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Can e-governance reduce capture of public programmes?

Experimental evidence from India's employment guarantee scheme in Bihar

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Can e-governance reduce capture of public programmes? Experimental evidence from India's employment guarantee scheme in Bihar

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Abstract

Low administrative capacity and pervasive corruption constrain the performance of social insurance programs in many low-income settings. The increasing availability of e-governance, i.e., the application of information and communication technology for delivering public services, makes it possible to design mechanisms with fewer agents intermediating the delivery process. Do such redesigns reduce leakages by reducing the number of potential bribe-takers, or worsen performance by reducing oversight on local implementing agencies? We evaluate the impact of a reform in the delivery of funds for a large public employment program, the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). The reform was implemented in 69 blocks randomly selected from 12 districts of Bihar with a total rural population of 33 million. The reform reduced the set of agents involved in the wage payment process and, alongside, empowered the village-level agents by increasing their ability to directly request and process wage payments. During the seven months of the intervention, program expenditures dropped by approximately 25% in the treatment blocks as compared to the control. However, household survey data shows similar levels of employment in treatment and control blocks. Survey data also indicates that payments to MGNREGS workers were delayed, but not cut, especially in the first four months of the intervention when numerous implementation issues arose. Our findings are consistent with reduced leakage of MGNREGS funds: we show that incidence of ghost beneficiaries declined in treatment blocks. We provide qualitative evidence that intermediary bureaucrats who were excluded by the fund-flow reform had previously used control over the fund flow to collect bribes, and actively opposed the new financial architecture. Finally, the reform presents a mechanism to link fund releases to reported expenditure. We find that this intervention contributed to a significant decrease in the amount required by implementation agencies to achieve similar program outcomes. This result suggests that better cash management systems can achieve significant reductions in program costs.

Contents

List of figures and tables

Abbreviations and acronyms

CBI	Central Bank of India
CPSMS	Central Planning Scheme Monitoring System
DC	district coordinator
DRDA	District Rural Development Authority
IT	information technology
J-PAL	Abdul Latif Jameel Poverty Action Lab
MIS	Management information systems
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MKSS	Mazdoor Kisan Shakti Sangathan
NREGA	National Rural Employment Guarantee Act
PO	program officer
PRS	*panchayat rozgar sewak* (*panchayat* employment assistant)
RDD	Rural Development Department
ZBA	zero balance account

1. Context

This section describes the context of the intervention. We present India's employment guarantee, and the low level of implementation of the scheme in Bihar. We focus on two important issues: the lack of administrative capacity and the prevalence of corruption.

1.1 The National Rural Employment Guarantee in Bihar

With close to 50 million beneficiary households in 2013, the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) is one of the largest social protection programs in the world today. It was created by the National Rural Employment Guarantee Act (NREGA) of 2005. The Act gives the right to 100 days of work per year per household to all rural adults who are willing to do unskilled manual labor at the wage notified for the program. In the years since its launch, the impact of MGNREGS on the lives of the poor has varied greatly across different states of India. In particular, the quality of implementation has been consistently poor in poorer states (Bihar, Jharkhand, Odisha, West Bengal). As Dutta *et al.* (2012) note: "Ironically, the incidence of unmet demand for work tends to be higher in poorer states, even though demand for the scheme is higher there. On balance, the scheme is no more effective in the states where it is needed the most." This point is illustrated in Figure 1 in Appendix A, which shows that poorer states have a higher fraction of households that would have liked to do MGNREGS work, but did not get any work in 2009–2010 (according to National Sample Survey data).

This is particularly stark in the case of Bihar, arguably the poorest among India's large states. Bihar appears in the top right corner of Figure 1 in Appendix A. Historically, Bihar has experienced one of the slowest long-run poverty reduction trend in India; indeed, there was virtually no change in poverty in Bihar between 1960 and 2000 (Ravallion and Datt 2002). Since 2005, however, Bihar has been among the fastest growing states in India, and government efforts to promote economic development, e.g., through massive investments in roads, have been widely acknowledged (*Economist* 2010). Yet, Bihar has the lowest participation rate of any state in MGNREGS. This is particularly regrettable because, if it did perform to its potential, the scheme could achieve considerable success in its fight against poverty. Dutta *et al.* (2012) conclude: "While we estimate that under ideal conditions the extra labor earnings from the scheme would bring down the poverty rate in Bihar by 14% points or more, in actuality the impact is closer to 1% point."

1.2 Lack of demand for work

This participation paradox could potentially have many explanations, which can be roughly divided into demand-side and supply-side issues. Demand-side issues are those reasons for which potential beneficiaries who would like to work for MGNREGS do not demand employment. Supply-side issues are those reasons for which the administration and local politicians do not deliver enough public employment to match the demand for work. On the demand side, it may well be that many of the poor are ill-informed about their rights. In order to ensure that sufficient records are maintained and corruption is controlled, the government may have imposed too many procedures – many of which could be beyond the understanding of potential participants.

Finally, potential beneficiaries may find it futile to apply for and claim the 100 days they are entitled to if there is no sufficient recourse against a local official who refuses to provide employment. In its all-India report, the World Bank (2011) summarizes: "In practice, very few job card holders formally apply for work while the majority tend to wait passively for work to be provided."

A study by Dutta *et al*. (2014) explores the role of demand-side factors to explain the poor performance of MGNREGS in Bihar. Household surveys reveal that there is little public awareness among people of rural Bihar of even the Act's basic features. They implement a randomized control trial to evaluate the impact of showing villagers "a…movie, which aims to inform people of their rights under the Act" (Dutta *et al.* 2014). Comparing treatment and control villages, we find that the movie improved people's knowledge of the scheme. However, we do not find any effect on participation in MGNREGS, which leads us to conclude that public awareness and positive perceptions are not sufficient for positive change. These results suggest that the lack of awareness about the scheme alone does not explain low levels of MGNREGS employment in Bihar. Poor service delivery is likely to be the main factor which prevents the large potential demand for work from translating into employment.

1.3 Lack of administrative capacity

Poor service delivery in MGNREGS in Bihar takes two main forms: the lack of administrative capacity and corruption. The lack of administrative capacity is a lack of financial resources, a lack of skills and staff, and a lack of basic infrastructure (electricity, computers, internet). Corruption grows from the lack of administrative capacity (because of insufficient monitoring, low pay, for instance), and contributes to it by diverting resources for the private benefit of bureaucrats. In MGNREGS, expenditures on unskilled labor, which by law represent at least 60% of all expenditures, and administrative expenditures (which by law cannot exceed 6%) are paid entirely by the center, and other expenditures are shared between the center (75%) and the states (25%). Hence, states like Bihar have financial resources to provide more MGNREGS employment and to invest in administrative capacity, but do not take advantage of it: in 2012, administrative expenditures in Bihar were 4%, lower than the 6% cap.

This issue is not new in Bihar. Mathew and Moore (2011) make the case that poor administrative capacity reduced the ability to spend centrally funded transfers under the previous Chief Minister, Lalu Prasad Yadav. While state-level capacity improved under the administration of the new Chief Minister, Nitish Kumar, a number of problems persist at the lower echelons of the bureaucracy – at the district, block, and *panchayat* levels. This fact is underlined by the following quote from Sushil Modi, former Deputy Chief Minister of Bihar:"Even if we have the money," he asks, "how to spend that money?" (*Economist* 2010).

This deficiency directly affects the performance of MGNREGS: qualitative interviews conducted with 350 *mukhiyas* (heads of *panchayats*, or village councils) point to a host of process-related obstacles to the provision of employment (the survey methodology is described in Appendix E: Sample design). Procurement prices for MGNREGS materials are a frequent cause of complaints: official prices are lower than the market price and do not include cost of transportation. *Mukhiyas* also speak of political obstacles to MGNREGS implementation – caste

and class tensions prevent public employment provision to certain groups or works in certain areas. Finally, *mukhiyas* often complain about the lack of cooperation from district and block level officials who intentionally create delays, for instance in work measurement, in order to extract bribes.

1.4 Transparency and corruption

In a remarkable effort to promote transparency, the information portal, nrega.nic.in, was launched in 2006 to host data on every MGNREGS work and every worker. As Drèze and Sen (2013) note:

> [T]he NREGA [has] also been a lively laboratory for anti-corruption efforts, involving a whole series of innovations that are now gradually being extended to other schemes as well: the use of the Internet to place all essential records (including every wage payment, worker-wise and work-site wise) in the public domain….

This data is painstakingly entered by persons working at the *panchayat* and block level, which puts a heavy burden on the poorer states that struggle to provide the *panchayats* access to computers, internet, and trained data entry operators. In Bihar, for example, these constraints were such that in 2012, the central government made fund transfer to Bihar conditional on online expenditure filing of *at least* 60% of the total spending on MGNREGS. Thus, while the MGNREGS portal is a remarkable effort at transparency and a useful monitoring tool, it is also likely to be incomplete and inaccurate.

This state of imperfect transparency fosters a system of falsified reports and leakages. Misrepresentation of reports can be done in many ways: for instance, inflating the number of days worked per person (ghost days), registering fake workers (ghost persons), or reporting fake works (ghost works). There have been some attempts to try and quantify the extent of these acts. One approach is to compare survey estimates of public works employment with administrative data on MGNREGS days provided. Another is to randomly sample MGNREGS workers from administrative records available online at nrega.nic.in, and to attempt to survey them to independently confirm i work days and payments received.

Following the first approach, Imbert and Papp (2011) use the monthly progress reports obtained from the nrega.nic.in portal and National Sample Survey data for the year 2007–2008. They find that “employment estimates from the survey data are between 42% and 56% of the employment in the administrative data.” Based on a primary survey they conducted using data for Bihar alone, Dutta *et al.* (2014) find a much smaller estimate, between 20 and 25%:

> The gap is nowhere near as large as some casual observers have claimed; grossing up our (representative) sample estimates to the state as a whole we find that one fifth of the claimed wage payments is unaccounted for. Leakage to unintended beneficiaries is the likely explanation.

The difference between nation-wide and Bihar-specific estimates is likely due to the fact that leakages have gone down over the years, and not because Bihar's corruption levels are particularly low. Updating Imbert and Papp's (2011) results using data for the year 2011–2012, we find that employment estimates from National Sample Survey data represent between 68% and 78% of employment in administrative reports.

Following the second approach, Niehaus and Sukthankar (2013) implemented a survey of 1,499 individuals in the state of Odisha who were reported as MGNREGS workers by nrega.nic.in. They find that only 821 both exist and report having worked, and, of these 821, most received less than the reported payments. We used a similar survey methodology on a small sample from two *panchayats* in Rohtas district in November 2012 and found that ghost workers accounted for 12% per cent of all MGNREGS days, and ghost days for 8%.

The interviews we conducted with *mukhiyas* in 2013 provide abundant qualitative evidence on the pervasive nature of corruption among the lower tiers of the bureaucracy.[1] The perspective of *mukhiyas* on corruption is certainly one-sided, but their observations are nonetheless striking; they depict everyone in the administration, from engineers to auditors to block level functionaries and data entry operators, as rent seekers. A *mukhiya* from Jamui district remarked: "Bribery is so common that it almost seems like that it is the only way anything gets done in the *panchayat*."

1.5 Interventions to reduce corruption

Since MGNREGS was launched in 2006, state governments and civil society organizations have made repeated efforts to fight corruption and reduce leakages. The state of Andhra Pradesh pioneered a system of administrative and social audits to detect and punish officials who divert MGNREGS funds. Other states emulated this practice, e.g., MGNREGS *divas* (day) in Bihar. Either independently or in coordination with the administration, civil society organizations throughout India, e.g., Mazdoor Kisan Shakti Sangathan (MKSS) in Rajasthan, implemented awareness campaigns and social audits to address workers' grievances.

In an effort to reduce diversion of worker payments and promote financial inclusion, in 2008 the government mandated that MGNREGS wages be paid through bank or post office accounts. Survey evidence discussed by Adhikari and Bhatia (2011) suggests that the reform did make embezzlement more difficult since wages could no longer be withdrawn without the beneficiaries' consent. However, it also shows that corrupt practices survived with the complicity of bank or post office employees. For example, workers would sign a blank sheet of paper which would allow the *panchayat* officials to receive wages in their name without them ever knowing the actual amount. In other cases, officials would keep large parts of MGNREGS payments as compensation for advances made to beneficiaries at the time they worked.

Andhra Pradesh recently implemented smart cards that link beneficiary payment to biometric identification, thus making it impossible for corrupt officials to withdraw money in the name of MGNREGS workers without their presence. Muralidharan, Niehaus, and Sukhtankar (2014)

[1] The survey methodology is described in detail in Section 4.1 and Appendix D.

designed a randomized control trial to estimate the impact of smart cards on MGNREGS outlays, employment, and payments. They find that households in treatment subdistricts received 23% more in MGNREGS payments and worked 12% on public works. In contrast, there was no change in MGNREGS spending, which they interpret as evidence that smart cards reduced leakages. Finally, they find that delays in payments decreased, and that time spent collecting payments also decreased. They conclude that the new payment technology unambiguously improved public service delivery and reduced leakages of public funds. Our study is closely related to theirs, in that we also evaluate the effect of a reform in MGNREGS fund flow that uses technology to limit opportunities for corruption. However, while their study focuses on the last step of MGNREGS payment, i.e., when beneficiaries receive payments, the intervention we evaluate affects the first step, i.e., when *panchayats* send payment orders.

2. Theory of change and intervention

This section briefly describes the financial architecture of MGNREGS in Bihar under the status quo and the objectives of the intervention. It then presents the design of the intervention in more detail in the context of the broad reform of MGNREGS fund flow in Bihar.

