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Abstract

Are ostensibly demand-driven public programs less susceptible to political clientelism even when private goods are allocated? We investigate this conjecture using expenditure data at the local level from India's National Rural Employment Guarantee Scheme. By focusing on one state where accountability and transparency mechanisms have been employed and implementation efforts have been applauded, we do not find evidence of blatant vote buying before the 2009 election but do find that patronage played a small part in fund distribution after the 2009 election. Indeed most variation in expenditures is explained by the observed needs of potential beneficiaries, as the scheme intended.

Keywords: India, political economy, clientelism, project allocation, employment guarantee

JEL Code: D73, H41, H42, H53, H54, I38, O12

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The political economy of MGNREGS spending in Andhra Pradesh

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Abstract: Are ostensibly demand-driven public programs less susceptible to political clientelism even when private goods are allocated? We investigate this conjecture using expenditure data at the local level from India's National Rural Employment Guarantee Scheme. By focusing on one state where accountability and transparency mechanisms have been employed and implementation efforts have been applauded, we do not find evidence of blatant vote buying before the 2009 election but do find that patronage played a small part in fund distribution after the 2009 election. Indeed most variation in expenditures is explained by the observed needs of potential beneficiaries, as the scheme intended.

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1. Introduction

Infrastructure projects are necessary for economic growth (Esfahani and Ramírez 2003) and reducing income inequality (Calderón and Servén 2004), likely due to the spill-over gains from increased accessibility (Aggarwal 2014). While seemingly essential for poverty reduction in many contexts, it is well-known that the allocation of infrastructure projects is often subject to clientelism (Cadot, Röller, Stephan 2006) whereby public resources are strategically awarded with the intention of garnering or rewarding political support instead of catering to economic needs (Kurer 1993; Powell 1970). Because the political allocation of funds may lead to sub-optimal social policy and undermine the usefulness of infrastructure projects as poverty reduction or growth enhancing tools (Kurer 1996), uncovering instances where funds are distributed based on non-economic reasons and curtailing the extent to which politics can infiltrate project allocation is crucial.

However, another thread of research shows that voters may not actually respond to public goods allocation decisions, particularly where it is not obvious that they benefit from a large project with public good characteristics (Lizzeri and Persico 2001; Wantchekon 2003). In India, for example, while surveys of households show a clear demand for improvements in public infrastructure, especially water, roads, and electricity (Ban and Rao 2009; Besley et al. 2004), Bardhan et al. (2008) find that voters in West Bengal are more likely to respond to private goods allocation than to public goods allocation. Therefore, if a political leader's objective is re-election, then investing in the socially optimal mix of policies that provide the set of public goods necessary for economic growth and poverty reduction may be at odds with politicians' self-interested goal (Khemani 2010), meaning private goods are more likely to be allocated where clientelism is tolerated.

India's Mahatma Gandhi National Rural Employment Guarantee Scheme (hereafter, MGNREGS), employing about 50 million men and women every year (Khera 2011), offers an interesting hybrid between broadly influential infrastructure projects and an individual job creation program and, therefore, may serve the dual purpose of providing the necessary public goods that will stimulate economic growth and the private benefits that will encourage voting patterns that reward the ruling political party. While seemingly ripe for political manipulation, MGNREGS is derived from the Mahatma Gandhi National Rural Employment Guarantee Act (hereafter, MGNREGA) which grants citizens the "right to work" on these local infrastructure

projects at a set minimum wage. MGNREGS, therefore, is ostensibly designed to be a self-targeting and demand-driven program, where labor is aggregated and public works are selected at the local level before final approval at higher levels of government. While the demand-driven nature of the program may be sufficient to counter the political manipulation of program funds, MGNREGS also put in place a suite of accountability and transparency mechanisms, including but not limited to publicly-available data and social audits. The extent to which these several unique features of MGNREGS have eliminated avenues for using the program for political reward or gain is a conjecture worth exploring.

This paper investigates the correlates of MGNREGS spending at the mandal (sub-district) level in Andhra Pradesh (hereafter, AP), with a specific focus on clientelism. Other important political economy research on MGNREGS to date has focused on issues such as rent-seeking behavior (Niehaus and Sukhtankar 2013a) and leakage (Niehaus and Sukhtankar 2013b) but no studies, to our knowledge, explore the political manipulation of MGNREGS expenditures in general. Moreover, AP acts as an interesting case within India because it is one of the few states praised for its implementation quality but also remains subject to anecdotal assertions that politics have been instrumental in the targeting of funds. Following a similar framework used by Moser (2008), we econometrically test to what extent project spending at the mandal level is related to two major components of clientelism—vote buying and political patronage— versus the stated target of the program, human needs (broadly defined). The timely occurrence of a national and state-level election in 2009, several years into the implementation of MGNREGS, allows us the opportunity to test for the incidence of vote buying by the national and state-level incumbent coalition, the United Progressive Alliance (UPA), leading up to the election. Then, because we observe several years of MGNREGS implementation following the 2009 election where the incumbent party did, in fact, win re-election, we also are able to test for the existence of patronage effects.

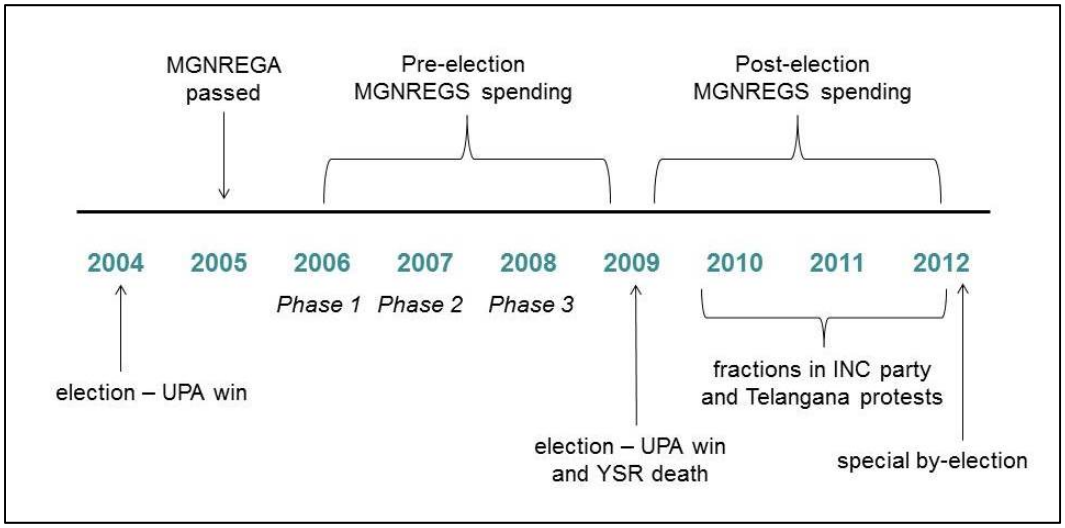
Our results are striking. We find no evidence of vote buying in the initial years of program implementation although do uncover significant patronage effects where mandals that voted for the winning incumbent coalition in the 2009 elections were rewarded with more MGNREGS funds in the following years. Even so, the overwhelming majority of MGNREGS spending to date flowed according to needs-based correlates, as the program intended, so the distortionary effect of politically-driven resource allocation is very modest, likely on account of

the distinct demand-driven characteristics of the scheme and the local political context at the time. Through our analysis of MGNREGS, we also offer a range of hypotheses for empirically testing vote buying and patronage effects using any public project that straddles a major election.

2. Context

In this section, we provide a summary of MGNREGS implementation and the relevant local political context in AP. For more details on the timing of MGNREGS roll-out and the changing political situation between 2004 and 2012, see Figure 1.

Figure 1: Timeline of MGNREGS project implementation and political situation in AP



Notes: Refer to Section 2 for more details.

2.1 MGNREGS in AP

MGNREGS implementation was phased in over three sets of districts categorized based on "backwardness" level. In the first phase the poorest districts gained access to funds in the 2006/07 fiscal year, with each of the remaining two phases joining in succession in the following years.[1] While MGNREGS is a national program implemented by individual states, hence our interest in AP in particular, the MGNREGA provided space for a "bottom-up" approach to planning and selecting works. Section 16 (3) (4) of MGNREGA stipulates that every gram

[1] In AP, 13 districts were included in phase 1 (2006/07), 6 districts in phase 2 (2007/08), and 3 districts in phase 3 (2008/09). For more details on what is known about the algorithm used to determine the district phase-in and how the intended design may have diverged from actual phase-in, see Zimmermann (2012b).

panchayat, the village level elected body, with participation from constituents, be responsible for aggregating local demand for work under MGNREGS, develop a list of projects that would benefit the larger community, and propose a timeline for their completion. The long-run development plans and annual work plans are submitted to the district level, which aggregates the plans across mandals and then submits to the state level government for final approval.[2] It was envisaged that decentralized responsibility to determine which projects should move forward under MGNREGS would ensure their contextual appropriateness, reflect the local needs and priorities of the people and facilitate a demand-driven approach.

Popular opinion and empirical studies claim, however, that factors apart from the intended "demand driven" targeting tactics, generally political ones, determine where MGNREGS funds are directed. The Central Employment Guarantee Council (2010) observed that work priorities across all of India tend to follow orders from state or district headquarters and do not reflect the needs and aspirations of the people as they should. In AP specifically, Reddy (2012) observes that implementation has often been flush with directives and orders from the state government on the prioritization of works to be taken up. Maiorano (2014) further substantiates this claim in the AP, referring to the implementation approach as "supply driven" and "rigid top down" (p. 97). In particular, Maiorano finds that hired Field Assistants, not locally elected leaders, implement programs at the village level, undermining the power envisioned of the gram panchayat. The state government of AP, which employs and manages the Field Assistants, can exert direct control of the implementation process through these individuals. Another field report from AP by Chamorro et al. (2010) states that the supply of jobs (and therefore expenditures) seemed more determined by the Field Assistants than by actual demand from laborers. A "top down" approach to program implementation and spending directives may imply the political manipulation of funds by higher-level elected leaders.

