Control Blocks	Treatment Blocks	Difference	Observations
Panel A: Census 2011				
Area (hectares)	1101	1129	28.38	2,936
Number of households	1860	1845	-15.22	2,936
% SC Population	0.196	0.194	-0.00164	2,936
% ST Population	0.0112	0.0144	0.00320	2,936
Literacy Rate	0.64	0.639	-0.000859	2,936
% With education facility	0.992	0.997	0.00529*	2,936
% With medical facility	0.668	0.679	0.0114	2,936
% With post office	0.0394	0.0357	-0.00367	2,936
% With bank branch	0.352	0.402	0.0496**	2,936
% With electricity supply	0.426	0.46	0.0344	2,936
% Land Irrigated	0.53	0.523	-0.00639	2,936
Panel B: Household Survey				
% Hindu	0.92	0.89	-0.0268**	390
% Scheduled Castes	0.26	0.24	-0.0188	390
% Other Backward Castes	0.59	0.60	0.0162	390
% House without a solid roof	0.38	0.41	0.0246	390
% Owns Land	0.58	0.57	-0.0139	390
% Male Head	0.78	0.76	-0.0129	390
% Literate Head	0.56	0.55	-0.00884	390
Household Size	6.52	6.44	-0.0836	390
Number of adults in the household	3.42	3.36	-0.0664	390
Panel C: nrega.nic.in reports (April 2011- March 2012)				
MGNREGS beneficiary households	187	196	9.283	2,950
MGNREGS work days provided	6290	6673	383.7	2,950
MGNREGS labor expenditures (lakhs)	7.69	8.68	0.996**	2,950
MGNREGS material expenditures (lakhs)	6.57	7.07	0.508	2,950
Panel D: CPSMS reports (Sept 2011- March 2012)				
MGNREGS funds spent (CPSMS)	9.00	8.73	-0.272	3,025
MGNREGS funds received (CPSMS)	9.52	9.59	0.0645	3,025

Note: The unit of observation is a Gram Panchayat (GP). Out of 3067 GP from our sample list, we match 2936 GP with census 2011 data (Panel A), we surveyed 390 GP (Panel B), we match 2950 GP with nrega.nic.in data (Panel C) and 3025 GP with CPSMS data (Panel D). The difference between control and treatment blocks is estimated using a regression of each GP characteristic on a dummy equal to one for treatment blocks and district fixed effects. Standard errors are clustered to take into account correlation at the block level. Stars denote signicance levels. *, ** and *** denote significant differences at the 10%, 5% and 1% levels respectively.