2.1 Theory of change

The administrative structure in charge of MGNREGS provides a canonical example of a principal–agent problem in governance. The principal is the state government, which seeks to deliver work and wages to villagers, but must rely on agents within the state administrative machinery to do so. Under the status quo, this machinery can be modeled as a chain of five agents. The lowest agent is the village-level official (the *panchayat rozgar sewak* [PRS]), who is subordinate to the village elected representative (*mukhiya*). For simplicity, we take this as a single agent who allocates work to villagers and is responsible for creating the list of wage payments. Next, there is the appointed block level officer (program officer [PO]) who approves the wage payment list, and then the district level official (district development committee or DDC) who logs into the financial software, that is the Central Planning Scheme Monitoring System (CPSMS), and requests payment to the *panchayat*. After this, the next two agents are the bank officer (state level) who processes the payment, and the local payment agency officer at the village level who releases beneficiary-wise checks. Documentation of expenditures (i.e., employment details) is made *ex post* on the web portal nrega.nic.in with no connection with the payment process. Figure 3 in Appendix A provides a graphical representation, and Appendix C provides more detail.

In this system, *panchayats* are entirely dependent on higher level functionaries (block/district officials) pushing money into their bank accounts. According to state guidelines, this push is supposed to occur when the balance of the *panchayat* account falls below a threshold, e.g., INR 100,000, or they specifically make a request. However, due to various inefficiencies in the bureaucratic system, this push is not made automatically. Based on our analysis of fund-flow data of *panchayat* accounts, between July 2011 and July 2012 in 12 districts of Bihar, the average time taken to replenish a *panchayat* account that was short of funds was about three

months. *Panchayat* officials interviewed in May–July 2013 suggested that block and district officials requested bribes to process payments. Village level officials would hence pay as kickbacks part of payments received after inflating the number of days worked by MGNREGS beneficiaries.

There are multiple reasons for seeking to redesign this system. From a governance perspective, Shleifer and Vishny (1993) show that the level of corruption is determined by the structure of the market for bribes, the elasticity of demand for the officials' services, and the degree to which corrupt officials can coordinate with one another in setting prices. Barron and Olken (2007) show that reducing the number of officials involved in a transaction reduces overall bribes and also changes distribution of rents. Under the status quo, the NREGA system has several agents who can potentially hold up the process by demanding bribes. Redesigning this so that fewer agents are involved in the fund-flow process could reduce corruption. It may also reduce delays in wage payment as there are fewer bargains being made along the chain.

This, of course, assumes that higher level agents are (at least) as willing to engage in rent-seeking behavior as village-level officials. If not, then one may be concerned that reducing oversight of village officials can increase corruption. In addition, increasing involvement of village-level agents in financial processing presumes that they are sufficiently trained in using such systems and that information technology (IT) is available at the village. If not, then reducing block and district involvement may lead to worse outcomes. Finally, if one assumes that village level officials have stronger incentives to provide MGNREGS employment than block and district officials, e.g., to secure political support for *panchayat* elections, then greater autonomy given to local officials may improve employment provision.

We report on an evaluation that seeks to examine the relative importance of these forces. Figure 4 in Appendix A and Appendix C explain how the reform changed the flow of funds. To summarize, the reform enabled the village level agent to directly access MGNREGS funds available at the state level via the CPSMS portal. For each rupee drawn from the system, the village level agent had to enter online the details of wage payments of MGNREGS workers. Payments were then processed by the Central Bank of India (CBI) and funds sent directly to the *panchayat* savings account. In this system, district and block level officials had no control over the fund flow, except indirectly through CPSMS data entry (*panchayat* assistants relied on block resources to access the web portal). Finally, a second round of data entry was still done *ex post* on nrega.nic.in without any connection to the payment process.

The reform (i) reduced the number of agents involved in MGNREGS wage payment, (ii) reduced the oversight on village agents by higher officials, (iii) reduced the unutilized funds parked in *panchayat* accounts, and (iv) increased the IT needs at the local level.

The intervention is expected to benefit program implementation at two levels. At the state level, the program benefits from reduction in leakage of funds and program implementation costs. At the level of program beneficiaries, MGNREGS workers may benefit in two ways – first, fewer payment delays, and second, access to more funds and therefore improved employment opportunities.

As mentioned earlier, these positive benefits rely on a number of assumptions. First, it assumes that accessing MGNREGS funds through district and block officials increased opportunities for corruption by block and district officials rather than deterring corruption by village officials. Second, it assumes that village officials will be able to use the system and understand its advantages, which, in turn, requires the necessary amount of training and infrastructure. Third, it assumes that village officials have incentives to increase employment if given access to more MGNREGS funds. Finally, it assumes that the agents would allow implementation of a program that reduces the scope for corruption.

	Objectives Hierarchy	Indicators	Sources of Verification	Assumptions/Threats
Impact **(Goal/Overall objective)**	Improved household welfare	MGNREGS employment received, migration, days of work and wages for private sector work, household consumption	Household survey	MGNREGS improves household welfare directly through program participation, and indirectly through an increase in private sector wages
Outcome **(Project Objective)**	More MGNREGS employment is provided. Reduced leakages Reduction of parked funds in *panchayat* accounts	MGNREGS spending and mandays generated Number of infrastructure projects Bank balances of *panchayat* accounts	CPSMS and nrega.nic.in Household survey Asset survey	District/block officials use their control over funds to extract bribes. *Panchayat* officials have stronger incentives to provide MGNREGS employment.
Outputs	Easier access to MGNREGS funds	*Mukhiya* and PRS perceptions on fund-flow problems	PRS survey *Mukhiya* survey	*Mukhiya* and PRS will adopt the CPSMS system.
Inputs **(Activities)**	Implementation of zero balance accounts at the *panchayat* level	Training of PRS Number of computers, printers, scanners, generators, data entry operators per *panchayat* Use of zero balance accounts	PRS survey Infrastructure surveys CPSMS data	

3. Implementation

This section describes the implementation of our intervention. It first presents how the required infrastructure was put in place and the staff trained to use the new system before the launch of the intervention in September 2012. It next describes how the lack of funds in the state pool and a strike affected the initial phase of the intervention until early January 2013. Finally, it discusses implementation quality across study districts from January to March 2013, and how the intervention was rolled back in April 2013.

3.1 Preparation phase: July–August 2012

Infrastructure

In order for the new system to function smoothly, some basic infrastructure needed to be put in place in each of the treatment blocks before the start of the intervention in September 2012. Each treatment block needed internet access, a scanner, a printer, and a generator to ensure constant power supply. Blocks were supposed to have one computer and one data entry operator for every fifth *panchayat* so that the average block needed three computers and operators. In July 2012, we conducted a first wave of phone interviews of block level officials (or POs) to monitor infrastructure levels. The survey revealed that we had barely achieved 50% of the requirements.

Based on this, it was conveyed to the principal secretary of the Rural Development Department (RDD) that infrastructure deficits in the treatment blocks could be a concern and needed to be addressed urgently. J-PAL helped develop infrastructure monitoring tools wherein live data was being collected at the block level. This was done using linked Google documents filled by the district coordinators (DC) posted in each district by the RDD. This allowed the RDD to keep a regular tab on the availability of resources in various districts and address issues in blocks that needed attention. As Appendix Table 10 shows, this focused monitoring helped increase infrastructure availability. In January 2013, we carried out the second wave of phone interviews and found that 80% of the infrastructural needs were covered.

We also developed a portal to streamline complaints regarding the CPSMS server, which allowed POs to log in their complaints. Subsequently, personnel from the CPSMS team keyed in information on the nature of the problem and the estimated time taken for resolution. This proved to be another useful source of information to monitor the status of implementation.

Training

In August 2012, in collaboration with the RDD, we held a two-day training session in Patna for the POs on the new CPSMS module. The training helped the POs comprehend the changed fund flow architecture at a conceptual and practical level. The following week, we held another training session for the newly appointed DC at the J-PAL office. The DCs were designated as master trainers for PRS officials at the block level. Working alongside CPSMS consultants, we

developed thorough training material – a powerpoint presentation with embedded audio and a comprehensive manual on CPSMS and the new fund flow. We also worked with the DCs to ensure that they presented the material in a manner that was easy to understand.

The training at the block level was carried out simultaneously in the 12 districts over a span of two weeks. We visited various districts to monitor field level training held for the PRS officials. We helped facilitate training by providing feedback to the DCs on areas which we believed they could improve on. We also interacted with the district-level officials to ensure that the infrastructural needs for training were taken care of.

3.2 First phase: September–December 2012

With the required infrastructure in place and the training complete, the intervention was rolled out in September 2012. Figure 6 in Appendix A shows the proportion of *panchayats* that had ever used their zero balance account (ZBA) at the different stages of the intervention. The implementation period can be divided into two phases. Between September and December 2012, less than 20% of *panchayat*s used the system. This proportion rose steeply in January 2013, and reached 60% on average by April 2013 when the intervention was rolled back. This section explains why the intervention was not implemented in its initial phase. The next section discusses why it did not reach its full potential and was eventually rolled back.

Lack of funds and PRS strike

From September to December 2012, the functioning of MGNREGS across Bihar was impaired by two major issues unrelated to the intervention: the lack of funds in the state pool, and a PRS strike. In mid-September 2012, the Bihar state pool of funds for MGNREGS ran dry, which resulted in a huge delay in the MGNREGS payment process, affecting *panchayats* in both treatment and control blocks. The center refused to replenish the state pool, pointing out that the state had not done its quota of filing online expenditure on nrega.nic.in (60% of all spending across the state). The state's MGNREGS bureaucracy was initially slow to react, which may have been partly due to a change at the top of the RDD, with a new principal secretary joining in early September. The process of completion of mandated entries took nearly three months, during which the state pool's only access to funds was by borrowing from other sources within the Government of Bihar. Unfortunately, these relatively tiny borrowings did little to fill the huge gap that the lack of funds had created in MGNREGS payments.

Figure 5 in Appendix A shows how the lack of funds in the state pool and the PRS strike impacted MGNREGS spending in the 12 districts of our study. By comparing with 2011 figures, one can see that expenditures are usually low in the months of September to December, which is the peak agricultural season. There is, however, a sharp decline in expenditures just after the state pool ran dry, and the PRS strike seems to have slowed down the recovery.

Impact on implementation

The timing of fund depletion in the state account was particularly difficult from the intervention's point of view. As our district monitors (intervention monitors who carefully observed the system and reported to us on a regular basis) reported, it was not unusual for stakeholders at the block and especially the *panchayat* level to think that the two events were linked. Many PRS who had enthusiastically taken to the system and painstakingly generated payment advices were disappointed when the money did not flow in to their accounts. Program officers who had set up laptops and internet connections in their offices were similarly disappointed; while some of them were aware of the reasons for the state pool running dry, many continued to believe that there may have been some connection between the lack of funds and the new system. This is how the monitor from Siwan district summarizes the situation: "If CPSMS worked well and money came quickly, then no one had any issues. However, once there was a delay in payments, people got scared and were no longer very keen on the system."

When, in mid-December 2012, the center finally did release funds for MGNREGS for the state, the PRS officers went on strike. This was purportedly over the murder of a PRS in one of the districts, but it was also to protest against weekly checking of MGNREGS works by district level functionaries, which led to a few hundred PRS officers being fired. This resulted in lower MGNREGS expenditures and further delays in payments made to the beneficiaries of the scheme.

3.3 Second phase: January–March 2013

As Figure 6 in Appendix A shows, *panchayats* really started to use the new fund flow only from January 2013 onward. Two observations can be made about the January–March 2013 period. First, the intervention was not fully implemented: by March 2012, one third of *panchayats* had never used the system. Second, the quality of implementation varied greatly across districts. In Begusarai district, the proportion of *panchayats* using their ZBA rose from 20 to 90% while in Madhubani district it never crossed the 40% mark. In this section we discuss two implementation issues that were common across treatment districts: payment processing by the CBI, and double data entry for *panchayats*. We next explain why the support of district administrations was instrumental in the success of the intervention, and latent opposition from the districts eventually led to its rollback.

Two issues: payments processing and double data entry

The new financial architecture dispensed with authorization by intermediary levels of administration, but increased the workload at the top with the CBI having more payments to process, and at the bottom, with *panchayats* having to document in the CPSMS portal.

Under the old system, the CBI had received a few payment advices from a district for several *panchayats* at a time (with fund requests ranging from INR 3-5 lakhs per *panchayat*). With the new system, it suddenly had to process hundreds of advices from each *panchayat*, with amounts

as small as INR 4,000. This was because PRS created an advice for every muster roll they entered. This was soon rectified, with PRS being asked to generate larger advices (often bunching several musters together), and this helped reduce the workload. Throughout the intervention period, the CBI team seemed severely understaffed and could not keep pace with the increased number of payment advices from the various *panchayats*. The online interface for checking payment advices against their records was never created, and manual record keeping prevailed until the end of the intervention.

Another issue which made the use of the new system by the *panchayats* particularly cumbersome was data entry on CPSMS. When the intervention was launched, it was made clear to all stakeholders, especially the PRS, that while CPSMS mandated muster roll entry for payment, these musters would eventually feed into nrega.nic.in (through a patch created between the two servers: CPSMS and Management information systems (MIS). Unfortunately, due to lack of coordination between the Ministry of Finance and the Ministry of Rural Development, this patch was never developed. This meant that the PRS in the treatment blocks had to document expenditures twice: once on CPSMS to get money, and again on nrega.nic.in to continue with online expenditure filing norms. This additional burden was something that many PRS complained about, which limited intervention take-up and caused delays in worker payments.