However, a growing collection of evidence exists to suggest that AP stands out as a "success story" above other Indian states in implementing MGNREGS. For example, Johnson (2009a) found little evidence that the political affiliation of the local level leader influenced any of the project outcomes in AP. Descriptive evidence from Johnson, Tannirkulam, and Larouche (2009) suggests that MGNREGS in AP has been better targeted to the intended beneficiaries than

[2] The panchayat village is the lowest level of administration in India followed by mandals (a term for sub-districts, or blocks, specific to AP) then districts within each of the 28 states.

other government programs operating over the same time frame. Using household level data from AP, Deininger and Liu (2013) found that the welfare impacts of the program were greater than the costs, signaling a sound investment. While not specifically about targeting, these results suggest that MGNREGS funds were appropriately allocated to areas where needs were highest. Johnson (2009b) found that MGNREGS allowed households in AP to mitigate the negative income effects of weather-related shocks, implying the timely distribution of funds to needy households. As part of their cross-state analysis, Liu and Barrett (2013) note that AP is one of the eight states categorized as having "good" pro-poor implementation, although AP does not make it into the "best" group due to relatively high rates of self-selection out of MGNREGS by the poorest households. So there are clearly divergent views about the degree to which MGNREGS resources are allocated in the intended, progressive manner versus by political calculation, in AP and elsewhere in India. Given the scale of the program, a sound answer to the question of what drives project allocation is of broad interest.

2.2 Politics in AP

Because MGNREGS is implemented by the states and often the program signage and materials feature images of state-level political figures, like the Chief Minister, we expect that voters attribute MGNREGS funds allocation to the political coalition in power within the Legislative Assembly, the state-level governing body.[3] At the time MGNREGA was passed in 2004, the Indian National Congress (hereafter, INC), the main party within the United Progressive Alliance (hereafter, UPA) coalition, had just wrested power from the regional party, Telugu Desam, in the AP's Legislative Assembly election. Y.S. Rajashekara Reddy (hereafter, YSR) took over as Chief Minister with an overt mission to address the agrarian crisis, an issue of contention in the run up to the election (Srinivasulu 2009). In his years in power, YSR oversaw the implementation of a large number of social welfare measures, the new MGNREGS among them. AP was the inaugural MGNREGS implementation state, further solidifying the scheme as YSR's flagship program. Useful for the purpose of this analysis is the fact that the state-level

[3] To the contrary, data from the Public Evaluation of Entitlement Programmes (PEEP) Survey of 2013 shows that nearly three-quarters of surveyed households across ten states, of which Andhra Pradesh was not included, claimed that they did not know which leader was responsible for initiating MGNREGA and an additional 15 percent could not identify the correct leader. We expect AP is a special case given the match between national and state-level governing political parties and the fact that AP was the flagship MGNREGS state.

incumbent coalition in the AP is the same incumbent coalition in the National Parliament, meaning it should be very clear to constituents that the UPA is strongly affiliated with MGNREGS program implementation.

The next election, both at the state and national level, was held in April 2009, just at the start of the 2009/10 fiscal year. Ethnographic evidence shows that the assembly constituency elections in 2009 in AP were characterized by candidates from all parties promising the distribution of funds and benefits under a number of social welfare programs (Elliott 2012), although MGNREGS is not among the schemes described. In AP, YSR was re-elected with a large margin ostensibly due, among other things, to the successful implementation of various social welfare programs. Re-election in India is rare[4], so this signaled great satisfaction with YSR's first administration. However, soon after the elections YSR was killed in a helicopter crash and a struggle for power within the state and party ensued. After deep conflicts with members of the ruling INC party, in 2011 YSR's son, Jaganmohan Reddy, left to form his own party, the YSR Congress. In 2012, the YSR Congress successfully contested by-elections and won 16 of the 19 contested Legislative Assembly seats, with Jaganmohan Reddy himself winning a National Parliament seat and his mother, Y.S. Vijayamma, winning the State Assembly seat vacated previously by his father's death.

Another complicating issue in AP is the longstanding fight for state-succession by one of the three cultural regions, Telangana. Throughout his first tenure, YSR was a strong supporter of separation for these 10 districts who claim to lack representation and submit to general neglect of their needs (Ramdas 2013). Upon YSR's death in 2009, uncertainty surrounding the plan to move forward with succession meant the revival of the Telangana movement and violent protests throughout the region and the capital city of AP, Hyderabad. The issue of a separate Telangana state eventually emerged prominent with the national government, which proposed a split of AP in December 2013. The upheaval surrounding YSR's death and the reinvigoration of the Telangana movement prompted considerable changes to the contours of the political context in AP after 2009.

[4] Indeed, voters are said to possess an "incumbency aversion" (Elliott 2011; Linden 2004) although perhaps not as strong as sometimes suggested (Ravishankar 2009). As evidence, Maiorano (2014) finds that only 25 percent of incumbents in all of Indian government successfully won re-election between 1980 and 2008.

3. Conceptual Framework

The caricature of MGNREGS implementation, and therefore spending, in AP fits a widespread narrative of poor or weak governance in developing countries (Banerjee 1997; Pande 2008). Specifically, the accumulated evidence that state-level and state-influenced political leaders have been so instrumental in implementation suggests that clientelism may have played at least a small part in MGNREGS expenditure decisions to date. Clientelism in India more generally has been well studied over the years (e.g., Platteau 1995; Sadanandan 2012), even garnering the title "patronage democracy" by Chandra (2004). Given the range of evidence suggesting both good implementation and the heavy-handedness of state administrators, we expect both needs-based and clientelistic-based motivations have been instrumental in guiding resource allocation and, ultimately, expenditures.[5] Like a set of possible motives described and tested by Moser (2008) in the context of Madagascar, we expect MGNREGS funds are spent with three considerations in mind:

$$MGNREGS = f(vote\ buying, patronage, needs) \quad (1)$$

where $vote\ buying$ and $patronage$ together form the set of clientelistic tendencies observed at different points along the political calendar, the former pre-election and the latter post-election.

In the MGNREGS context, $needs$ can be viewed as two-dimensional – (i) livelihood-securing and (ii) agricultural potential-enhancing – so as to meet the immediate needs of individuals while laying longer term foundations for rural economic growth and the efficient use of limited government resources. Because MGNREGS follows from the newly recognized right to work in India, we expect project funds to be allocated more to areas with the need to safeguard volatile livelihoods through employment generation and the mitigation of labor market shocks. However, because groups of individuals with different types of livelihoods – e.g., cultivators versus agricultural laborers – have explicitly different needs, we expect MGNREGS

[5] We chose to focus our analysis on MGNREGS expenditures instead of MGNREGS fund allocations for a number of reasons: (i) allocation amounts are simply funds budgeted and may not actually be spent, potentially due to similar political economy reasons, (ii) the same state-governing body that makes final decisions about allocations also can directly influence implementation, and therefore expenditures, via the hired and perhaps politically motivated Field Assistants (Maiorano 2014), (iii) field reports show that Field Assistants may have more influence on who works under MGNREGS and when than expressed demand (Chamorro et al. 2010), and (iv) expenditure data is theoretically less susceptible to manipulation due to the presence of social audits integrated into MGNREGA.

expenditures to differ where one of these groups dominates the other.[6] Further, because MGNREGS activities are directed around public and private works projects, particularly as anti-drought measures, where the end result should contribute to increases in agricultural productivity and economic growth, we also expect that areas with greater need for improving their infrastructure, particularly agricultural infrastructure, will receive more funds.

Apart from the stated aim of the program, it may be rational for policy makers to use some portion of the funds to meet their potentially competing objectives of political success. The incumbent political coalition, UPA, may use MGNREGS funds as a means of buying votes to win re-election.[7] Indeed Maiorano (2014) claims that transforming state welfare schemes from a means of simply channeling money to local elites into a mechanism for winning re-election was part of the YSR's focus of MGNREGS in AP. For the purpose of this study, we define "vote buying" broadly as distributing funds in an attempt to influence the outcome of an upcoming election in the favor of an incumbent.[8] This analysis builds on a long history of studies, dating back to seminal work on the political economy of the New Deal program in the United States by Wright (1974), attempting to link project allocation and vote buying in specific contexts (e.g., Brusco, Nazareno, Stokes 2004; Schady 2000). Then, because the UPA coalition did win both state and national-level re-election in 2009, we expect that they used MGNREGS funds in the years after the election to reward areas where their advantage was higher. This phenomenon, known as "patronage," is defined in this study as political leaders' allocation of scarce public funds towards their supporters following a favorable election outcome. Like vote buying, the study of political patronage and its link with project allocation has a long history in the political science literature (e.g., Finan 2004; Levitt and Synder 1995; Miguel and Zaidi 2003).

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[6] For example, if cultivators make up the larger part of the population and depend on agricultural laborers to perform many of the on-farm functions, then they may not want a robust MGNREGS program in their mandal since it may put upward pressure on wages and tighten the labor market on which they depend. On the other hand, if agricultural laborers make up the majority of the population, then more funds may be allocated to these areas in order to secure the employment opportunities, particularly in years with adverse agricultural conditions and reduced demand for hired labor.

[7] While there are several other means, on both the revenue and expenditure side, through which the incumbent party could attempt to buy votes, state-level panel analysis in India by Khemani (2004) suggests that Indian politicians are more likely to target public investment projects and programs that funnel money towards small and marginal farmers by diverting funds from other areas of spending directly before elections. MGNREGS fits this set of characteristics well.