Limited support from district administration

The response of the district administration to the new system was mixed. The District Rural Development Authority (DRDA) in Begusarai supported the system, but many were wary of the financial reform and campaigned openly against the system. This was in their interest because, as we have pointed out before, the district administration had very little say in the flow of funds in the treatment blocks. As our monitor for the district of Jamui reports:

> Initially, the PO were apprehensive about the system. The DRDA Accountant [Mr Jha] had scared the PO at the beginning and had convinced them that the system was useless…. Whenever PO or the Mukhiya would come, the operators and the accountants would scoff them and tell them that they were stuck with a useless system. They would tell them: “Look, you were better under us. Now, you won’t get any money from the state.”

Our district monitor placed in the neighboring district of Nawada similarly said:

> The DRDA Director was not very active; in fact, most of the officials there were not pro-CPSMS. The DRDA fudged data – he produced fake records to show that he had given the [required] infrastructure to all the [treatment] blocks. This was untrue.

This was compounded by the fact that the DCs who were appointed in each district to facilitate system implementation were often ineffective. Their role was to act as an instructor and troubleshooter, allaying concerns the various stakeholders had about the system. Except

Begusarai, which had a very good and very cooperative DC, in most other districts the DC did little to support the system. The monitor from Gopalganj describes the DC in the following manner: “His performance was very poor. He never did any work.”

Roll back of the intervention

The principal secretary of the RDD who had joined in September 2012 eventually decided to roll back the intervention in April 2013. Field reports suggest that repeated complaints from district officials about the delays caused by the new financial system played an important role in this decision. We do not, however, have direct evidence of this.

4. Results

In this section, we first present the data and the methodology used, and then our estimates of the effect of the intervention on MGNREGS spending, employment provided, and wages paid.

4.1 Data

In order to evaluate the effect of the new fund flow on MGNREGS spending, our first source of information is the CPSMS portal itself. Since all *panchayat* savings accounts were mapped into the system whether or not they had a ZBA, treatment and control *panchayats* are perfectly comparable. The CPSMS data contains information on bank balances as well as every credit and debit transaction in *panchayat* accounts from July 2011 to January 2014, which allows us to monitor MGNREGS spending on a daily basis, both before and after the intervention.

The nrega.nic.in portal is the second source of information on MGNREGS spending. On the one hand, the information from nrega.nic.in is less precise than CPSMS since it provides information on *panchayat* spending only by financial year (i.e., from April 1 to March 31 every year). The financial year 2012–2013 therefore includes part of the pre-intervention period. On the other hand, nrega.nic.in provides the breakdown of MGNREGS expenditures into four categories (unskilled labor, material, skilled labor, admin), which is not possible with CPSMS data. Appendix Table 11 shows that expenditure levels reported in nrega.nic.in and in CPSMS in 2012–2013 are similar.

Our measures of MGNREGS employment and payments made to workers come from two different sources. The first is an independent survey of 10,036 households randomly sampled in 390 *panchayats* in 195 blocks, which we conducted from May to July 2013. Household members who worked for MGNREGS were asked to report when and how long they had worked in MGNREGS since July 2012, and when and how much they were paid. The household survey was completed by a survey of 4,165 MGNREGS assets randomly sampled from nrega.nic.in and a qualitative interview with *mukhiyas* in each surveyed village.

The second source of information on MGNREGS employment is job cards in nrega.nic.in, which report work spells and payments for all MGNREGS workers. As discussed in section 1.4, data entry in nrega.nic.in is often delayed by many months, but the state requires that 100% of expenditures be documented. Appendix Table 11 compares payments in job cards and labor expenditures reported in nrega.nic.in, and shows that the two sources match relatively well.

Because of ghost workers and ghost days included in their reports by corrupt officials, we do not expect estimates of MGNREGS employment and payments from household declaration and from nrega.nic.in to coincide (see Section 1.4). Simply comparing levels of employment and expenditures in official reports and in survey data is indicative of leakages. We can go one step further by matching survey households and nrega.nic.in job cards. This allows us to verify whether job cards belong to real households and whether these households have worked (ghost workers), and whether the level of employment and payments reported in nrega.nic.in matches what households declare (ghost days).

Given the paucity of household information available on the job cards, we used the household member's name and age and considered a household as matched if at least one household member matched. As a result, we matched 71% of the survey sample to at least one job card, and the average for households that were matched is as high as 5.2 job cards. The imprecision of the matching implies that a comparison of levels of employment in survey and website data is unlikely to yield a reliable measure of leakages. However, matching quality should be the same in treatment and control, so that we can still compare the differences between treatment and control for both datasets.

4.2 Evaluation methodology

In order to evaluate the effect of the intervention on MGNREGS reported and actual outcomes, we compare the 69 randomly selected treatment blocks and the 126 remaining control blocks in the 12 sample districts. The randomization ensures that treatment and control blocks are *ex ante* comparable. We test this by comparing *panchayats* in treatment and control blocks along characteristics that were determined before the intervention. Table 1 in Appendix B shows that villages in treatment and control *panchayats* have similar socio-demographic characteristics and have the same level of infrastructures according to the 2001 census. Treatment *panchayats* are less likely to be reserved for women, but the difference is small (1.5 percentage points), and there is no difference in caste reservation. Finally, according to nrega.nic.in, treatment *panchayats* had 15% higher MGNREGS labor expenditures between April 2011 and March 2012, i.e., the financial year preceding the intervention. The difference is significant at the 10% level. There is no difference in total MGNREGS spending between treatment and control *gram panchayat* at baseline according to CPSMS.

4.3 MGNREGS employment provision in the sample

Data from the household survey conducted in 12 districts from May to July 2013 provides direct evidence of high, unmet demand for MGNREGS work (see Appendix Table 9). Awareness seemed to be high: 80% of households in our sample knew about employment guarantee. The

scheme itself had been implemented on a relatively large scale: a third of all households were registered and had job cards, and a quarter had participated at any time in the past. However, we find a large gap between the fraction of households who said they would have wanted to work for MGNREGS in the past year (57%), the fraction who requested work (26%) and the fraction who did receive employment (9%). Among those who did some MGNREGS work, the average number of days is 35, well below the 100-day guarantee, and almost all would have wanted to work more days. These findings are comparable with Dutta *et al.* (2014), who conducted a survey in a representative sample of Bihar households in 2010. They find that while 64% of households would have liked to work in 2009–2010, only 17% received employment and worked on average 37 days.

4.4 Effect of the intervention on MGNREGS spending

We first use CPSMS data on daily debits from *panchayat* savings accounts to compare MGNREGS spending in treatment and control blocks. Figure 7 in Appendix A shows the trends in spending in treatment and control before, during, and after the intervention period. There is no systematic difference in spending between treatment and control before the intervention, which simply reflects that treatment and control blocks were randomly chosen. However, there is a clear decline in spending in treatment as compared to control, which persists throughout the intervention period. Once the intervention is rolled back, treatment blocks seem to close the gap rapidly with control blocks. Table 2 in Appendix B presents the same evidence with a regression analysis. There is no significant difference between treatment and control blocks before the implementation period. From September to December 2012, however, spending is 19% lower in treatment blocks, and 32% lower from January to March 2013. After the intervention is rolled back, between April 2013 and August 2013, there is no significant difference in spending between treatment and control blocks.

The decline in MGNREGS spending in treatment blocks is further confirmed by data on nrega.nic.in. Table 3 in Appendix B shows that for the financial year 2012–2013 – i.e., between April 1, 2012, and March 31, 2013 – expenditures on labor and on materials were respectively 17% and 14% lower in treatment blocks. Given their different time spans of 7 and 12 months, respectively, CPSMS and nrega.nic.in data provide very consistent estimates for the negative effect of the intervention on spending.

It seems paradoxical that an intervention which was designed to facilitate MGNREGS spending effectively reduced it. One possible interpretation is that implementation issues – lack of infrastructure, insufficient knowledge of the scheme, double data entry – made the new system more burdensome than the old and MGNREGS employment provision decreased. Another possibility is that the real-time, online documentation of expenditures in the new system made spending more transparent and reduced leakages of MGNREGS funds. The two explanations are mutually compatible: the intervention may have simultaneously increased the effort required to spend MGNREGS funds, and reduced the (private) benefits from doing so. However, they have different implications for MGNREGS employment provision. In particular, reduced leakages may cause spending to fall without any decline in employment provided.

4.5 Effect of the intervention on employment

We next turn to the effect of the intervention on MGNREGS employment provision. Based on the household survey, we construct three different measures of MGNREGS employment. The first is a binary indicator of participation in MGNREGS, the second is the number of weeks that households declared having worked in MGNREGS, the third is the number of days worked. Panel A in Table 4 in Appendix B presents the estimated effect of the intervention on the probability of participating in MGNREGS. The estimates are positive, small, and insignificant for the intervention period. Given the relatively small size of the standard errors, the results represent a precisely estimated zero effect of the intervention on MGNREGS employment. Treatment effect estimates on the number of weeks of public employment yield the same conclusion (Panel B). If anything, the probability that a household works in a given week is higher in treatment blocks, but the difference is not significant. Finally, Panel C presents the estimated effect on the number of days provided, which may be subject to more measurement error since it is based on retrospective questions, and recall of the exact number of days may be an issue. The findings for the treatment period are similar to those of the number of weeks and participation rate.

Perhaps surprisingly, we find that the number of days worked was lower in treatment blocks just before the intervention started, which may be an anticipation effect, but is not, as such, an effect of the treatment. Overall, these findings suggest that the decline of MGNREGS spending in the treatment blocks, documented in the previous section, does not reflect a drop in public employment provision, but rather, reduced leakages of MGNREGS funds. This conclusion is strengthened by the fact that we find no evidence that less MGNREGS assets were built in treatment blocks. As Table 6 shows, the number of assets built according to official reports (nrega.nic.in) and the fraction of assets mentioned in official reports we were able to find in the field are the same in treatment and in control blocks.

4.6 Effect of the intervention on labor payments

Taken together, our findings suggest that the intervention had no negative effect on employment despite a dip of 24% of MGNREGS spending. One likely explanation which we explore in the next sections is that the intervention reduced leakages of MGNREGS funds. There could however be another, much less favorable explanation, which is that workers in treatment blocks worked but did not get paid, i.e., the intervention induced delays, or even cuts in beneficiary payments. This is what we test in this section.

We further use household survey data to estimate the effect of the intervention on payments to MGNREGS workers. For each spell worked in MGNREGS, the respondents declared whether, when, and how much they had been paid at the time of the survey. Based on this information, we construct two measures. First, we compute for each household the total of all payments received for MGNREGS employment. We next compute the average number of days between

each work spell and the date when the payment was made.[2] Each of these measures is constructed for four periods: July to August 2012 (before the intervention), September to December 2012 (first phase of the intervention), January to March 2013 (second phase), and April to the time of the survey. Since households were interviewed between May and July depending on the district, most payments for the fourth period had likely not been made at the time of the survey.

Panel A in Table 5 in Appendix B presents the estimated treatment effect on wage payments: there is a negative and significant effect of the intervention on payments for work spells in July and August 2012, i.e., before the intervention was implemented. This drop in payments is equivalent to the drop in days worked that we documented in the previous section. There is, however, no significant effect on payments made for work spells during the intervention. The estimates are noisily estimated, equivalent to -11% of payments in control during the first four months, and +14% during the next three months. Given that more employment is provided from January to March, the total effect is an insignificant -0.6%. We also observe a decrease in payments for employment spells after the intervention, which may be due to delayed payments (i.e., the payment had not been made at the time of the survey).

Panel B in Table 5 in Appendix B yields further insight about the effect of the intervention on MGNREGS payments. As compared to an average delay of 73 days in control blocks, workers employed during the first phase of the intervention (September–December 2012) in treatment blocks waited 44 more days for their payment. The effect is statistically significant. Those who worked during the second phase of the intervention also waited longer in treatment than in control blocks, but the difference is four times less (11 days) and statistically insignificant. These results suggest that the intervention slowed down the disbursement of funds to *panchayats*, and further delayed workers' payments, especially during the first phase of the intervention, for reasons discussed in Section 3.3.

This interpretation is corroborated by the *mukhiyas* whom we interviewed parallel to the household survey.[3] Panel C in Appendix Table 13 shows that twice as many *mukhiyas* either spontaneously declared or agreed with the view that the CPSMS caused delays in fund flow in treatment (34%) than in control blocks (17%). *Mukhiyas'* answers do not necessarily reflect actual problems. In particular, *mukhiyas* may blame CPSMS for fund flow issues unrelated to the intervention, such as the lack of funds in the state pool at the time the system was launched (cf. Part 103.2). But they nonetheless add credence to the idea that the intervention slowed down the delivery of funds.

[2] When the payment had not yet been made at the time of the survey, we take the number of days between each work spell and the date of the survey so that our measure is in fact a lower bound of delays in payments.

[3] *Mukhiyas* were first asked, "What are the main problems that you face in implementing MGNREGS?" and then prompted, "Some of the *mukhiyas* we talked to mentioned the following problems with respect to implementation of MGNREGS works. Do you also face them?" (see Mukhiya survey in Appendix E available online only)

Given these results, an important question is whether the decline in MGNREGS spending that we documented in the previous section can be explained by increased delays in payments. Payments are delayed by one and a half months for the first four months of the intervention, by only 10 days in the next three months, and there is no further delay after the intervention is rolled back. One would hence expect delays to translate into lower expenditures in treatment as compared to control blocks in this first period, and then into higher expenditures in treatment as compared to control blocks in the second period as payments finally go through. This is not consistent with our finding that spending is lower throughout the intervention period, and the same afterward.

4.7 Effect of the intervention on leakages

The results presented in the previous sections suggest that MGNREGS expenditure declined by 25% with no effect on MGNREGS employment and payments (apart from delays). Our interpretation is that the financial reform reduced leakages of MGRNEGS funds. As Panel B in Appendix Table 13 shows, *mukhiyas* are significantly less likely to think that corruption in the administration is an issue in treatment (37%) than in control (47%) blocks. This section attempts to provide direct evidence of the decline in corruption in treatment blocks.

Table 7 in Appendix B provides evidence on this issue and suggests that the scheme led to a decline in the number of ghost workers rather than overexerting of days for households who worked. Panel A shows the number of days reported to have been worked in the nrega.nic.in data base: corresponding to what we find in Table 3 in Appendix B, there is a significant decline in the number of days worked during the intervention period. Panel B shows, however, that the number of days worked per household in the data base does not decline: the entire decline is accounted for by a decline in the number of households that are reported to have worked (Panel C).

The next two panels provide more direct, if tentative, evidence. Recall that our matching is very partial: we only surveyed a sample of households, and matching based on name leads to both inclusion and exclusion errors. However, these factors should be constant in treatment and in control. Hence, when the number of ghost workers declines, we should find a reduction in work days for the households for which we do not find a match. Indeed, Panel D shows that the decline in days worked is concentrated among job cards that were not matched with households in our survey. In contrast, Panel E shows that among job cards that are indeed matched with households in our survey, there is no decline in the number of days reported (suggesting no change in overreporting among real households).

These results strongly suggest that the decline in leakage comes from a reduction in ghost workers, rather than the over-reporting of days. In contrast, Muralidharan, Niehaus, and Sukhtankar (2014) focused on a front end reform in payment, and found a reduction in the over-reporting of days, not a reduction in ghost workers. In their context, there was no reform in accountability and biometric identification was not imposed for all workers, so that opportunities for local officials to steal MGNREGS funds using ghost workers was unaffected. However, the over-reporting of days in the name of MGNREGS workers who used biometric identification

became impossible without their consent. The two interventions are hence not only complementary in their design, but also in their effects: if combined, they would close the two main sources of leakages of MGNREGS funds.

4.8 Effect of the intervention on household consumption

Our analysis suggests that the intervention had little effect on MGNREGS employment but increased delays, at least in the first few months of implementation. We may hence expect negative effects on household consumption if delayed payments translated into temporary shocks to household consumption. Alternatively, since we find a decline in MGNREGS spending, it may be that part of the funds leaked by village officials are redistributed to family and friends, and hence some households in treatment blocks may be worse off. We test these hypotheses by estimating the program impact on log monthly consumption as measured in the household survey.[4] Appendix Table 14 presents the results: the estimated impact is negative but very small (equivalent to 0.7 percentage points less consumption). If we split consumption by categories of expenditure with shorter or longer reporting periods, we do not find any significant impact.

4.9 Effect of the intervention on assets of *mukhiyas*

As part of our survey, we collected information on asset holdings and number of cattle in the household of the *mukhiya*. If the decline in MGNREGS spending caused by the intervention translated into a decrease in illegal income for the *mukhiya*, we may expect a negative effect on the *mukhiya's* asset holding. The results presented in Appendix Table 15 present some evidence of this. Since there are nine asset categories and four types of cattle, we perform separate regressions for each asset or animal type, but also implement regressions using as outcome a standardized index of asset holding and a standardized index of cattle holding as in Clingingsmith, Khwaja, and Kremer (2009). For most asset categories, *mukhiyas* in treatment blocks report a smaller number of assets, but this difference is never significant. The standardized asset index is not significantly different in treatment and control blocks. For cattle, *mukhiyas* in treatment blocks report having less cattle, and this difference is individually significant for goats and chicken. The standardized cattle index is significantly lower in treatment than in control blocks. These results provide suggestive evidence that *mukhiyas* may have suffered an income shock due to the intervention, presumably because of reduced leakages of MGNREGS funds.

4.10 Effect of the intervention on assets of MGNREGS officials

We also collected the annual declaration of assets of MGNREGS officials for the financial years 2012–2013 and 2013–2014. These declarations are mandatory for all Government of Bihar employees, and the RDD decided in 2012 to extend them to contract employees in charge of MGNREGS (mainly PO and PRS). The 2012–2013 batch of asset declarations was sent between June 2012 and April 2013, over a period which starts before the intervention and

[4] See household survey instrument in Appendix E (available online only).

covers the intervention period. Figure 9 in Appendix A presents the distribution of the log of assets declared in treatment and control blocks. It shows that during this intervention period, personal assets of MGNREGS employees in treatment and control blocks are very similar. The 2013–2014 batch was made from September 2013 to November 2014, i.e., more than a year after the intervention. Figure 10 in Appendix A suggests that after the intervention, the distribution of assets of MGNREGS employees in treatment is lower than in control blocks. Appendix Table 16 uses regression analysis to compare log assets in treatment and control blocks for the two periods. The mean difference between treatment and control is 4% during the intervention and 15% after the intervention (neither difference is significant). We further explore differences in treatment and control at different deciles of the distribution of assets (using quantile regressions). We find that assets of MGNREGS functionaries at the lower end of the distribution decreased by 16 to 22%. In contrast, there is no effect of the treatment for top deciles. Figure 11 in Appendix A provides a graphical illustration of these findings. We interpret them as suggestive evidence that the reduction in leakages of MGNREGS funds caused financial losses to local officials.

4.11 Effect of the intervention on financial management

One objective of the intervention was to eliminate the parking of funds, i.e., to avoid a situation where funds are lying unutilized in *panchayat* accounts. In control blocks, the district initiates transfer of lump advance amounts. However, as *panchayat* spending levels vary, this results in a situation where some *panchayats* may lack funds while others have unspent balance in their accounts. In treatment blocks, as *panchayats* pull funds from the state pool on the basis of wage payments due to beneficiaries, fund release amounts were directly linked to reported expenditure. The intervention was thus expected to reduce the unutilized funds parked in *panchayat* accounts. Figure 12 in Appendix A presents the average balance in *panchayat* accounts in treatment and control blocks. They are similar until the start of the intervention in September 2012. In the first three months of intervention, the state pool of funds is dry, and the *panchayats* deplete their accounts both in treatment and control blocks. However, in December 2012, the state pool is replenished, and the control *panchayats* receive large installments, while the treatment *panchayats* receive money that corresponds to the employment they provide, following the new system. Hence, from December 2012 onward, the balance of *panchayat* accounts in treatment blocks remains low, while it increases dramatically in control blocks. The gap is equal to INR 200,000 per *panchayat*, close to 50% of the balance in control blocks. It closes two months after the intervention is rolled back in May 2013. These results suggest that the intervention reduced the amount of funds parked in *panchayat* accounts by linking fund release to past expenditures. A decrease in funds transferred to *panchayat* accounts with no significant impact on work provided to beneficiaries implies that such cash management reforms can reduce the overall cost of program implementation.

5. Summary and policy recommendations

In this section, we briefly summarize the preliminary findings of this study and describe our policy dissemination strategy.

5.1 Summary

Our three main findings can be summarized as follows: the intervention reduced MGNREGS spending, left employment and wages unchanged, but delayed labor payments. On the one hand, these results are disappointing, because the intervention aimed at increasing employment and facilitating the fund flow. The relatively short time span of the experiment and the initial phase of four months during which the state pool from which *panchayats* drew funds was dry are probably part of the explanation. On the other hand, the fact that spending decreased by 25% with no effect on employment or on wages paid (apart from delays) suggests that the intervention reduced leakages of MGNREGS funds by a large margin. Because it allowed *panchayats* to bypass the district and the block to access funds, it may have limited the scope for extracting bribes for these intermediary levels of administration. This is what qualitative evidence suggests, with *panchayat* level officials complaining about having to pay bribes to get funds, and our field monitors reporting constant efforts from districts officials to undermine the intervention. These efforts contributed to the early roll back of the intervention in April 2013.
In addition to its effect on leakages, the intervention also improved the efficiency of public funds management in MGNREGS. In the status quo, the *panchayat* receives lump-sum installments from the districts in advance of expenditures: some *panchayats* may run out of money, some may end up not spending it all. By making the release of the funds to the *panchayat* conditional upon the documentation of the expenditures, it eliminated the amount of public funds parked in *panchayat* accounts, and reduced the average balance on *panchayat* accounts by 50%. As the treatment *panchayats* were able to achieve similar program outcomes with less funds, the fund release reform reduced the overall program implementation cost.

5.2 Policy recommendations

The results from our study illustrate the advantages, but also the challenges, of implementing an electronic transfer system. On the positive side, these systems reduce opportunities for rent seeking and decrease leakages of public funds by making payments automatic and transparent. The reduction of funds parked in *panchayat* accounts is also significant as it demonstrates that better cash management systems can achieve the same program outcomes with less financial resources, effectively reducing the overall cost of program implementation.

This study examines only the implications of reducing parked funds at the *panchayat* level. It should be possible to implement similar cash management systems to eliminate parked funds at state, district, and block level agencies. These systems could be extended to cover beneficiary payments in a manner that allows implementation agencies to initiate beneficiary payments directly from a central pool of funds. Such cash management systems can completely eliminate the need to maintain parked funds at all levels of program implementation, and support reduction in program costs at a much larger scale.

The need for better cash management models is not exclusive to MGNREGS. The Government of India currently spends approximately INR 3 trillion annually on centrally sponsored schemes. Across program verticals, this money is released to implementation agencies in bulk advance amounts (Mathew and Subrahmanyam 2013). *A priori*, if one were to replace these advance

amounts with expenditure-linked fund releases, the Government of India could stand to gain tremendous reduction in the cost of implementing centrally sponsored schemes.

However, as the intervention has demonstrated, any such system would require significant investments in IT infrastructure and the support of local officials, who may lose power and illegal rents from their implementation.

The findings of this study are relevant not only for MGNREGS, but for all other centrally or state funded schemes which require fund transfers to finance public expenditures made locally. Sectors other than rural development, e.g., education and health, could use similar systems.

From the perspective of scaling up the intervention in Bihar and other states of India, it is important to solve the issues which increased payment delays at the beginning of our intervention. Bihar was perhaps the most challenging context in which to implement such a reform because of the lack of infrastructure, and the low quality of governance and administrative capacity at the local level. Some of the technical issues that arose during the intervention we study, in particular, the need for double data and the lack of manpower at the CBI to process payment advices, could have been avoided. A system similar to CPSMS called E-FMS has been developed by the Ministry of Rural Development, which is integrated in nrega.nic.in and hence does not require double data entry. The Ministry of Finance, which has developed CPSMS (now renamed Public Financial Management System), is now well aware of the need to strengthen capacity at the CBI in each state. The Ministry of Rural Development and the Ministry of Finance are the two main targets of our policy dissemination strategies.

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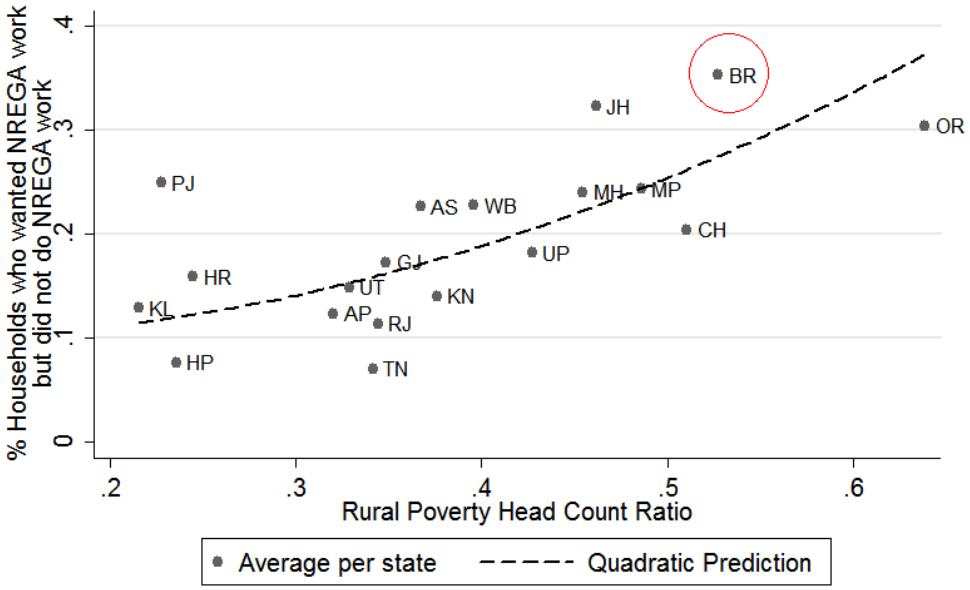
Appendix A: Figures

Figure 1: Rationing of demand for NREGA work across Indian states



Source: National Sample Survey 2009-10. Poverty is computed using National Sample Survey 2004-05 data and Planning Commission (2009) poverty lines. Quadratic Prediction is weighted by population.