[8] "Vote buying" in this non-literal sense is sometimes referred to as "tactical redistribution" in the academic literature (Cox and McCubbins 1986; Dixit and Londregan 1996; Lindbeck and Weibull 1987); however we will use the phrase "vote buying" for simplicity throughout.

4. Empirical Methodology and Hypotheses

In this section, we provide details on the models and hypotheses used to understand the allocation of MGNREGS expenditures and how constituents responded to fund disbursements with their votes in the 2009 election in AP. To estimate the extent to which vote buying, patronage, and the targetable needs of the population have influenced MGNREGS spending in the AP, we rely on three model specifications on which we test a range of hypotheses, all described in the following three sub-sections. Then, in the fourth sub-section, we describe an additional model specification used to test our hypotheses related to voter reward.

4.1 Vote buying effects

Because MGNREGS started in 2006/07, several years before the 2009 election, we expect the state-level incumbent political coalition to have used MGNREGS funds in 2006/07, 2007/08, and 2008/09 as a means of convincing constituents to vote for them in the 2009 election. To estimate the extent to which voting-buying has influenced MGNREGS spending in AP during these years, we estimate total MGNREGS spending in mandal *i* in district *d* during fiscal year *t* using the following regression model:

$$(2) \qquad MGNREGS_{idt} = \alpha_1 advantage_{id} + \alpha_2 advantage_{id}^2 + \alpha_3 needs_{id} + \alpha_4 needs_{idt} + \alpha_5 z_{idt} + \mu_d + \tau_t + \varepsilon_{idt}$$

where $needs$ represents a vector of the observable "needs" of the mandal, both baseline (time-constant) ($needs_{id}$) and year-specific ($needs_{idt}$); $advantage$ captures the voting behavior of mandal constituents in the most recent election (2004), as defined below; z is a vector including other mandal-level controls, notably variables that characterize election particulars described later; μ represents district-level fixed effects; τ is fiscal-year fixed effects; and ε is a mean zero, independent and identically distributed error term. Instead of looking at aggregate MGNREGS spending levels before the election, we estimate our model as a panel because it provides a more complete and dynamic picture of project expenditure and clientelistic tendencies (Diaz-Cayeros, Estévez, and Magaloni 2012), while allowing us to control for time-invariant unobservables that might influence both election results and MGNREGS spending patterns.

Because Indian elections are governed by a multi-party system and the candidate with the highest percentage of votes wins, we define the $advantage$ term as:

$$advantage_{UPA} = \frac{votes_{UPA} - votes_{other}}{votes_{total}} \quad (3)$$

rescaled from -1 to 1, where $votes_{UPA}$ is the total number of votes garnered by the UPA coalition at the mandal level, $votes_{other}$ is the total number of votes received by the non-UPA party with the most number of votes[9], and $votes_{total}$ is the total number of votes cast at the mandal level.[10] We define the $advantage$ term with respect to the UPA coalition because MGNREGS is a UPA flagship program and we expect that constituents will credit allocation under this program to the political coalition that brought it about. We use a list of those parties that provided both "weak" and "strong" support to the UPA coalition before the elections when specifying this variable.[11]

We test our vote buying hypothesis by looking at the relationship between $advantage$ in the 2004 election, which serves as a measure of known political climate in the mandal directly before the start of MGNREGS, and MGNREGS spending in the years leading up to the 2009 election. We examine the existence of vote buying by testing the joint null and alternative hypotheses:

$$H_O(1): \alpha_1 = \alpha_2 = 0$$
$$H_A(1): \alpha_1 \; or \; \alpha_2 \neq 0$$

when using the coefficient estimates from equation (2).

If these null hypotheses are rejected, then past electoral advantage is associated with spending patterns. We can then explore in which mandals the UPA coalition focused its vote buying efforts using two competing theories from the political science literature. One theory says

[9] Where UPA lost, this means the total votes from the winning party is used. Where UPA won, this means the total votes from the second place party is used.
[10] Our definition of "advantage" differs from the often-cited definition provided by Gelman and King (1990). Our variable is also called "margins" in some work, including Asher and Novosad (2013).
[11] In the 2004 election, the UPA coalition includes 11 parties in AP: INC, MUL, RPI(A), LJNSP, RJD, RPI, TRS, CPI, CPM, AIMIM, PRBP. In the 2009 election, the coalition includes 6 parties in AP: INC, AIMIM, BSP, RJD, JD(S), SP. Independent candidates are considered non-UPA supporters throughout.

that political leaders should focus on "swing vote" areas over areas of loyalists (Dixit and Londregan 1996; Downs 1957; Lindbeck and Weibull 1987). If vote buying in "swing vote" areas is present, we expect the relationship between MGNREGS funding and UPA coalition advantage in 2004 to follow an inverted-U pattern, whereby those areas that did not strongly vote for or against UPA in 2004 would be "encouraged" to vote for UPA in 2009 using MGNREGS funds, while those areas that voted strongly for or against UPA in 2004 would be relatively under-resourced since they are more likely to continue to vote for or against UPA in 2009 regardless of MGNREGS allocations. Therefore, we first test the following joint null and alternative hypotheses using equation (2):

$$H_O(2): \alpha_1 = \alpha_2 = 0$$
$$H_A(2): \alpha_1 > 0, \alpha_2 < 0$$

If we can reject the joint null, the second necessary condition for the swing vote theory to hold is that the maximum of the marginal expenditure function falls within a narrow swing voting range:

$$H_O(3): \frac{-\alpha_1}{2\alpha_2} = h$$
$$H_A(3): \frac{-\alpha_1}{2\alpha_2} \neq h$$

where h is a level of $advantage$ that falls within a swing vote interval $[\underline{h}, \overline{h}]$. Because we find no consensus in the political science literature about how this range is defined, we separately test using swing vote intervals of $[-0.05, 0.05]$ and $[-0.02, 0.02]$, offering looser and tighter bounds for robustness.

The second theory of vote buying stresses that risk averse politicians may decide to solidify the votes of their core supporters by, instead, focusing their fund allocation tactics where they have won in the past (Cox and McCubbins 1986). There is good reason to believe this may be a better hypothesis in India where voters are historically unlikely to re-elect incumbent politicians, meaning UPA may want to ensure the support of those voters who previously elected them. We conclude that vote buying in core supporter areas is present if we can reject the joint null:

$$H_O(4): \alpha_1 = \alpha_2 = 0$$
$$H_A(4): \alpha_1 > 0, \alpha_2 \geq 0$$

and, if there is an inflection point, where it reaches beyond the chosen swing vote ranges:

$$H_O(5): \frac{-\alpha_1}{2\alpha_2} = \bar{h}$$
$$H_A(5): \frac{-\alpha_1}{2\alpha_2} > \bar{h}$$

Because it may be the case that mandals with high levels of $advantage$ differ in unobserved ways from mandals with lower levels of $advantage$, and perhaps in a way that is correlated with $MGNREGS$, we first estimate our model using ordinary least squares (OLS) then using a series of instrumental variables (IVs) to test the robustness of our results. Given evidence that voters in India punish incumbent politicians, which would not be the UPA coalition before 2004, for rainfall events beyond their control (Cole et al. 2013) and reports that farmers, reliant on good and consistent rainfall, were instrumental in the UPA's 2004 victory in Andhra Pradesh (Rao and Suri 2006; *The Hindu* 2004), we include a rainfall shock variable for the total year and the main *rabi* season in the fiscal year preceding the election. While conceptually well-correlated with the $advantage$ of the UPA in 2004, there is no reason to believe that rainfall events of 2003 would affect MGNREGS implementation starting three years later. Following analysis on the Peruvian Social Fund by Schady (2000), we also include lagged $advantage$ from the previous elections in 1999. Past election results are expected to be good predictors of current election outcomes, but should not influence MGNREGS implementation and expenditures several years later, following a subsequent election. Moreover, the UPA coalition was not formed until 2004, so we use the 2004 UPA coalition parties to create a hypothetical UPA $advantage$ for 1999, another argument for the exogeneity of this instrument.[12]

[12] Because both $advantage$ and $advantage^2$ may be endogeneous, we also create a squared term in our IV regressions by predicting the endogenous variable in our first stage regression, then use the square of the predicted term as an IV following suggestions in Wooldridge (2010) in order to avoid a forbidden regression.

4.2 Patronage effects

Because the UPA coalition won reelection at the state and national level in 2009, we then investigate the extent to which patronage effects affected MGNREGS spending levels in the years after 2009, namely 2010/11, 2011/12, and 2012/13.[13] We rely on three model specifications, the first of which is equation (2) where the $advantage$ term and related elections controls are updated with the results of the 2009 elections. Using these estimates, we perform a weak test for the presence of patronage by investigating the relationship between the new $advantage$ term and MGNREGS spending in the years after the elections. We conclude that patronage was present in the post-2009 election years where we can reject the joint null in favor of the alternative:

$$H_O(6): \alpha_1 = \alpha_2 = 0$$
$$H_A(6): \alpha_1 \; or \; \alpha_2 \neq 0.$$

As a stronger test, unlike the inverted-U shape to the relationship between $advantage$ and fund allocation underlying our vote buying hypotheses, the patronage hypothesis implies the relationship between $advantage$ and MGNREGS spending after the 2009 election should be monotonically increasing in $advantage$, where mandals with the highest levels of $advantage$ receive the most MGNREGS funds, all else equal, as a reward for their voting behavior. This can be tested with a follow-on hypothesis:

$$H_O(7): \alpha_1 = \alpha_2 = 0$$
$$H_A(7): \alpha_1 \geq 0, \alpha_2 \geq 0, with \; at \; least \; one \; strict \; inequality$$

In the presence of patronage, we also expect that those areas that did not vote for UPA in 2004 but did in 2009 were "rewarded" with MGNREGS spending after the 2009 election, implying that the UPA coalition considers changes in voting patterns over time when making