Figure 2: Map of control and treatment blocks

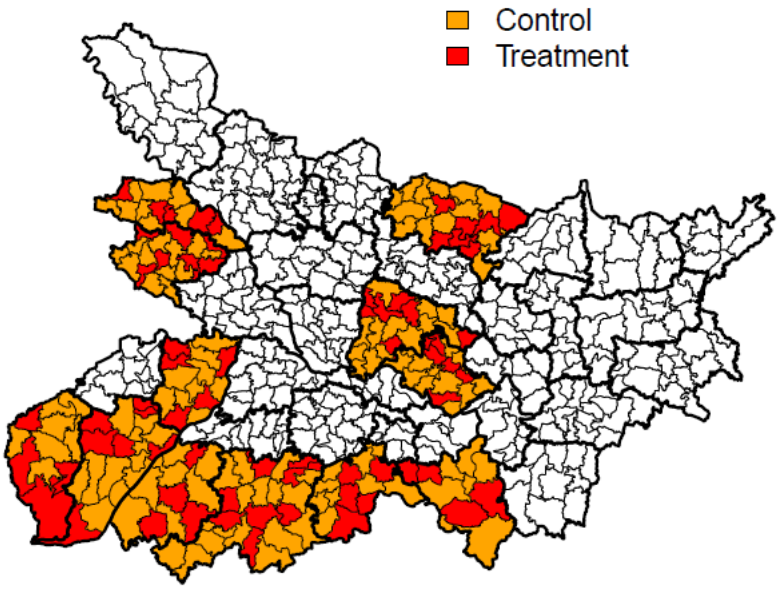
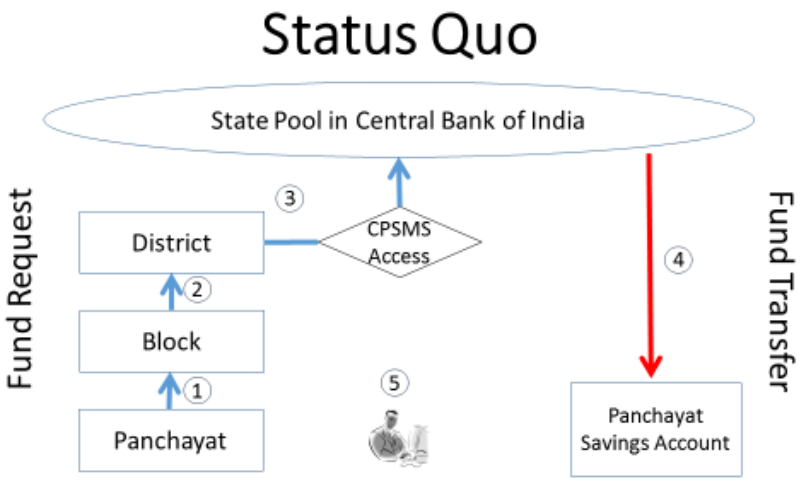
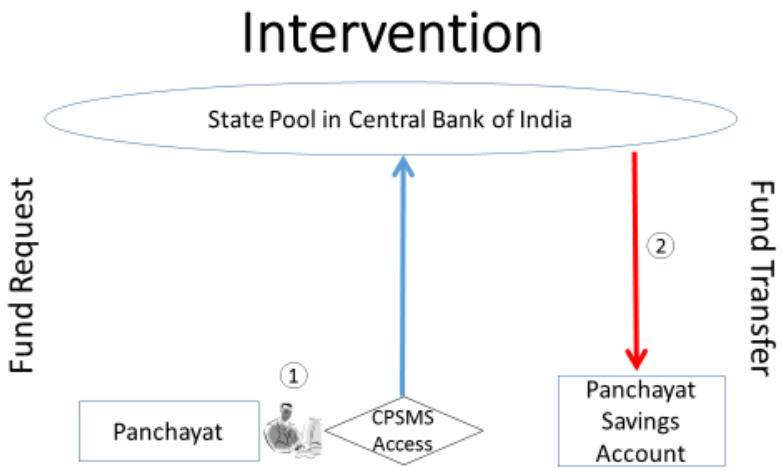


Figure 3: CPSMS system in control blocks



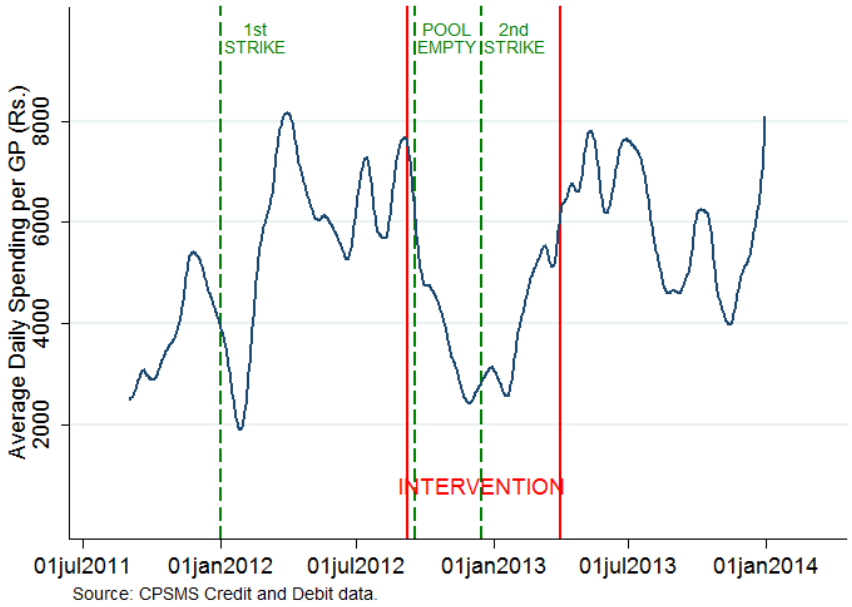
Note: This figure describes the fund flow in control blocks: *panchayats* request funds from blocks (1), which pass on the request to districts (2), which log into CPSMS and make the request to CBI (3). CBI checks and authorizes the payment to the *panchayat* account (4). The *panchayats* log into nrega.nic.in and document expenditures independently from the payment process (5).

Figure 4: CPSMS system in treatment blocks



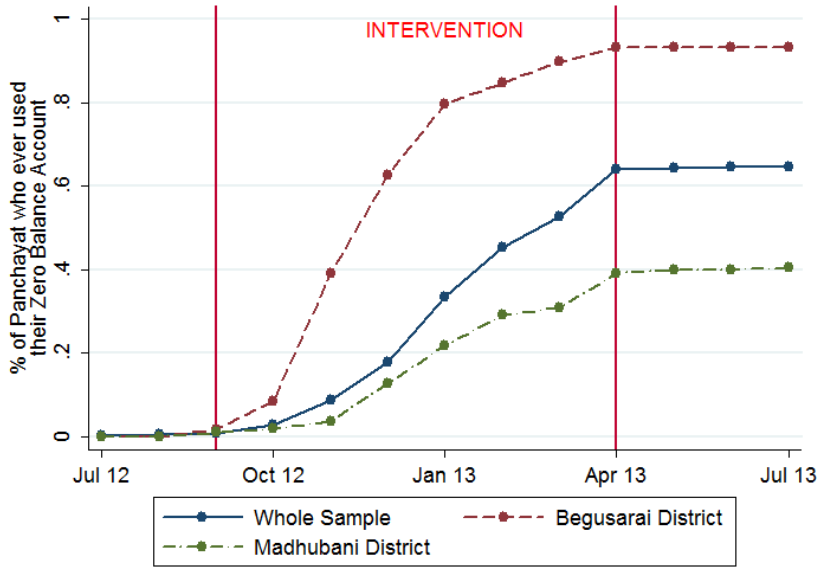
Note: This figure describes the fund flow in treatment blocks: *panchayats* log into CPSMS, document all expenditures and make the request to CBI (1), which checks and authorizes the payment to the *panchayat* account (2).

Figure 5: Average daily debit per *panchayat* in the 12 sample districts



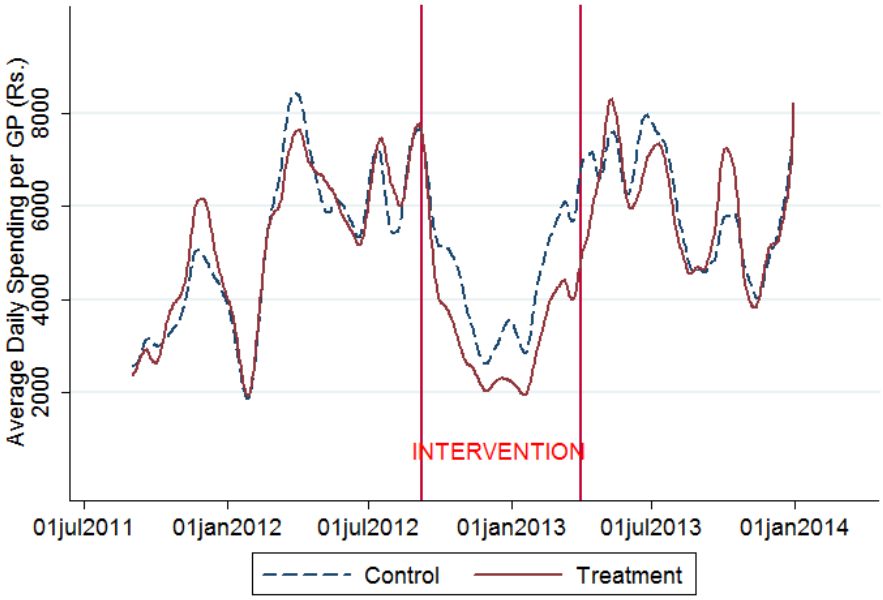
Note: Average daily debit is computed using CPSMS data on the credit-debit information of *panchayat* savings accounts. The state pool was empty at the end of September 2012 and the PRS strike started mid-December.

Figure 6: Proportion of treatment *panchayats* using the system in a given month



Note: The share of *panchayats* that used their ZBAs every month is computed as the proportion of *panchayats* for which at least one transaction was observed in the ZBA in that month. The red vertical lines indicate the start (September 1, 2012) and end (April 1, 2013) of the intervention.

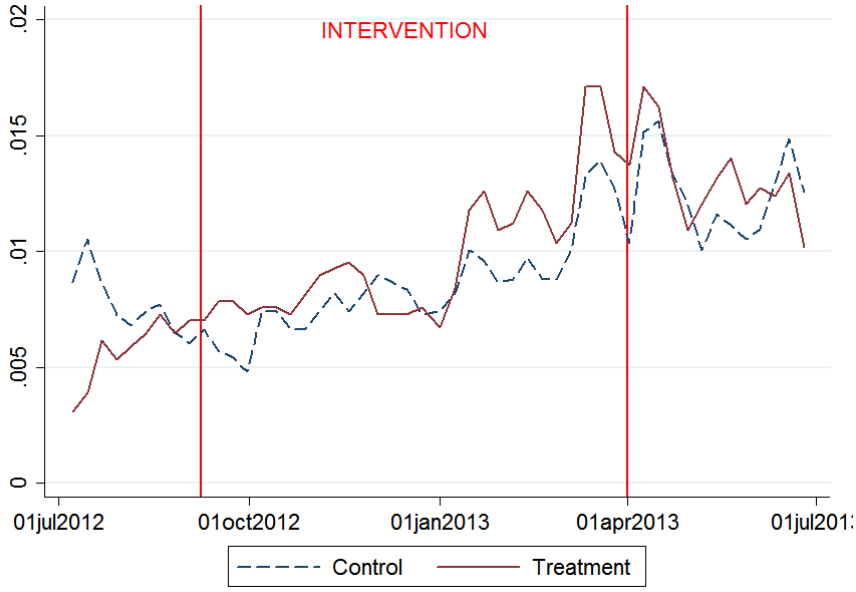
Figure 7: MGNREGS average debit in treatment and control blocks



Source: CPSMS Credit and Debit data.

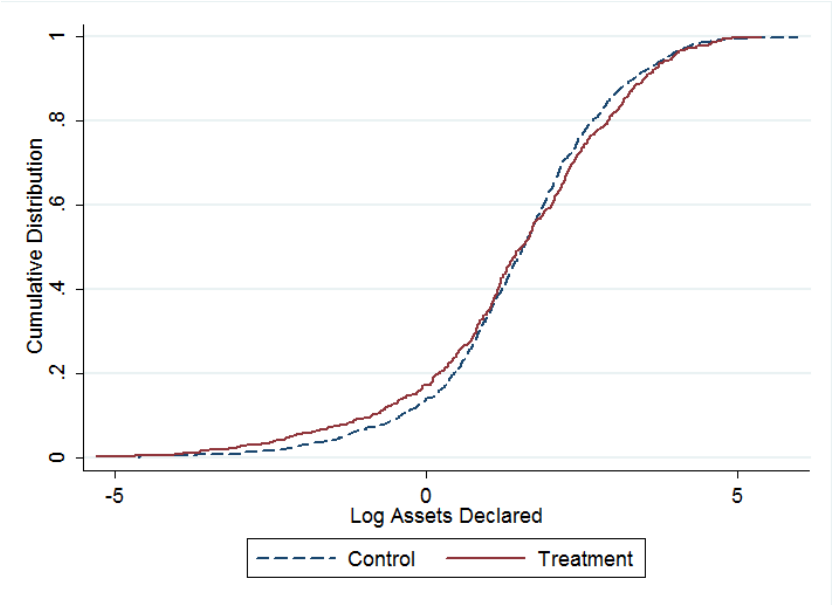
Note: Average daily debit is computed using CPSMS data on credit-debit information of *panchayat* savings accounts in treatment and control. The red vertical lines indicate the start (September 1, 2012) and end (April 1, 2013) of the intervention.

Figure 8: Fraction of households who report having worked in a given week



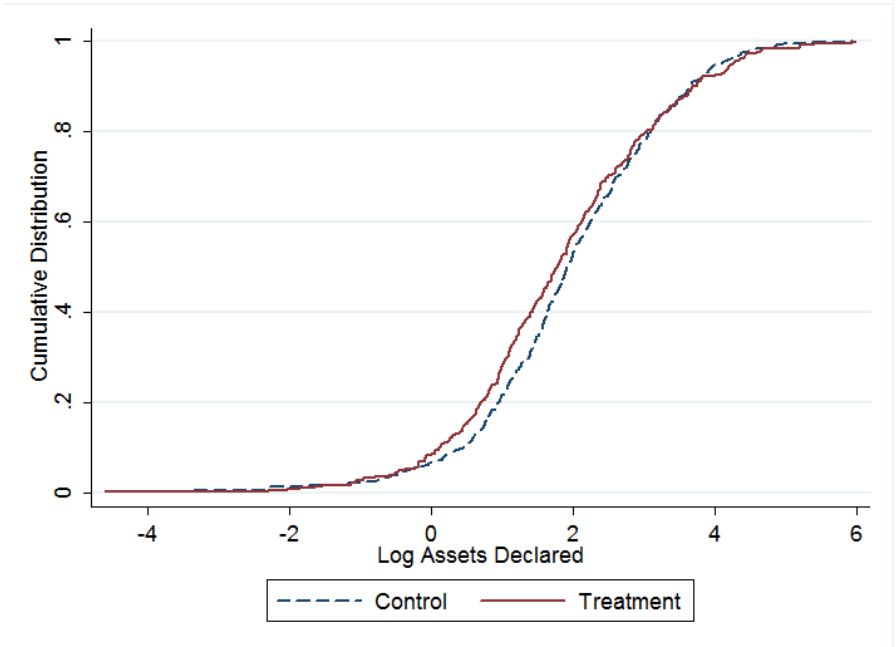
Source: Representative household survey of 10,036 households implemented from May to July 2013. The intervention started on September 1, 2012, and was rolled back on April 1, 2013.

Figure 9: Log assets of MGNREGS functionaries during the intervention (lakhs)



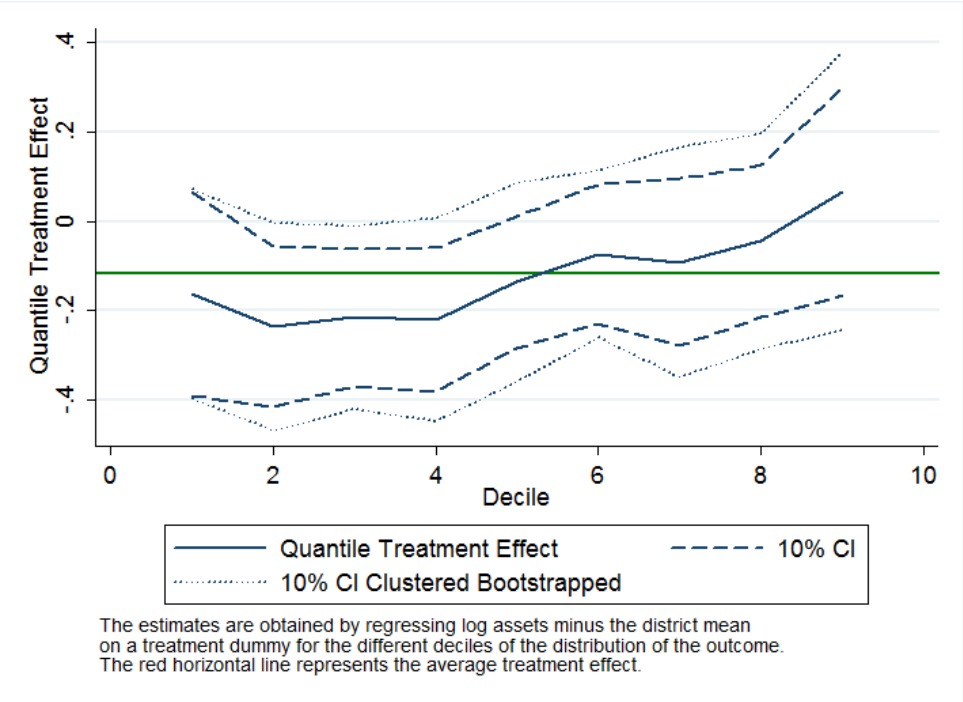
Source: Annual Asset Declaration of MGNREGS Employees 2012–13 (Government of Bihar).

Figure 10: Log assets of MGNREGS functionaries after the intervention (lakhs)



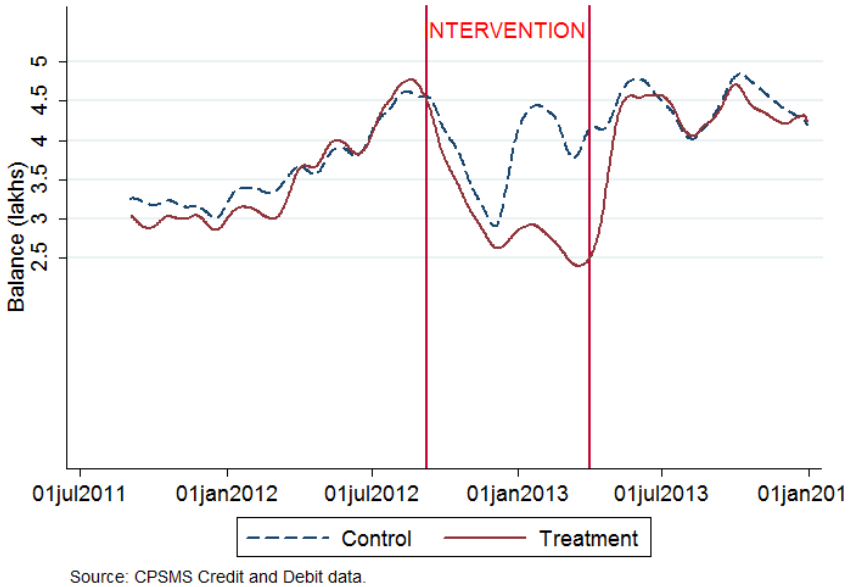
Source: Annual Asset Declaration of MGNREGS Employees 2013–14 (Government of Bihar).

Figure 11: Treatment effect on log personal assets of MGNREGS officials after the intervention (lakhs)



Source: Annual Asset Declaration of MGNREGS Employees 2013–14 (Government of Bihar).

Figure 12: Treatment effect on the balance of *panchayat* accounts (CPSMS)



Note: Credit-debit information of *panchayat* savings accounts in treatment and control. The red vertical lines indicate the start (September 1, 2012) and end (April 1, 2013) of the intervention.

Appendix B: Tables

Table 1: Balance test

***Panchayat* Characteristics**	**Source**	**Control Blocks**	**Treatment Blocks**	**Difference**
Area (hectares)	2001 Census	1582	1617	34.95
Number of households	2001 Census	1302	1276	-26.21
% SC Population	2001 Census	0.248	0.247	-0.000538
% ST Population	2001 Census	-0.000679	0.0035	0.00418
Literacy Rate	2001 Census	0.554	0.547	-0.00675
% Population in village with education facility	2001 Census	0.233	0.206	-0.0273
% Population in village with medical facility	2001 Census	0.0569	0.0503	-0.00666
% Population in village with post office	2001 Census	0.0341	0.0362	0.00209
% Population in village with bank branch	2001 Census	0.0155	0.0138	-0.00162
% Population in village with electricity supply	2001 Census	0.0337	0.00721	-0.0265*
% Land Irrigated	2001 Census	0.108	0.1	-0.00720
Political reservation for women	State Election Commission	0.463	0.447	-0.0155**
Political reservation for Other Backward Caste	State Election Commission	0.177	0.169	-0.00833
Political reservation for Scheduled Caste	State Election Commission	0.238	0.241	0.00371
Political reservation for Scheduled Tribe	State Election Commission	-0.000774	0.00155	0.00232
MGNREGS beneficiary households	nrega.nic.in (Apr 2011-Mar 2012)	243.2	253.3	10.16
MGNREGS work days provided	nrega.nic.in (Apr 2011-Mar 2012)	9066	9485	418.9
MGNREGS labor expenditures (lakhs)	nrega.nic.in (Apr 2011-Mar 2012)	6.307	7.343	1.036*
MGNREGS material expenditures (lakhs)	nrega.nic.in (Apr 2011-Mar 2012)	7.073	7.645	0.572
MGNREGS *panchayat* spending	CPSMS (Jul 2011-Mar 2012)	16.11	15.95	-0.153
Number of *Panchayat*			1953	1003

Note: The unit of observation is a *Panchayat*. The difference between control and treatment blocks is estimated using a regression of each *Panchayat* 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.

Table 2: Treatment effect on MGNREGS spending (CPSMS data)

	Before the intervention	During the intervention			After the intervention
	July 2011 - Sep 2012	Sept-Dec 2012	Jan - Mar 2013	Whole Period	Apr 2013 - July 2014
	(1)	(2)	(3)	(4)	(5)
Treatment	-0.360	-1.034***	-1.300***	-2.324***	-0.449
	(0.961)	(0.322)	(0.283)	(0.540)	(0.974)
Observations	2,918	2,918	2,917	2,919	2,766
Mean in Control	18.38	5.367	4.126	9.487	16.71
Effect as % of Control Mean	-1.959	-19.26	-31.51	-24.50	-2.685

Note: The unit of observation is a *Panchayat*. The dependent variable is the sum of debits from 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.

Table 3: Treatment effect on MGNREGS spending (nrega.nic.in)

Annual *panchayat* expenditures from nrega.nic.in						
	Apr 2011–Mar 2012		Apr 2012–Mar 2013		Apr 2013–Mar 2014	
Expenditure items	Labor	Material	Labor	Material	Labor	Material
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.996**	0.508	-2.270***	-1.077**	-0.271	0.315
	(0.495)	(0.432)	(0.760)	(0.526)	(0.729)	(0.534)
Observations	2,950	2,950	2,947	2,947	2,954	2,954
Mean in Control	7.551	6.504	13.83	7.717	13.66	8.377
Effect as % of Control Mean	13.19	7.807	-16.42	-13.96	-1.980	3.758

Note: The unit of observation is a *panchayat*. 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 31, 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.

Annual *panchayat* expenditures from nrega.nic.in						
	Apr 2011-Mar 2012		Apr 2012-Mar 2013		Apr 2013-Mar 2014	
Expenditure items	Labor	Material	Labor	Material	Labor	Material
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.996**	0.508	-2.270***	-1.077**	-0.271	0.315
	(0.495)	(0.432)	(0.760)	(0.526)	(0.729)	(0.534)
Observations	2,950	2,950	2,947	2,947	2,954	2,954
Mean in Control	7.551	6.504	13.83	7.717	13.66	8.377
Effect as % of Control Mean	13.19	7.807	-16.42	-13.96	-1.980	3.758

Note: The unit of observation is a Panchayat. 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.

Table 4: Treatment effect on MGNREGS employment (household survey)

	Before intervention	Intervention period			Since intervention
	Jul - Aug 2012	Sept-Dec 2012	Jan-Mar 2013	Whole Period	Apr - Jun 2013
	(1)	(2)	(3)	(4)	(5)
Panel A: MGNREGS Participation					
Treatment	-0.00673***	0.000417	0.00188	0.00225	0.00355
	(0.00240)	(0.00391)	(0.00304)	(0.00528)	(0.00505)
Observations	9,969	9,969	9,969	9,969	9,969
Mean in Control	0.0124	0.0217	0.0174	0.0378	0.0391
Effect as % of Control Mean	-54.47	1.921	10.80	5.966	9.078
Panel B: Number of weeks worked					
Treatment	-0.00697	0.0141	0.0260	0.0402	0.00837
	(0.0227)	(0.0308)	(0.0323)	(0.0564)	(0.0330)
Observations	9,969	9,969	9,969	9,969	9,969
Mean in Control	0.0853	0.151	0.172	0.324	0.184
Effect as % of Control Mean	-8.176	9.335	15.10	12.41	4.558
Panel C: Number of days worked					
Treatment	-0.153***	0.0627	0.138	0.200	0.0873
	(0.0493)	(0.147)	(0.139)	(0.225)	(0.359)
Observations	9,969	9,969	9,969	9,969	9,969
Mean in Control	0.231	0.676	0.515	1.192	1.825
Effect as % of Control Mean	-66.47	9.266	26.69	16.80	4.786

Note: The unit of observation is a household. In Panel A the dependent variables is a dummy variable which is equal to one if any household member participated to MGNREGS. In Panel B the dependent variable is the total number of weeks worked by household members under MGNREGS. In Panel C the dependent variable is the total number of days worked by household members. The data was collected by a representative survey of 10,036 households in May-July 2013. Households were asked about work spells from July 2012 to the time of the survey. Treatment is a dummy which is equal to one for the blocks selected for the intervention. All specifications include district fixed effects and household controls. Household controls include sets of dummies for religion, caste, type of housing, land ownership, gender and literacy of the household head, household size and number of adults.

Table 5: Treatment effect on MGNREGS payments (household survey)

	Before intervention	Intervention period			Since intervention
	Jul - Aug 2012	Sept - Dec 2012	Jan - Mar 2013	Whole Period	Apr - Jun 2013
	(1)	(2)	(3)	(4)	(5)
Panel A: Wages received for MGNREGS employment					
Treatment	-18.06***	-6.821	6.106	-0.716	-25.03
	(5.854)	(15.09)	(12.62)	(22.44)	(26.75)
Observations	10,036	10,036	10,036	10,036	10,036
Mean in Control	24.33	59.88	43.54	103.4	113.5
Effect as % of Control Mean	-74.22	-11.39	14.02	-0.692	-22.06
Panel B: Average delays in payment (days)					
Treatment	-18.54	44.09***	10.92	28.19***	-1.798
	(23.43)	(15.31)	(8.770)	(10.33)	(6.104)
Observations	123	218	175	379	383
Mean in Control	73.44	72.61	45.15	60.12	38.41
Effect as % of Control Mean	-25.24	60.73	24.19	46.90	-4.682
Panel C: Illegal advance payments					
Treatment	-0.0488	-0.0163	0.0625	0.00235	0.0436
	(0.136)	(0.0802)	(0.0912)	(0.0590)	(0.0565)
Observations	104	176	143	309	250
Mean in Control	0.394	0.273	0.294	0.291	0.380
Effect as % of Control Mean	-12.38	-5.989	21.29	0.805	11.47

Note: The unit of observation is a household. In Panel A The dependent variable is total wage payments received by each household for MGNREGS employment. In Panel B the dependent variable is the average number of days between the time of work spells and the time of each payment. When payments have not been made at the time of the survey, the delay is set equal to the time between the work spell and the survey date. In Panel C the dependent variable is a binary variable which is equal to one if any household member has received a payment for MGNREGS work in cash within 15 days of the work spell. The data was collected by a representative survey of 10,036 households in May-July 2013. Households were asked about all work spells since July 2012. The intervention period is Sept 1st 2012-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 and household controls. Household controls include sets of dummies for religion, caste, type of housing, land ownership, gender and literacy of the household head, household size and number of adults.