[13] As the 2009 election happened at the very beginning of the 2009/10 fiscal year, is uncertain how MGNREGS spending in that year would have been affected by the election, especially since most of the allocation decisions should have been made before the start of the fiscal year. Furthermore, 2009/10 was a drought year and was characteristic of widespread political upheaval following the death of YSR and the resurgence of the Telangana movement. For all of these reasons, we exclude the 2009/10 MGNREGS spending from our analysis.

decisions about fund allocation and spending. We also expect that those areas that voted for the UPA in 2004 but not in 2009 were "punished" by receiving less funds, all else equal. Our second model incorporates changes in voting patterns between the 2004 and 2009 elections, allowing us to focus specifically on MGNREGS expenditures in the post-2009 election years. In particular, we group mandals into four categories— $winwin$ includes those mandals that elected the UPA coalition in both 2004 and 2009; $losewin$ includes mandals where UPA lost in 2004 but won in 2009; $winlose$ includes mandals where UPA won in 2004 but lost in 2009; and $loselose$ includes mandals where UPA lost in both elections—and specify a final model as:

$$MGNREGS_{idt} = \beta_1 losewin_{id} + \beta_2 winlose_{id} + \beta_3 loselose_{id} + \beta_4 needs_{id} + \beta_5 needs_{idt} + \beta_6 z_{idt} + \mu_d + \tau_t + \varepsilon_{idt} \quad (4)$$

where $winwin$ is the excluded group. Using these coefficient estimates, we test another set of patronage-related hypotheses:

$$H_O(8): \beta_1 = \beta_2 = \beta_3 = 0$$
$$H_A(8): \beta_1 > \beta_2,\ \beta_1 > \beta_3,\ \beta_2 < 0,\ \beta_3 < 0$$

Like the pre-2009 years, we may be concerned about the endogeneity of the $advantage$ term in equation (2) or the categories described in equation (4) and, therefore, the likelihood that we can truly identify the patronage relationship in a model estimated with OLS in the post-2009 election years. Unfortunately, the instruments used in the pre-2009 election years are not relevant in the post-2009 election years and using similar but updated instruments applicable to the 2009 elections is not a convincing strategy since MGNREGS was already in progress and lagged rainfall and elections variables are likely correlated with post-2009 MGNREGS expenditures. Instead, we rely on two other identification methods as robustness checks. First, we investigate the extent to which regression discontinuity design (RDD) (with potential discontinuity at $advantage = 0$) is a feasible strategy to cleanly identify the effect of electing a UPA coalition member in 2009 on MGNREGS spending in the post-2009 years. A similar strategy is employed by Asher and Novosad (2013) who also use Indian election data but for the purpose of isolating the effect on local economic growth outcomes. Second, we use a first difference approach by

estimating a third model specification that describes how a continuous change in voting patterns between the 2004 and 2009 elections might affect the change in aggregate MGNREGS spending before and after the 2009 elections:

$$\Delta MGNREGS_{id} = \gamma_1 \Delta advantage_{id} + \gamma_2 needs_{id} + \gamma_3 z_{id} + \rho_p + \varepsilon_{id} \quad (5)$$

where $\Delta advantage$ is the difference in UPA $advantage$ between 2009 and 2004 elections and $\Delta MGNREGS$ is the difference in total $MGNREGS$ spending between aggregate 2010/11-2012/13 and aggregate 2006/07-2008/09. This first difference method allows us to eliminate any mandal-level fixed effects, lessening concerns about endogeneity. We also include phase dummies, ρ_p, in this specifications since the phase in which a mandal was placed will directly influence total expenditures in the pre-2009 election period and, therefore, the change in spending between the two time periods. With this specification, we can test nearly identical patronage hypotheses as those denoted in $H_O(6)$ and $H_O(7)$:

$$H_O(9): \gamma_1 = 0$$
$$H_A(9): \gamma_1 > 0$$

4.3 Needs-based targeting

Strictly, MGNREGS is a "right to work" program, not an anti-poverty program, meaning the government does not necessarily target funds so much as approve, oversee, and possibly manipulate how funds are spent. In theory, however, self-targeting implies that expenditures should be concentrated in poorer areas where reservation wages are lower and where infrastructure is less developed. While the government is not tasked with allocating funds based on specified criteria as in many other public programs, we refer to and test for the presence of what we generically refer to as "needs-based targeting" using a series of variables that describe the state of the population of the mandal before MGNREGS began. While the needs of individuals and their communities may change once benefiting from MGNREGS, creating an issue of endogeneity in estimation, we use decisively exogenous baseline characteristics from before MGNREGS implementation began for all static needs variables so as to overcome this potential issue.

We arrive at a list of variables that together encapsulate the "needs" of a mandal through several means. First, we refer partially to the task force report written by the Government of India Planning Commission (2006) which describes how districts are identified and targeted for wage employment schemes, allowing us to create variables that mimic, to a large extent, or act as proxies for this list, doing so at the mandal-level instead.[14] Second, because we are interested to study which groups have their needs considered when dispersing MGNREGS funds, especially cultivators versus (typically worse off) agricultural laborers, we include a number of variables that seek to describe the distribution of land and workers within the mandal. The variables we include describe population characteristics, the type and distribution of land within, and the infrastructure status of the mandal. We therefore find evidence of needs-based targeting if we can reject the null hypotheses:

$$H_O(10): \alpha_3 = 0$$
$$H_A(10): \alpha_3 > 0$$

using coefficient estimates from equation (2), and:

$$H_O(11): \beta_4 = 0$$
$$H_A(11): \beta_4 > 0$$

using coefficient estimates from equation (5), and where the needs variables are all ordered such that higher values indicate higher needs. We also want to identify which needs appear most strongly associated with receipt of MGNREGS funds.

Further, we wish to understand to what extent MGNREGS accommodates the time-varying needs of the mandal, serving as a safety net against shocks, not just as a pro-poor transfer. AP is an agriculturally important and drought vulnerable state, therefore variation in rainfall levels over time is expressly important to households deriving some part of their income from agricultural cultivation or labor. In periods when rainfall is particularly bad, MGNREGS spending may increase to account for the resulting surplus of under-employed agricultural

[14] This report describes the following criteria as essential for selection of a district as needy: incidence of poverty, unemployment rate, agricultural wage rate, per hectare agricultural productivity, productivity per agricultural worker, SC/ST population, drought-proneness and desert-proneness, and rural connectivity.

laborers if the needs of agricultural labors are truly considered.[15] Similar to Paxson (1992), we create a rainfall shock variable for each of the two important seasons, *kharif* and *rabi*, that describes how many standard deviations from long-term average the current season rainfall level is.[16] Using the same two model specifications, we conclude that MGNREGS accommodates the time-varying needs of the mandal if we can reject the null hypotheses:

$$H_O(12): \alpha_4 = 0$$
$$H_A(12): \alpha_4 > 0$$

and

$$H_O(13): \beta_5 = 0$$
$$H_A(13): \beta_5 > 0$$

where, as before, needs variables are ordered such that increasing values correspond with greatest need.

4.4 Political reward for MGNREGS spending

Because the UPA won re-election in 2009, there is good reason to believe that MGNREGS fund allocation played some role in their victory. While not the central focus of our analysis, considering the relationship in this direction will add support for or against a growing body of literature linking the UPA's performance in the 2009 election with this program in particular (Elliott 2011; Ramani 2009; Zimmermann 2012a). Moreover, if we are able to reject the null hypotheses that vote buying in the pre-election years was not present, then this test will help us to understand to what extent vote buying "worked" for the UPA coalition. To investigate the link between MGNREGS fund allocation and voter response in 2009, we estimate the following model as a cross section:

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[15] In India, there is also a process by which mandals are declared "drought stricken" and receive government funds, including more MGNREGS funds, to help with the short term crisis conditions. In AP, over 800 mandals were declared in drought in 2005, over 200 in 2006, nearly 1,000 in 2009, over 900 in 2011, and over 200 in 2012 fiscal years. However, because a government body, the Ministry of Rural Development, is in charge of these declarations and because the criterion for declaration are somewhat loosely defined, we expect politics may be a contributing factor in the decision and therefore do not consider this declaration in our analysis.

[16] This methodology is also similar to that employed by Dasgupta (2013) in a study of the effect of MGNREGS on buffering childhood nutrition outcomes when drought conditions hit AP.

(6) $$\Delta advantage_{id} = \delta_1 MGNREGSsum_{id} + \delta_2 needs_{id} + \delta_3 z_{id} + \mu_d + \varepsilon_{id}$$

where $\Delta advantage$ is the difference in voting advantage of the UPA coalition between the 2009 and 2004 elections and $MGNREGSsum$ is the total program funds spent in the mandal in and before 2008/09. We conclude that there is evidence that MGNREGS expenditures are positively correlated with a shift in voters towards the UPA coalition by testing the hypothesis:

$$H_O(14): \delta_1 = 0$$
$$H_A(14): \delta_1 > 0$$

Because it may be the case that voters view their local level incumbent part at the implementers of MGNREGS and, therefore, reward that party instead of the UPA coalition with their votes in 2009, we also run equation (6) by redefining the $\Delta advantage$ term with respect to the local level incumbent party for comparison. Where $H_O(14)$ holds for the UPA coalition but not for the local level incumbent party, we take this as *ex post* empirical evidence to accompany much qualitative evidence that we correctly define our analysis with respect to the UPA coalition.

5. Data

The data used in this analysis come from a range of publically available sources. Because the written names of mandals and districts are often the unique observation in the underlying data sets, we successfully merged all data manually for 1,061 mandals from 22 districts in AP, about 96 percent of the 1,109 rural mandals found in these 22 districts in the Indian Population Census of 2001.[17] Definitions, data sources, and summary statistics for all of the variables used in our analysis can be found in Table 1.

[17] There are 23 districts in AP; however, Hyderabad, the capital of the state, is excluded because it is an entirely urban district and therefore should not benefit from MGNREGS.