Table 6: Treatment effect on MGNREGS assets built

	Number registered (1)	Number completed (2)	Fraction found (3)
Treatment	0.0494	0.372	0.0176
	(0.263)	(0.342)	(0.0176)
Observations	390	390	4,165
Mean in Control	13.82	2.126	0.855
Effect as % of Control Mean	0.357	17.48	2.057

Note: In column one and two the unit of observation is a *Panchayat*. In column three the unit of observation is a MGNREGS infrastructure projects. The dependent variables are the number of projects registered in the MIS (nrega.nic.in) (1), the number of projects declared as complete in the MIS (2), and the fraction of assets sampled which were actually found by surveyors (3). Out of 5391 projects registered in nrega.nic.in, a random sample of 4165 projects were surveyed. All specifications include district fixed effects.

Table 7: Treatment effect on MGNREGS days worked and reported

	MGNREGS days worked per household		
	Before intervention	Intervention period	Since intervention
	(1)	(2)	(3)
Panel A: Days worked (nrega.nic.in)			
Treatment	-245.8	-692.8*	-890.2
	(340.5)	(364.1)	(543.4)
Observations	2,941	2,941	2,941
Mean in Control	4956	5008	10567
Effect as % of Control Mean	-4.959	-13.83	-8.424
Panel B: Days per working household (nrega.nic.in)			
Treatment	-0.578	0.0530	-0.116
	(0.797)	(0.935)	(0.841)
Observations	2,874	2,856	2,930
Mean in Control	28.54	33.57	40.29
Effect as % of Control Mean	-2.025	0.158	-0.288
Panel C: Number of working households (nrega.nic.in)			
Treatment	0.853	-14.20*	-15.16
	(9.940)	(8.141)	(9.941)
Observations	2,941	2,941	2,941
Mean in Control	168.2	139.6	249.5
Effect as % of Control Mean	0.508	-10.17	-6.079
Panel D: Days worked by household not matched with survey (nrega.nic.in)			
Treatment	-250.5	-704.0*	-910.8*
	(336.8)	(360.1)	(534.4)
Observations	2,941	2,941	2,941
Mean in Control	4896	4954	10440
Effect as % of Control Mean	-5.117	-14.21	-8.725
Panel E: Days worked by household matched with survey (nrega.nic.in)			
Treatment	0.764	-3.829	27.98
	(30.66)	(62.09)	(67.96)
Observations	372	372	372
Mean in Control	89.89	456.4	436.1
Effect as % of Control Mean	0.850	-0.839	6.416

Note: The unit of observation is a *panchayat*. 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 that 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 September 2013. Treatment is a dummy which is equal to one for the blocks selected for the intervention. All specifications include district fixed effects.

Appendix C: Intervention

Fund-flow reform before the intervention

The Bihar government started at the end of 2011 an important reform of the financial architecture for MGNREGS payments. This reform had three main components:

First, to smoothen the fund flow, a state pool of funds for MGNREGS was created in Patna (with the CBI) to replace the previously existing system where funds were transferred directly to districts from the center (Delhi). This was a crucial change because it meant that now districts were directly answerable to the Government of Bihar, and not the Government of India, as was previously the case. Conversely, the Government of Bihar – in particular, the officials at the RDD, Patna – were collectively responsible for all districts. For example, in the fall of 2012, the center refused to replenish the state pool of funds if districts did not document on nrega.nic.in the equivalent of 60% of all reported expenditures.

Second, in order to cut down on bureaucratic hurdles and empower the *panchayat*, funds traveled to the *panchayat* directly from the state pool through a ZBA set up at the district level. A ZBA is a no-frills account; money cannot be parked in these accounts, and their balance is always set at zero. These are merely shadow accounts, allowing one to track the path money takes from the source (in this case, the state pool) to the destination (the *panchayat's* savings account).

Third, to deal with the issue of transparency, a new accounting and payment system, the CPSMS, was implemented. All transactions could be monitored via a web-based interface.

Figure 3 in Appendix A gives us a picture of how fund flow took place before the intervention. The sequence of the payment procedure is as follows:

1. The local *panchayat* official, the PRS, or, less frequently, the *mukhiya*, makes a request for funds.
2. This request is made to the block level officer (the PO), who passes it on to the district administration.
3. The accountant or some other district level official scrutinizes the *panchayat's* request, logs into CPSMS, and makes a request for transfer of funds to the *panchayat*.
4. A payment advice is generated on CPSMS, which is emailed to the CBI.
5. An official at CBI checks the payment advice and logs into CPSMS and triggers the payment.
6. The money flows directly to the *panchayat* through the district and block's ZBA. As explained, a ZBA is an account whose balance is always zero, and is merely a passage way for funds to flow from the state pool to the *panchayat's* MGNREGS savings account. These ZBAs help keep track of expenditures made, both at the district and at the block level.
7. Once the money reaches the *panchayat's* savings account, a payment advice is made to

the relevant bank or post office. This constitutes a wage list (a list of all beneficiaries in the payment agency), and a check is cut for the requisite amount.
8. Money flows to the beneficiary's account through the payment agency.

Intervention

J-PAL was called in to evaluate an upgraded version of the financial system (simply called CPSMS Phase II among MGNREGS functionaries within the state). Under this new system (see Figure 4 in Appendix A), *panchayat* level ZBAs would be set up that would allow the *mukhiya* and his/her PRS (the *panchayat* level functionary for the MGNREGS) direct access to CPSMS and, through it, the state pool of funds. In essence, with regard to labor payments alone, this new model simply took away the discretionary power that rested in the hands of the district administration and handed it to the PRS. Below is a description of the payment procedure:

1. Whenever a payment needs to be made to MGNREGS beneficiaries for work done on the scheme, the PRS needs to log in onto CPSMS and enter the days worked, payment owed, and work code.
2. Once done, a payment advice is generated that is to be signed by the *mukhiya*.
3. The signed payment advice is scanned and emailed to the CBI.
4. The CBI scrutinizes the payment advice and triggers a payment via CPSMS.
5. This payment travels directly from the state pool to the *panchayat* account through a chain of ZBAs.
6. Once money is credited into the *panchayat* savings account, matters proceed as before with wage lists being prepared, checks being sent in favor of payment agencies, and money being transferred to beneficiaries' accounts.
7. Material payments are unaffected by this system and proceed as before, with utilization certificates being prepared by the PRS and submitted to the district administration, which then approves and provides funds.

In the treatment, data entry is done real time, as workers' payment is conditional on entry in the CPSMS. This is in stark contrast to the case of *panchayats* in control, where data entry was being done only on nrega.nic.in. Documentation of expenditures in the control was often done months after the payments were made (in October 2012, the center required 60% of expenditures made since April 2012 to be documented before releasing a new tranche of payments). Hence, the ability to use expenditures documented by the *gram panchayat* as a monitoring tool may be limited. With the long delay and bulk entry, it is easy to argue that any discrepancy between the records and the reality seen in the field is the result of a clerical error or poor recollection by the workers. Even though the case can be made that on average there are both ghost days and ghost workers in the system, it is much more difficult to build an individual case based on that evidence.

Note that despite efforts to integrate the two systems, treatment *panchayats* had to do the data entry twice, first in CPSMS and then in nrega.nic.in.

Appendix D: Data

In this section, we describe the different sources of information we use.

CPSMS: In July 2014, we were granted access to detailed information on MGNREGS expenditures via the CPSMS portal. Both treatment and control *panchayats* were monitored in the system from July 2011 onward, and we could observe all credit and debit transactions from *panchayat* savings accounts. We use this information to compute MGNREGS spending per *panchayat* for the different periods of interest: from July 2011 to the start of the intervention in September 2012, from September 2012 to December 2012, from January 2013 to March 2013, and from the end of the intervention in April 2013 until July 2014.

nrega.nic.in: This government website provides publicly available information on MGNREGS expenditures per *panchayat* for every financial year (a financial year starts April 1). In July 2014, using a newly available facility called the Public Data Portal,[5] we downloaded data on *panchayat* spending on labor and material for the financial years 2011–2012, 2012–2013, and 2013–2014. Labor expenditure figures in nrega.nic.in are aggregates of work and payment details of each MGNREGS worker, which are also entered on the website and made publicly available in the form of job cards. We requested access to job card information from the Ministry of Rural Development and were provided with all job card details of workers in our sample districts for the financial years 2011–2012, 2012–2013, and 2013–2014.

In order to provide independent measures of MGNREGS implementation, we carried out our own survey in the 12 sample districts between May and July 2013. Within each district, we visited every block – i.e., we had 69 treatment blocks and 126 control blocks, 195 blocks in total. We surveyed two randomly sampled *panchayats* in each block – this gave us a total of 390 *panchayats*. The survey consisted of three main surveys:

Household survey: We have a household survey covering 10,036 households. In each *panchayat*, we covered at least 25 households. These households were sampled from the list of households obtained from the DRDA. These lists were initially compiled in 2002 for the purpose of identifying below poverty line households, so each household was given a poverty score based on various criteria. From these lists, we sampled 66% of households below the median poverty score and 33% households from above the score. In case a sampled household had left the village or all its members were defunct, surveyors were asked to interview a replacement household that had been randomly chosen from the initial list. Because the sampling lists were 10 years old and many areas had high migration rates, the proportion of households interviewed as replacements was also high, about 30%.

[5] http://mnregaweb4.nic.in/netnrega/dynamic2/dynamicreport_new4.aspx [Accessed 31 March 2015]. The Public Data Portal was jointly produced by the Ministry of Rural Development and Evidence for Policy Design.

In order to compare MGNREGS employment in the survey data and in official reports, we matched survey households and nrega.nic.in job cards by the name, gender, and age of each household member. A survey household and a job card were considered as a match if any household member matched. Because the same name is frequently shared by many individuals in the same *panchayat*, our matching is not quite clear: on average, one survey household was matched with five job cards.

Asset survey: We sampled 10 assets from each *panchayat*. These were randomly sampled from the MIS (www.nrega.nic.in). In total, we sampled 4,165 assets.

***Mukhiya* survey**: We attempted to interview the *mukhiya* of every single *panchayat* we visited. We managed to locate and interview 358 *mukhiyas*. Unlike the other two surveys, the *mukhiya* survey was conducted on paper and was both quantitative and qualitative in nature.

Selection of sample districts

The experiment was carried out in 12 districts of Bihar: Aurangabad, Begusarai, Bhojpur, Gaya, Gopalganj, Jamui, Kaimur (Bhabua), Madhubani, Nawada, Rohtas, Samastipur, and Siwan. These 12 districts are located in the western and southern parts of the state (see Figure 2 in Appendix A). The Ministry of Rural Development decided to leave out the eastern part of Bihar, which is further away from the state capital, Patna; moreover, recurrent flooding in this region during the months of July and August would have made it difficult to start the intervention in the summer of 2012. Appendix Table 8 compares *panchayats* in sample districts with *panchayats* in other parts of Bihar. There are many important differences between the two groups. *Panchayats* in sample districts are more sparsely populated and rely more on irrigation, which is likely due to the fact that the Gangetic plains are mostly excluded from the sample. In terms of access to public services such as education or health facilities, access to post offices or banks, or to electricity supply, there are no differences between sample districts and others. Finally, sample districts have higher levels of expenditures than non-sample districts, but lower levels of participation and days worked, but these differences are not very significant.

Power calculations

The experiment is a three-level clustered design. The randomization was done at the second level (block). It was clustered at the third level (district), i.e., there was an equal number of treatment and control blocks drawn from each of the 12 sample districts. The average number of blocks in a district is 16.5. The first level, or level of observation, depends on the outcome we consider. Our power calculations focus on the main outcomes of our analysis: MGNREGS spending, employment, and wages. For MGNREGS spending and official data on MGNREGS employment, the level of observation is the *panchayat* (there are on average 15 *panchayats* per block). For MGNREGS participation, days and weeks worked, and wages paid measured in the household survey, the level of observation is the household. We surveyed two *panchayats* in each block and 25 households per *panchayat* (see section above).

We use the Optimal Design software to perform power calculations, using the Multisite Cluster Randomized Trials option and setting the power to 0.8.[6] Appendix Table 17 summarizes the results of our power calculations for our main outcomes. In the first two rows, we use official data on MGNREGS spending and employment in the financial year 2011–2012 from nrega.nic.in. The minimum detectable effect is equivalent to 20–25% of the mean. In the next two rows, we use data from CPSMS and perform power calculations on *panchayat* financial outcomes. The minimum detectable effect on *panchayat* saving accounts' daily balance is equal to 20% of the average balance in control during the intervention period. The minimum detectable effect on debits from *panchayat* savings accounts is equal to 26%. Finally, the last four rows perform power calculations on household level measures of MGNREGS implementation, based on the endline household survey. Power is lower for household level outcomes, which is due to the high variance of these outcomes. Since MGNREGS participation is low overall, it is more difficult to measure MGNREGS outcomes by sampling households. The minimum detectable effect for MGNREGS participation is 32% of the mean, for weeks worked it is 66%, for payments it is 85%, and for payment delays it is 13%.

[6] Optimal Design only allows for designs in which the number of treated units is the same as control units. Our own sample has only one third of treatment blocks; we are hence overestimating slightly the power of our experiment.

Appendix tables

Table 8: Selection of sample districts

Panchayat characteristics	Source	Other districts	Sample districts	Standardized difference
Superficy (hectares)	2001 Census	1033	1154	0.18
Number of households	2001 Census	1541	1353	-0.32
% SC population	2001 Census	15%	19%	0.49
% ST population	2001 Census	1%	1%	-0.09
Literacy rate	2001 Census	42%	48%	0.56
Education facility in the *panchayat*	2001 Census	99%	99%	-0.02
Medical facility in the *panchayat*	2001 Census	58%	51%	-0.15
Post office in the *panchayat*	2001 Census	80%	77%	-0.07
Bank branch in the *panchayat*	2001 Census	27%	27%	0.00
Electricity supply in the *panchayat*	2001 Census	65%	68%	0.06
% land irrigated	2001 Census	43%	51%	0.32
MGNREGS participation rate (2001 households)	nrega.nic.in (Apr 2011-Mar 2012)	19%	17%	-0.02
MGNREGS work days per household (2001 households)	nrega.nic.in (Apr 2011-Mar 2012)	7.47	5.61	-0.05
MGNREGS labor expenditures per household (2001 households)	nrega.nic.in (Apr 2011-Mar 2012)	714	971	0.09
MGNREGS material expenditures per household (2001 households)	nrega.nic.in (Apr 2011-Mar 2012)	551	858	0.14
Number of *panchayats*		5005	2956	

Note: The unit of observation is a *panchayat*. The standardized difference is computed as the difference in means between *panchayats* in sample districts and in other districts divided by the standard deviation in other districts.

Table 9: MGNREGS employment provision

Fraction of households that:	
Know about NREGA	82%
Have a NREGA job card	43%
Have worked for NREGA in the past	29%
Wanted NREGA work since Jul '12	57%
Requested work since Jul '12	26%
Did MGNREGS work since Jul '12	9%
For households who worked for NREGA since Jul '12	
Number of days worked	35
Fraction who wanted more days	98%
Households	10036
Households who worked since Jul	937

Source: Household survey conducted from May to July 2013 in 12 districts of Bihar.

Table 10: Infrastructure availability between July 2012 and June 2013: a comparison

	July '12		Jan '13	Apr '13		Required
Infrastructure	**T**	**C**	**T**	**T**	**C**	
Computers (number)	1.32	1.06	2.49	2.06	1.61	3
Operators (number)	1.22	0.86	2.20	1.75	1.27	3
Generator (1=Yes 0=No)	0.67	0.56	0.97	0.90	0.85	1
Internet (1=Yes 0=No)	0.38	0.33	0.85	0.71	0.60	1
Scanner (1=Yes 0=No)	0.57	0.37	0.73	0.81	0.65	1
Printer (1=Yes 0=No)	0.59	0.43	0.71	0.83	0.76	1
Sampled Blocks	69	126	66	69	123	

Source: Phone surveys of block level MGNREGS functionaries (PO). The intervention started in September 2012 and ended in April 2013. T denotes treatment blocks and C denotes control blocks.

Table 11: MGNREGS expenditures per *panchayat* in different administrative sources

Panel A		**Control**	**Treatment**	**Difference**	**Pvalue**
Debit in CPSMS					
	2012-13	19.27	16.84	-2.43	0.11
	2013-14	16.99	16.32	-0.67	0.65
Total Expenditures in MIS					
	2012-13	21.66	18.27	-3.38	0.05
	2013-14	21.48	21.27	-0.21	0.90
Difference CPSMS-MIS					
	2012-13	-2.39	-1.44	0.95	0.15
	2013-14	-4.49	-4.95	-0.46	0.63
Panel B		**Control**	**Treatment**	**Difference**	**Pvalue**
Payments in Job Cards					
	2011-12	8.30	9.26	0.96	0.24
	2012-13	15.74	14.25	-1.49	0.29
	2013-14	16.27	14.61	-1.66	0.26
Labor Expenditures in MIS					
	2011-12	7.59	9.04	1.45	0.08
	2012-13	13.91	11.66	-2.26	0.06
	2013-14	13.23	12.83	-0.41	0.71
Difference Job Cards-MIS					
	2011-12	0.71	0.22	-0.49	0.21
	2012-13	1.82	2.59	0.77	0.03
	2013-14	3.03	1.78	-1.25	0.02

Source: CPSMS Credit Debit Data, MIS Financial Reports (nrega.nic.in), Job Cards (nrega.nic.in). All amounts are *annual* panchayat averages in lakhs. CPSMS data is not available for the whole financial year 2011-12. p-values take into account correlation of errors at the block level. Years are financial years (Apr 1st-Mar 31st).

Table 12: Treatment effect on MGNREGS implementation issues (*mukhiya* survey)

	Main issue in MGNREGS implementation mentioned by the *Mukhiya*		
	Spontaneously	when prompted	Either
	(1)	(2)	(3)
Panel A: Lack of funds from the government			
Treatment	0.0500	-0.0473	0.00273
	(0.0589)	(0.0467)	(0.0494)
Observations	346	346	346
Mean in Control	0.489	0.229	0.718
Effect as % of Control Mean	10.23	-20.63	0.381
Panel B: Corruption in the administration			
Treatment	-0.0377	-0.0656	-0.103*
	(0.0438)	(0.0501)	(0.0567)
Observations	346	346	346
Mean in Control	0.207	0.264	0.471
Effect as % of Control Mean	-18.22	-24.81	-21.91
Panel C: CPSMS fund-flow creates delays			
Treatment	0.127***	0.0513	0.179***
	(0.0443)	(0.0356)	(0.0525)
Observations	346	346	346
Mean in Control	0.0749	0.0925	0.167
Effect as % of Control Mean	170.1	55.47	106.7

Note: The unit of observation is a *Mukhiya* (head of Panchayat). The dependent variables *are* the fractions of Mukhiya who declared that the lack of funds from the government (panel A) corruption in the administration (panel B) and delays in fund-flow created by CPSMS (panel C) are important issues in MGNREGS implementation. The data was collected from a representative sample *of* 354 Mukhiya from treatment and control blocks in May-July 2013. Treatment is a dummy which is equal to one for the blocks selected for the intervention. All specifications include district fixed effects *and* Mukhiya controls. Mukhiya controls include sets of dummies for *Mukhiya's* Religion, caste, gender, education (university education), age (above 42), whether any member of the family was elected *Mukhiya* in 2001 and 2006.

Table 13: Treatment effect on household log monthly consumption

	Log Monthly Consumption			
	All	**Frequent expenditures**	**Recurrent expenditures**	**Rare expenditures**
	(1)	**(2)**	**(3)**	**(4)**
Treatment	-0.00764	-0.00788	-0.0400	0.00104
	(0.0212)	(0.0163)	(0.0261)	(0.0393)
Observations	10,033	10,032	10,016	10,009

Note: The dependent variable are the log of household monthly expenditures for different categories of expenditures. Frequent expenditures are expenditures reported every week. Recurrent expenditures are reported every month. Rare expenditures are reported over the past five months. The data was collected by a representative survey of 10,036 households in May-July 2013. Treatment is a dummy which is equal to one for the blocks selected for the intervention. All specifications include district fixed effects and household controls. Household controls include sets of dummies for religion, caste, type of housing, land ownership, gender and literacy of the household head, household size and number of adults.

Table 14: Treatment effect on personal assets of *mukhiyas*

	Panel A: Assets owned by the *mukhiya*				
	TV	Two wheeler	CD/DVD player	Gas stove	Bicycle
	(1)	(2)	(3)	(4)	(5)
Treatment	0.0329	-0.0549	-0.0976	-0.0584	0.0966
	(0.0696)	(0.0909)	(0.0693)	(0.0803)	(0.0945)
Observations	346	346	346	346	346
Control Mean	0.648	1.018	0.432	0.709	0.709
Effect as % of Control Mean	5.084	-5.398	-22.62	-8.234	13.62
	Chair Bed	Mobile phone	Four wheeler	Fridge	**Asset index**
	(6)	(7)	(8)	(9)	(10)
Treatment	0.122	-0.0189	-0.0242	-0.0431	**-0.026**
	(0.952)	(0.539)	(0.165)	(0.0489)	**(0.055)**
Observations	346	346	346	346	**346**
Control Mean	10.34	3.145	0.731	0.260	
Effect as % of Control Mean	1.180	-0.601	-3.315	-16.58	
	Panel B: Cattle owned by the *mukhiya*				
	Cows	Buffaloes	Goats	Chickens	**Cattle Index**
	(11)	(12)	(13)	(14)	(15)
Treatment	-0.105	0.00803	-0.199**	-0.0867*	**-0.094***
	(0.215)	(0.114)	(0.0930)	(0.0520)	**(0.0528)**
Observations	346	346	346	346	**346**
Control mean	1.502	0.423	0.286	0.132	
Effect as % of Control Mean	-7.001	1.898	-69.50	-65.59	

Note: The dependent variable is the number of assets owned by the *mukhiya* household. The data was collected by a representative survey of 350 *mukhiyas* from 12 sample districts' households in May–July 2013. Treatment is a dummy which is equal to one for the blocks selected for the intervention. All specifications include district fixed effects and *mukhiya* controls. *Mukhiya* controls include sets of dummies for *mukhiyas*' religion, caste, gender, education (university education), age (above 42), whether any member of the family was elected *mukhiya* in 2001 and 2006.

Table 15: Treatment effect on personal assets of MGNREGS functionaries

	Log assets of MGNREGS functionaries			
	Declaration 2012-13		Declaration 2013-14	
	estimate	S.d.	estimate	S.d.
Mean effect	-0.0375	(0.156)	-0.145	(0.113)
1st Decile	-0.364	(0.166)	-0.163	(0.139)
2nd Decile	-0.187	(0.114)	-0.236*	(0.11)
3rd Decile	-0.04	(0.077)	-0.216*	(0.093)
4th Decile	-0.006	(0.075)	-0.22	(0.098)
Median	-0.039	(0.076)	-0.136	(0.09)
6th Decile	0.016	(0.075)	-0.073	(0.095)
7th Decile	0.122	(0.075)	-0.092	(0.114)
8th Decile	0.092	(0.103)	-0.045	(0.104)
9th Decile	0.083	(0.118)	0.066	(0.141)
Observations	2,073		1,317	

Note: The unit of observation is one asset declaration. Mean estimates include district fixed effects. For quantile regressions, the outcome is demeaned using the mean log asset in the district. Standard errors are bootstrapped and clustered at the block level. For quantile estimates they are boostrapped at the block level. Declarations 2012-13 were made from August 2012 to June 2013. Declarations 2013-14 were made from July 2013 to September 2014. The intervention period was September 2012 to April 2013.

Table 16: Power calculations

Outcome	Mean	S.d	Intra-block correlation	% Variance explained by districts	Minimum detectable effect	MDE (% of control mean
MGNREGS expenditures (lakhs)	15	11	0.31	0.26	0.3	22%
MGNREGS persondays (lakhs)	6594	5427	0.31	0.30	0.3	25%
Panchayat account balance (lakhs)	3.9	3.7	0.2	0.37	0.22	20%
Panchayat account debit (lakhs)	9.7	9.1	0.29	0.29	0.25	26%
MGNREGS participation	.09	0.29	0.02	0.005	0.11	32%
MGNREGS weeks worked	.58	3.8	0.007	0.006	0.11	66%
MGNREGS payments	104	891	0.006	0.002	0.11	85%
MGNREGS payment delays	51	69	0	.09	0.11	13%

Note: All power calculations have been conducted using Optimal Design software and setting power to 80% and the significance level to 5%.

Appendix E: Sample design

The endline survey was carried out in the 12 districts. Within each district, we visited every block – in total, we had 69 treatment blocks and 126 control blocks. We surveyed two randomly sampled *Panchayats* in each block – this gave us a total of 390 *Panchayats*.
The endline survey consisted of three main surveys:

Household survey: We have a household survey covering 10,036 households. In each Panchayat, we covered at least 25 households. These households were sampled from the list of households obtained from the District Rural Development Authority. These lists were compiled for the purpose of identifying BPL households, so each household was given a poverty score, based on various criteria. From these lists, we sampled 66 per cent of households below the median poverty score and 33 per cent households from above the score.

Asset survey: We sampled 10 assets from each *Panchayat.* These were randomly sampled from the MIS (www.nrega.nic.in). In total, we sampled a total of 4165 assets.

***Mukhiya* survey:** We attempted to interview the *Mukhiya* of every single *Panchayat* we visited. We managed to locate and interview a total of 358 *Mukhiyas.* Unlike the other two surveys, the *Mukhiya* survey was conducted on paper and was both quantitative and qualitative in nature.

Appendix F: Survey instruments (available online only)*

Asset survey

Household survey

Mukhiya questionnaire

*These documents have not been copy-edited or proofed and 3ie is making these available in the form they were received from the authors. Any errors and omissions are also the sole responsibility of the authors.

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With close to 50 million beneficiary households in 2013, the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) is one of the largest social protection programmes in the world today. It gives the right to 100 days of work per year per household to all rural adults willing to do unskilled manual labour. Bihar has the lowest participation rate in MGNREGS of any state in India and has high, unmet demand for work. One of the reasons for low participation may be constrained administrative capacity to spend centrally transferred funds. This study reports on a field experiment that evaluated an e-governance reform of the fund flow system for MGNREGS. This reform reduced the number of administrative tiers associated with wage disbursement and changed the informational requirements for requesting and disbursing programme funds.

The study findings show that the intervention reduced MGNREGS spending, left employment and wages unchanged and delayed labour payments. On the one hand, these results are disappointing because the intervention aimed at increasing employment and facilitating the fund flow. On the other hand, the fact that spending decreased by 25 per cent with no effect on employment or on wages paid (apart from delays) suggests that the intervention reduced leakages of MGNREGS funds by a large margin.

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