Table 1: Definitions, data sources, mean, and standard deviations of variables used in analysis

Variable name	Variable description	Data source	Phase 1 (n=639)	Phase 2 (n=297)	Phase 3 (n=125)	All mandals (n=1,061)
MGNREGS	Total spent (in 1000 Rs) by MGNREGS (total tech and admin) at the mandal level per capita in each fiscal year (2006/07 – 2012/13)	MGNREGS AP website and Indian Population Census 2001	0.59 (0.44)	0.48 (0.45)	0.35 (0.41)	0.54 (0.45)
MGNREGS change	Difference between aggregate MGNREGS spending (total tech and admin) at the mandal level per capita between 2010/11-2012/13 and 2006/07-2008/09	MGNREGS AP website and Indian Population Census 2001	1.1 (1.0)	1.2 (1.1)	1.2 (1.2)	1.2 (1.1)
Clientelism (vote buying and/or patronage)						
UPA advantage in 2004	Percent of votes between UPA and winner or second place party if UPA lost or won election (2004), respectively (range -1 to 1) $advantage_{UPA} = \frac{votes_{UPA} - votes_{other}}{votes_{total}}$	Election Commission of India	0.07 (0.18)	0.08 (0.12)	0.02 (0.13)	0.07 (0.16)
UPA advantage in 2009	Percent of votes between UPA and winner or second place party if UPA lost or won election (2009), *see above for definitions*	Election Commission of India	-0.01 (0.12)	0.02 (0.08)	-0.01 (0.06)	-0.002 (0.11)
UPA advantage change	Difference between UPA advantage in 2009 and 2004	Election Commission of India	-0.08 (0.22)	-0.06 (0.14)	-0.06 (0.15)	-0.06 (0.19)
UPA support category	Binary variable for mandal elected UPA in both 2004 and 2009 (winwin)	Election Commission of India	0.37 (0.48)	0.51 (0.50)	0.38 (0.49)	0.41 (0.49)
	Binary variable for mandal elected UPA in 2009 but not 2004 (losewin)	Election Commission of India	0.13 (0.34)	0.12 (0.33)	0.10 (0.30)	0.13 (0.33)
	Binary variable for mandal elected UPA in 2004 but not 2009 (winlose)	Election Commission of India	0.39 (0.49)	0.32 (0.47)	0.42 (0.50)	0.38 (0.49)
	Binary variable for mandal did not elect UPA in either 2004 or 2009 (loselose)	Election Commission of India	0.10 (0.30)	0.04 (0.20)	0.10 (0.30)	0.08 (0.28)
Needs of mandal: labor-related						
SC/ST caste (%)	Percent of people in mandal from either SC or ST castes	Indian Population Census 2001	28.5 (13.1)	26.2 (12.1)	24.8 (17.4)	27.4 (13.4)
Illiterate (%)	Percent of people in mandal classified as illiterate	Indian Population Census 2001	56.4 (8.0)	51.2 (8.7)	45.5 (10.4)	53.7 (9.3)
Agricultural laborers (%)	Percent of people in mandal classified as mainly agricultural laborers	Indian Population Census 2001	15.1 (5.0)	20.0 (6.2)	20.4 (7.0)	17.1 (6.2)
Cultivators (%)	Percent of people in mandal classified as mainly cultivators	Indian Population Census 2001	16.0 (5.4)	11.0 (5.0)	9.5 (6.8)	13.8 (6.1)
Needs of mandal: land-related						
Unirrigated land (%)	Percent of gross cropped area not under irrigation in mandal	Indian Agricultural Census 2005/06	57.3 (30.7)	52.9 (31.3)	35.5 (31.8)	53.5 (31.7)
Landholdings that are small/marginal (%)	Percent of total operational landholdings in mandal that are ≤2 hectares	Indian Agricultural Census 2005/06	49.7 (13.4)	54.8 (16.4)	62.1 (13.7)	52.6 (13.7)
Land gini coefficient	Computed gini coefficient of land holding size classes using categorical variables at mandal level	Indian Agricultural Census 2005/06	0.48 (0.05)	0.47 (0.04)	0.48 (0.04)	0.48 (0.05)
Long run average yearly rainfall rate (mm/hr)	Average estimated annual precipitation rate (mm/hr) in the mandal, 2000-2012	NASA	0.11 (0.02)	0.11 (0.02)	0.13 (0.01)	0.11 (0.02)
Needs of mandal: infrastructure-related						
Number of ag credit societies (in 1000s)	Total number of agricultural credit societies across all villages in mandal	India Village Amenity Survey 2001	4.5 (4.3)	6.5 (4.7)	9.0 (8.5)	5.6 (5.3)

Variable name	Variable description	Data source	Phase 1 (n=639)	Phase 2 (n=297)	Phase 3 (n=125)	All mandals (n=1,061)
Villages with medical facilities (%)	Population-weighted percent of villages in mandal with medical facilities	India Village Amenity Survey 2001	0.82 (0.17)	0.83 (0.17)	0.84 (0.15)	0.83 (0.17)
Villages with paved road (%)	Population-weighted percent of villages in mandal with a paved access road	India Village Amenity Survey 2001	0.84 (0.21)	0.93 (0.14)	0.90 (0.17)	0.87 (0.19)
Distance to nearest town from village	Population weighted average distance from villages to nearest town across all villages in mandal	India Village Amenity Survey 2001	34.8 (21.6)	29.4 (19.9)	32.5 (27.7)	33.0 (22.1)
Needs of mandal: rainfall-variability						
Kharif season rain less than average	Binary variable for rainfall in current kharif season was less than average across 2001-2012 (June – Oct)	NASA	0.46 (0.50)	0.49 (0.50)	0.36 (0.48)	0.46 (0.50)
Kharif season rainfall shock	Absolute value of rainfall shock in current kharif season, constructed using estimated precipitation rate (mm/hr) in the mandal (June-Oct) $\lvert rain\ shock_t \rvert = \frac{\lvert rainfall_t - rainfall_{mean} \rvert}{rainfall_{sd}}$	NASA	0.65 (0.73)	1.1 (1.0)	1.0 (0.71)	0.82 (0.85)
Rabi season rain less than average	Binary variable for rainfall in current rabi season was less than average across 2001-2012 (Nov – Feb)	NASA	0.50 (0.50)	0.39 (0.49)	0.34 (0.47)	0.45 (0.50)
Rabi season rainfall shock	Absolute value of rainfall shock in current rabi season, constructed using estimated precipitation rate (mm/hr) in the mandal (Nov- Feb), *see kharif for definition*	NASA	0.78 (0.72)	0.62 (0.54)	0.74 (0.51)	0.73 (0.66)
Election controls						
Voter turnout in 2004 election (%)	Percent of eligible voters that voted in 2004 AC election	Election Commission of India	72.5 (6.0)	74.1 (5.6)	77.2 (5.1)	73.5 (6.0)
Voter turnout in 2009 election (%)	Percent of eligible voters that voted in 2009 AC election	Election Commission of India	75.6 (6.0)	76.7 (5.0)	82.5 (6.4)	76.7 (6.2)
SC/ST reserved election in 2004 (1=yes)	2004 AC election was reserved for SC or ST castes	Election Commission of India	0.24 (0.43)	0.19 (0.39)	0.28 (0.45)	0.23 (0.42)
SC/ST reserved election in 2009 (1=yes)	2009 AC election was reserved for SC or ST castes	Election Commission of India	0.32 (0.47)	0.23 (0.42)	0.31 (0.47)	0.30 (0.46)
Mandal split between two ACs in 2004	Binary variable for whether or not mandal is split between two AC districts in 2004	Election Commission of India	<0.01 (0.07)	0 (0)	0.02 (0.07)	<0.01 (0.07)
Mandal split between two ACs in 2009	Binary variable for whether or not mandal is split between two AC districts in 2009	Election Commission of India	0.05 (0.23)	0.09 (0.29)	0.09 (0.28)	0.07 (0.25)
New or abolished AC	AC was new or abolished in 2008 redistricting	Election Commission of India	0.26 (0.44)	0.28 (0.45)	0.29 (0.45)	0.27 (0.44)
Instrumental variables for pre-2009 models						
Full fiscal year rainfall shock in 2003	Actual rainfall shock during 2003 fiscal year, constructed using estimated precipitation rate (mm/hr) in the mandal, *see above for definition*	NASA	-0.33 (0.58)	-0.61 (0.56)	-0.18 (0.29)	-0.39 (0.56)
Rabi season rainfall shock in 2003	Actual rainfall shock during 2003 rabi season, constructed using estimated precipitation rate (mm/hr) in the mandal, *see above for definition*	NASA	0.05 (0.74)	-0.35 (0.40)	0.21 (0.42)	-0.04 (0.66)
UPA advantage in 1999	Percent of votes between hypothetical UPA and winner or second place party if UPA lost or won election (1999), constructed using UPA coalition parties in 2004 election, *see above for definitions*	Election Commission of India	-3.2 (14.3)	-8.2 (13.2)	-7.9 (9.5)	-5.2 (13.7)

Note: Standard deviations in parentheses. See Section 5 for more details.

One major feature of the MGNREGS program is the pursuit of transparency. To that end, all administrative information about which projects are funded, how many person days are associated with the work, and the amount spent on these projects is available online.[18] Website management is handled at the state level, with data input directly from the mandal administration. While one may question the quality of government-reported project data, a major report on public works projects around the world praises the information technology system implemented by AP in particular (Subbarao et al. 2013), providing strong evidence that we need not be terribly skeptical of the data quality. We downloaded reports from the website, which include the total amount spent per fiscal year (April-March) at the mandal level, our variable of interest. We standardize the total spent in each mandal by the rural population size (using the population census described later) to estimate MGNREGS spending per capita per mandal.

Most of the time-invariant, needs-based variables come from the Indian Population Census from 2001, Indian Agricultural Census from 2005/06, and Indian Village Amenities Census from 2001, all of which were collected before the start of MGNREGS and act as a suitable baseline. Because MGNREGS is a program focused on rural employment, we limit our variables to population and land values that are observed only in rural areas, where possible. The time-varying, needs-based variables, all functions of observed rainfall levels across the two important rainfall seasons, *kharif* and *rabi*, are derived from geospatial data sets linked to mandal-level boundaries. In addition to these contemporaneous variables, we also include a measure of average yearly rainfall levels over a recent twelve year timeframe as a control for the agricultural potential of the area. On average across all mandals, 2009/10 and 2011/12 were below average *kharif* seasons while 2007/08 and 2011/12 were below average *rabi* seasons.

All elections outcome data were aggregated from various documents made available by the Election Commission of India, which includes number of votes by candidate and party for both the 2004 and 2009 elections. We utilize the assembly constituency (AC) level election results—as opposed to local level election or parliamentary constituency election results—for a number of reasons: (i) the state, led by the Members of the Legislative Assembly (MLAs), has ultimate implementation authority under MGNREGS, (ii) MLAs, elected via the assembly constituency elections, in Andhra Pradesh influence MGNREGS implementation via pressure on

[18] We downloaded mandal level spending data by fiscal year from the MGNREGS website for Andhra Pradesh (http://MGNREGA.ap.gov.in) from the "report" section (reports/reports general/R1.6). All data was downloaded on 11 September 2013.

and oversight of Field Assistants hired by the Mandal Parishad Development Officer (MPDO), and (iii) the importance of the Field Officer role in Andhra Pradesh means that locally elected officials play a much more marginal role than envisioned in the design of the program and perhaps in other states (Maiorano 2014). An assembly constituency can have several mandals in each and, therefore, we assign the results of the AC election to each component mandal in order to proceed with analysis at the mandal level. The UPA advantage variables, as described in equations (3) and (4), are created from these data. See Figure A1 in the Appendix for more details on the distribution of the advantage term across all mandals for both elections.

While the advantage variable is our main covariate of interest, we include as controls a number of variables that seek to capture the idiosyncrasies of the AC elections. Because the AC boundaries and mandal boundaries are not always identical, we control for those cases where a mandal is split between two ACs. Moreover, because we are interested in mandal-level MGNREGS expenditures, we collapse election results to the mandal level by taking a population-weighted average across the two ACs. To complicate matters, some AC boundaries were redrawn in 2008, between the 2004 and 2009 elections. We therefore control for those cases where mandals contain a new or abolished AC in the regressions involving changes in UPA advantage over time. Another feature of Indian elections is the presence of "reserved" elections where elected positions are set aside for scheduled castes and tribes (SC/STs). We control for the incidence of a reserved election in a given election year.[19] Finally, because voter turnout may be an indicator of voter awareness in India (Mookherjee 2012), we also include this value as a control.[20]

6. Results

In the following sections, we test our hypotheses related to the determinants of MGNREGS fund allocation in the pre-2009 and post-2009 project implementation years and voter response to MGNREGS expenditures in the 2009 election.

[19] Bardhan and Mookherjee (2012) find that clientelism in public service provision increased at the same time that targeting performance increased under SC/ST reservation elections in West Bengal.
[20] Nichter (2008) goes further to suggest that politicians "buy" turnout instead of explicit votes since it impossible to monitor voting behavior in a secret ballot environment.

6.1 Vote buying (pre-2009)

First we test our set of hypotheses related to the UPA's use of MGNREGS funds in the initial years of the program to buy votes for their 2009 re-election by estimating equation (2) for pre-2009 election years. Due to the phase in of the program, we ensure that only those mandals eligible for MGNREGS funds in a particular year are included in the relevant fiscal year cross section: phase 1 mandals in 2006/07, phase 1 and 2 mandals in 2007/08, and all mandals eligible in 2008/09.[21] Because mandals in phase 3 only started to receive MGNREGS funds directly before the 2009 election, our discussion related to pre-2009 election spending is most relevant to phase 1 and 2 mandals.

The estimation results for equation (2) in the pre-2009 years are presented in Table 2. The absence of statistical significance on both the linear and quadratic $advantage$ terms and the lack of joint significance of these terms mean we fail to reject the null hypothesis $H_O(1)$ that politics played no part in MGNREGS fund allocation, implying that vote buying was not present before the 2009 election. These results not only hold with an OLS estimator, but also when controlling for potential endogeneity using our three alternate IV specifications. The fact that our results do not change when including instruments that hold up under a number of diagnostic test lends credence to the claim that the endogeneity of the $advantage$ term does not influence our OLS results. Even so, our inability to reject $H_O(1)$ means that there is no need to look more closely at which areas—swing vote or core supporter—were more likely to be the focus of vote buying efforts, as described in $H_O(2)$ through $H_O(5)$.

[21] It should be noted, however, that we do observe several "out of phase" mandals receiving MGNREGS funds a years before they should. This includes 6 phase 2 mandals in 2006/07 and 68 phase 3 mandals in 2007/08. While there could be political economy reasons for early phase in, this paper does not concern itself with that dimension.

Table 2: Regression results for MGNREGS expenditure models, pre-2009 election

	(1) OLS	(2) IV-1	(3) IV-2	(4) IV-3
UPA advantage in 2004 election	-0.0151	-0.296	-0.0847	-0.110
	(0.0439)	(0.232)	(0.198)	(0.177)
UPA advantage in 2004 election squared	-0.0108	0.114	-0.844	-0.337
	(0.147)	(0.529)	(0.614)	(0.516)
SC/ST caste (%)	0.000643	0.000686	0.000343	0.000525
	(0.000839)	(0.000856)	(0.000858)	(0.000856)
Illiterate (%)	0.00444***	0.00289*	0.00430***	0.00402***
	(0.00108)	(0.00169)	(0.00148)	(0.00144)
Agricultural laborers (%)	0.00308**	0.00288**	0.00324**	0.00310**
	(0.00136)	(0.00141)	(0.00139)	(0.00138)
Cultivators (%)	0.00200	0.00235	0.00240	0.00225
	(0.00162)	(0.00173)	(0.00170)	(0.00168)
Unirrigated land (%)	0.000773***	0.000573*	0.000742***	0.000713***
	(0.000244)	(0.000303)	(0.000274)	(0.000268)
Landholdings that are small/marginal (%)	-0.00305***	-0.00338***	-0.00299***	-0.00310***
	(0.000787)	(0.000831)	(0.000812)	(0.000802)
Land gini coefficient	-0.502***	-0.483***	-0.530***	-0.510***
	(0.162)	(0.162)	(0.163)	(0.161)
Long run average yearly rainfall rate (mm/hr)	1.596**	1.446*	1.235	1.407*
	(0.790)	(0.852)	(0.874)	(0.837)
Number of ag credit societies (in 1000s)	-0.00625***	-0.00655***	-0.00615***	-0.00628***
	(0.00143)	(0.00155)	(0.00155)	(0.00150)
% of villages with medical facilities	-0.170***	-0.187***	-0.179***	-0.177***
	(0.0500)	(0.0521)	(0.0532)	(0.0515)
% of villages with paved road	-0.0624*	-0.0662*	-0.0766**	-0.0693*
	(0.0345)	(0.0360)	(0.0373)	(0.0357)
Distance to nearest town from village	0.00106***	0.00111***	0.00107***	0.00107***
	(0.000297)	(0.000311)	(0.000307)	(0.000303)
Kharif season rain less than average (1=yes)	0.0324***	0.0342***	0.0306**	0.0320***
	(0.0121)	(0.0125)	(0.0125)	(0.0124)
Kharif less than average * rain shock (abs value)	0.0331***	0.0306***	0.0327***	0.0323***
	(0.0106)	(0.0109)	(0.0110)	(0.0109)
Rabi season rain less than average (1=yes)	0.0230*	0.0213*	0.0211*	0.0218*
	(0.0124)	(0.0125)	(0.0125)	(0.0123)
Rabi less than average * rain shock (abs value)	-0.0300	-0.0266	-0.0258	-0.0274
	(0.0183)	(0.0183)	(0.0184)	(0.0181)
Voter turnout in 2004 election (%)	-0.00172	-0.00128	-0.00221*	-0.00182
	(0.00121)	(0.00124)	(0.00123)	(0.00120)
SC/ST reserved 2004 election (1=yes)	0.0194	0.0256*	0.0156	0.0192
	(0.0149)	(0.0153)	(0.0150)	(0.0148)
Split between ACs in 2004 election (1=yes)	-0.0948**	-0.0562	-0.0493	-0.0664
	(0.0388)	(0.0582)	(0.0564)	(0.0499)
Year dummy variables	Y	Y	Y	Y
District dummy variables	Y	Y	Y	Y
Observations	2,570	2,570	2,570	2,570
R-squared	0.494	0.478	0.481	0.490
Joint signif. of "vote buying" variables (p-value)	0.9418	0.3954	0.3887	0.6739
Under-identification test (F-value, p-value)	-	30.859 (0.000)	23.962 (0.000)	45.755 (0.000)
Over-identification test (Hansen J stat., p-value)	-	2.682 (0.1015)	-	3.320 (0.1902)

Notes: All reported results are estimated per Equation 2. Standard errors, shown in parentheses, are clustered at the mandal level (i=1,061). Pre-2009 years include 2006/07, 2007/08, and 2008/09. *** p<0.01, ** p<0.05, * p<0.1. The results remain largely the same when using phase dummy variables instead of district dummy variables (especially with respect to key election variables). Included IV specifications include: (1) total fiscal year rainfall shock from 2003 and rabi rainfall shock from 2003; (2) UPA advantage in 1999 AC election; (3) total fiscal year rainfall shock from 2003, rabi rainfall shock from 2003, and UPA advantage in 1999 AC election. All IV specifications also include a squared predicted value from the regression in Table A2 in the Appendix. See text for more details on how these variables were constructed.

Because we might expect that the fiscal year directly before the 2009 election (2008/09) may have been characterized by more vote buying than the earlier fiscal years, we estimate equation (2) on separate cross sections by fiscal year (Table A4 in Appendix) but still find no individual year when we could reject the null hypothesis of no vote buying. Moreover, because it

may be the case that the INC party instead of the full UPA coalition used MGNREGS funds for vote buying purposes, we also re-estimate equation (2) using an $advantage$ term specific to INC (Table A3 in Appendix) but still find no independent or joint significance of our $advantage$ term. Because of concerns that the politics surrounding the Telangana succession effort may be driving some of our results, we also drop the Telangana districts from our sample and re-estimate equation (2) on the limited sub-sample (Table A3 in Appendix).[22] In this case, we do find that the coefficient estimate on the squared $advantage$ term is negative and statistically significant and that the coefficient estimates on both $advantage$ terms are jointly significant at the five percent level. However, we do not find that the estimated average partial effect of the $advantage$ term is positive or significant. Taken together, the weight of evidence across all model specifications implies that the claim of overt vote buying by the UPA coalition leading up to the 2009 election cannot be substantiated in our data.

6.2 Patronage (post-2009)

We then test our second set of hypotheses describing the extent to which MGNREGS expenditures in the post-2009 election period, after the UPA coalition won a decisive victory in AP and during which all areas were entitled to benefits under the program, were rooted in patronage. The results from three model specifications—equations (2), (4), and (5)—using post-2009 data are reported in Table 3.

We test $H_O(6)$ using the set of regression results in column 1. Indeed, in this case, we reject (at the one percent level) the null hypotheses that the $advantage$ of the UPA coalition in the 2009 election is not related to MGNREGS expenditure in the years after the election. This null hypothesis is also rejected for each year when estimating separately by fiscal year (Table A5 in Appendix), meaning the effects cannot be attributed to any one of the three post-election years in particular. The results also hold when using an $advantage$ term specific to the INC coalition and when dropping the Telangana districts (Table A3 in Appendix). Not only that but, when returning to the estimates in Table 3, we are also able to reject the stronger null hypothesis, $H_O(7)$, in favor of the alternative that the $advantage$ relationship is monotonically increasing, implying no tapering effects at the highest end of the $advantage$ distribution. This same

[22] There are 10 Telangana districts, but 1 is Hyderabad. All 9 of the districts with rural mandals fall in phase 1. The non-Telangana district sample includes 630 mandals.

relationship holds with the INC specification, although not with the non-Telangana districts. In this case, we do observe a negative and statistically significant squared term, although the inflection point is at an $advantage$ level of 0.31, above which we find only 7 of the 630 mandals.

Over the full set of mandals, we estimate average partial effects of $advantage$ at 0.38 (significant at the 1 percent level), meaning a 1 percentage point increase in the $advantage$ of the UPA coalition in the 2009 election is correlated with about a 4 rupee per capita increase in annual MGNREGS expenditures in the years after the election (we estimate a very similar sized effect when using only the INC $advantage$ term). Given we observe an average MGNREGS allocation per capita of about 540 rupees in any given fiscal year (Table 1), this means that a 1 percentage point increase in UPA $advantage$ is correlated with a less than 1 percent increase in the total MGNREGS funds allocated to a given mandal in the post-election years, a magnitude that is only sizable when considering relatively high levels of UPA $advantage$ or mandals where per capita expenditure levels are much larger than average. While hypotheses testing provides solid evidence for the existence of patronage benefits, the magnitude and economic significance of these effects appears small on average.

With strong evidence that the UPA coalition considered their 2009 $advantage$ level when distributing MGNREGS funds to mandals, we move to test whether their standing in 2009 relative to the 2004 elections is also strongly associated with fund allocation. We test $H_O(8)$ using the coefficient estimates in column 2 of Table 3. Again, we reject the null hypothesis that mandals were treated the same way when grouping based on their change in voting patterns between 2004 and 2009. Indeed, the results of t-tests suggest that both of the groups that did not vote for UPA in 2009 ($loselose$ and $winlose$) were "punished" with less funds than were spent in mandals that elected a UPA candidate. We also find that those mandals that consistently did not vote for UPA ($loselose$) received significantly less funds than the group that switched from UPA supporters in 2004 to non-supporters in 2009 ($winlose$); however, the previously non-UPA mandals that moved towards the UPA in 2009 ($losewin$) were no more or less likely to receive more funds than those mandals that were consistent supporters ($winwin$). These findings provide weak evidence to suggest that the state level incumbent coalition did not necessarily consider their 2009 election results *relative to* the 2004 election when distributing MGNREGS

funds after the election. Patronage effects appear most related to the UPA's standing in 2009 alone.

In order to ensure our results hold up with controls for prospective endogeneity, we first explore the feasibility of regression discontinuity design methods. While regression discontinuity design is an attractive method where a discontinuity occurs at a discrete point, a key assumption in identification under this strategy is that a discontinuity occurs at a known threshold (Lee and Lemieux 2010). Using both local linear (non-parametric) regression under a range of bandwidths and global polynomial (parametric) regression approaches, we find no evidence of discontinuity at $advantage = 0$ (Figures A2 and A3 in Appendix) and therefore cannot rely on regression discontinuity in these data.[23] The fact that RDD is not a viable option for us, however, also helps to further substantiate our claim that the patronage effects are monotonically increasing with no jumps or inflection points within low "swing voter" ranges.

Instead of relying on RDD to confirm the tenability of our findings, we move to a first difference approach to test $H_O(9)$. As shown in columns 3 and 4 of Table 3, we find that a change in UPA $advantage$ between the 2004 and 2009 elections is positively and significantly related to a change in aggregate MGNREGS spending before and after the election when controlling for a range of other possible correlates and phase-fixed effects. Even more convincing is the fact that the average partial effects of the $\Delta advantage$ terms (0.35 and 0.37) are remarkably similar to the average partial effect of the $advantage$ term estimated in panel (0.38). Because differencing eliminates mandal-level fixed effects, we find the resemblance of these terms to lend further credibility to our post-2009 patronage claims.

[23] Under the few specifications where there appears to be any miniscule jump at $advantage = 0$, the economic significance of the jump is far too small to move forward with RDD analysis.

Table 3: Regression results for MGNREGS expenditure models, post-2009 election

	(1) Equation 2	(2) Equation 4	(3) Equation 5	(4) Equation 5
UPA advantage in 2009 election	0.378*** (0.104)	-	-	-
UPA advantage in 2009 election squared	0.290 (0.424)	-	-	-
UPA 2004=lose and UPA 2009=win	-	0.00948 (0.0338)	-	-
UPA 2004=win and UPA 2009=lose	-	-0.0634*** (0.0225)	-	-
UPA 2004=lose and UPA 2009=lose	-	-0.114*** (0.0320)	-	-
Change in UPA advantage between 2004 and 2009	-	-	0.354** (0.167)	0.370** (0.168)
SC/ST caste (%)	0.00405*** (0.00149)	0.00400*** (0.00150)	-0.00399 (0.00261)	-0.00467* (0.00283)
Illiterate (%)	0.00851*** (0.00172)	0.00850*** (0.00172)	0.0195*** (0.00401)	0.0190*** (0.00406)
Agricultural laborers (%)	0.000573 (0.00217)	0.000623 (0.00218)	-0.0128** (0.00504)	-0.0121** (0.00514)
Cultivators (%)	0.00983*** (0.00304)	0.0101*** (0.00298)	0.0355*** (0.00646)	0.0350*** (0.00649)
Unirrigated land (%)	0.00110** (0.000444)	0.00113** (0.000445)	0.00252** (0.00112)	0.00244** (0.00113)
Landholdings that are small/marginal (%)	-0.00445*** (0.00127)	-0.00447*** (0.00127)	-0.00807*** (0.00299)	-0.00816*** (0.00302)
Land gini coefficient	-0.839*** (0.278)	-0.858*** (0.274)	-0.155 (0.684)	-0.121 (0.686)
Long run average yearly rainfall rate (mm/hr)	3.272** (1.454)	3.323** (1.460)	18.93*** (1.996)	18.83*** (2.031)
Number of ag credit societies (in 1000s)	-0.0124*** (0.00289)	-0.0123*** (0.00283)	-0.0252*** (0.00591)	-0.0258*** (0.00595)
% of villages with medical facilities	-0.156** (0.0793)	-0.157** (0.0802)	-0.599*** (0.171)	-0.604*** (0.172)
% of villages with paved road	-0.0929 (0.0606)	-0.0837 (0.0605)	-0.0980 (0.155)	-0.0886 (0.156)
Distance to nearest town from village	0.00296*** (0.000561)	0.00309*** (0.000567)	0.00557*** (0.00137)	0.00557*** (0.00141)
Kharif season rain less than average (1=yes)	-0.0362* (0.0209)	-0.0353* (0.0210)	-	-
Kharif less than average * rain shock (abs value)	0.103*** (0.0156)	0.104*** (0.0158)	-	-
Rabi season rain less than average (1=yes)	0.00154 (0.0216)	-0.000478 (0.0216)	-	-
Rabi less than average * rain shock (abs value)	-0.232*** (0.0250)	-0.229*** (0.0248)	-	-
Voter turnout in 2009 election (%)	-0.00282 (0.00221)	-0.00247 (0.00223)	-	-
SC/ST reserved 2009 election (1=yes)	0.00675 (0.0238)	-0.00405 (0.0243)	-	-0.0751 (0.0765)
SC/ST reserved 2004 election (1=yes)	-	-	-	0.141* (0.0769)
Split between ACs in 2009 election (1=yes)	-0.0529 (0.0326)	-0.0546* (0.0329)	-	0.0814 (0.0637)
Split between ACs in 2004 election (1=yes)	-	-	-	-0.326 (0.403)
New or abolished AC in 2008 (1=yes)	-	-	-	-0.0952 (0.113)
Year dummy variables	Y	Y	-	-
District dummy variables	Y	Y	N	N
Phase dummy variables	N	N	Y	Y
Observations	3,183	3,183	1,039	1,039
R-squared	0.508	0.508	0.363	0.367
Joint signif. of "patronage" variables (p-value)	0.0011	0.0004	0.0348	0.0279

Notes: See text for definitions of variables used in panel (columns 1 and 2) and difference (columns 3 and 4) model specifications. Standard errors are shown in parentheses and are clustered at the mandal level (i=1,061) in the panel model. Post-2009 years include 2010/11, 2011/12, and 2012/13.

6.3 Needs

In this section we investigate our third set hypotheses that MGNREGS funds were allocated based on the needs of the mandal. With respect to the baseline (time-invariant) labor-related needs described in $H_O(10)$ and $H_O(11)$, we find that mandals with a higher percentage of illiterate individuals received more funds across all panel model specifications (Tables 2 and 3) but that areas with more scheduled caste and tribe (i.e., lower caste) households received more funds only in the post-2009 years. Because we expect that lower caste and illiterate individuals are likely to require assistance through government programs like MGNREGS on account of their relative poverty and employment levels, these findings suggest that MGNREGS expenditures were targeted to the poorest and neediest areas both before and (even more so) after the 2009 election, after which time all districts were participating in the program.

The coefficient estimates on the percentage of primary agricultural laborers and cultivators, on the other hand, show a changing story before and after the elections. Across most specifications, we find that mandals with a higher percentage of agricultural laborers receive more funds in the pre-election period but a lower amount of funds in the post-election period, with the opposite relationship observed for primary cultivators. This implies that MGNREGS initially was well-targeted to areas with larger numbers of casual agricultural laborers, the portion of the population that may have a higher demand for outside employment options, but that this correlation eroded after the election.

The coefficients on the static variables related to land or acting as proxies for the agricultural potential of the area suggest that these characteristics were also strong considerations when distributing MGNREGS funds to mandals. Mandals with a higher percentage of unirrigated land received more funds, all else equal, which is not surprising given that land improvement and irrigation projects supposedly accounted for over 75 percent of total MGNREGS projects in AP (Deininger and Liu 2013). This implies that the funds were targeted to areas that stood to gain from the type of infrastructure projects facilitated by MGNREGS. Moreover, areas with more farms that fall into small or marginal size categories and areas with more inequality in land holding size receive less MGNREGS spending. This signals that areas with mostly larger farms and more equality across farm sizes, in addition to areas with higher long run average rainfall, received more funding, characteristics we expect are associated with

areas of high agricultural activity and potential. To the extent that these features are associated with environments where infrastructure projects may enhance agricultural productivity and incomes and thereby accelerate economic growth and poverty reduction, our results suggest that MGNREGS funds were distributed to such areas across program years.

Our final set of static covariates describe other measures of infrastructure in the mandal that likely function as proxies for a range of other infrastructure and needs-based variables. We find that areas with more agricultural credit opportunities (a proxy for the robustness of agricultural institutions) and mandals containing more villages with medical facilities and paved approach roads (general infrastructure variables) receive less funds per capita. On the other hand, mandals with more remote villages receive more funding per capita. The direction and significance of these covariates are nearly identical in the years both before and after the 2009 election, suggesting spending has been well-matched to areas with more infrastructure needs across time.

We also investigate our hypothesis related to the flexibility of MGNREGS to accommodate time-varying needs of the mandal, $H_O(12)$ and $H_O(13)$, namely changing labor market dynamics between agricultural seasons and years, embodied in the rainfall shock in the current *kharif* and *rabi* seasons. In the pre-2009 election years, we observe that areas with less than average rainfall in both seasons were more likely to receive more funds and, for the *kharif* season in particular, we also find a positive and significant relationship where the magnitude of those negative shocks was highest (see interaction terms).

In the post-2009 years, the relationships are not as well-behaved. We observe that areas with below average *kharif* rainfall are less likely to receive funds, but after controlling for the magnitude of those shocks, which are positive and statistically significant. So far as the *rabi* season, areas with higher negative rainfall shock receive less funds. When disentangling these relationships by estimating average partial effects, we find that both the binary incidence of negative rainfall shock and the magnitude in only the *kharif* season were associated with higher MGNREGS spending levels.

The post-2009 period, however, should function as a period where the rainfall needs were considered even more than the pre-2009 period since "drought-affected mandals" were supposed to receive more money starting in 2011 via an increase in the number of days individuals were eligible for work under MGNREGS (100 to 150) when rainfall levels were far below average.

Using our exogenous rainfall shock variables, we find that mandals with higher rainfall shock in the *kharif* season may have benefited from this policy change, but that negative *rabi* season anomalies were not correlated with more MGNREGS spending in the post-election years. This is particularly unfortunate given the areas with a higher percentage of agricultural laborers received less MGNREGS, meaning those households who rely more on causal agricultural labor opportunities may have had more difficulty earning income in these post-election years, particularly during the main *rabi* season.

6.4 Summary of MGNREGS spending results

In summary, we do not find evidence of vote buying before the 2009 election but do find that patronage played a part in MGNREGS fund distribution after the 2009 election, all while still targeting public resources based on the observed needs of the mandals over time. These results hold under a number of robustness checks and specifications that should mitigate the potential for endogeneity of the variables aimed at capturing tendencies toward clientelism. The apparent lack of vote buying runs contrary to claims even by the ruling coalition that they could use the MGNREGS program to buy votes, implying that they may have used the well-targeted nature of the program funds as a means of "buying votes" instead of simply funneling money to mandals based on how they voted in the 2004 election irrespective of the targetable needs of mandals' populations.

Evidence of patronage in the post-2009 election years is best understood within the changing political climate immediately after the 2009 election. Recall that YSR, the figurehead of MGNREGS in AP, was killed not long after his re-election and that a struggle for power in the following years ensued. Evidence of patronage during this time may suggest that this disorder prompted politicians to use MGNREGS funds to secure their place in the AP political hierarchy moving forward, grounded in how their constituents voted in the most recent election. With a by-election for a limited number of seats in 2012 and another full election in 2014, we cannot necessarily disentangle the vote buying and patronage effects in the post-2009 era. What we can conclude is that clientelism emerged in the post-2009 period, representing a shift from the pre-2009 YSR era when MGNREGS fund allocation was a function of targeting the needs of constituents rather than obvious vote buying.

As a final exercise related to the correlates of MGNREGS fund allocation, we seek to understand which groups of variables (as categorized in Table 1) were most strongly correlated with the distribution of program funds. To do this, we calculate Shapley values using the regression estimates from equation (2), which decompose the explained variance (measured by R^2) into contributions over particular groups of regressors (Huettner and Sunder 2012). In other words, we calculate the mean marginal contribution of each group of variables to the overall model R^2. These estimates for all years, pre-2009, and post-2009 model specifications are presented in Table 4.

Table 4: Decomposition of R^2 for MGNREGS fund expenditure models

	(1) All years	(2) Pre-2009	(3) Post-2009
Clientelism	1.0	0.1	2.5
Needs-based: labor-related	14.2	9.9	22.9
Needs-based: land-related	11.3	11.6	16.7
Needs-based: infrastructure-related	14.2	12.0	20.2
Needs-based: rainfall-variability	2.5	2.9	3.9
Election controls	2.2	2.3	3.1
District and year dummies	54.6	61.2	30.7
R-squared	***0.5065***	***0.4936***	***0.5077***
Observations	***5,753***	***2,570***	***3,183***

Notes: The included numbers represent Shapley values, or the percentage of the R^2 that can be explained by a particular group of regressors. We calculate these values using the "rego" user-written command in Stata. See Table 1 for which variables are included in each of the six categories. The relevant matched regression results for these estimates are the specifications displayed the first columns of Tables 2 and 3 (Equation 2 estimated with OLS). The first column of this table includes all fiscal years between 2006/07 and 2013/13 except 2009/10.

Across all included fiscal years (column 1), we find that the advantage variables that allow us to measure clientelism can explain only about one percent of the variation in MGNREGS spending levels. By contrast, the four categories of variables that together encapsulate the needs of the mandal explain more than 42 percent of the variation. In the post-election period (column 3), where our results suggest that clientelism had a much stronger relationship with MGNREGS fund allocation than in the pre-election years, we still find that the needs of the mandal far dominate the variation explained by the election variables. Indeed, even as the importance of the clientelism variables climbs to only 2.5 percent, the needs variables become even better predictors when all districts and phases are eligible for MGNREGS, explaining more than 63 percent of variation in expenditure patterns. This decomposition exercise also uncovers the fact that the statically observed needs-based variables are jointly better predictors of MGNREGS funding levels than the rainfall-variability variables, suggesting that the MGNREGS expenditures have not responded very flexibly to changing labor market dynamics over time, although they do flow to poorer areas more generally.

6.5 Voter response in the 2009 election to MGNREGS expenditures

While we find little to no evidence of vote buying in years before the 2009 election, we remain interested in how constituents responded to MGNREGS fund allocation in the years leading up to 2009 with their votes in the election. Regression results for equation (6) are found in Table 5. When specifying $\Delta advantage$ with respect to the UPA coalition in both elections (columns 1 and 2), we find that aggregate MGNREGS spending in the pre-election years is positive and statistically significantly correlated with the movement of voters towards UPA candidates. This allows us to reject the null in $H_O(14)$ that MGNREGS expenditures were uncorrelated with the UPA's 2009 victory. When re-specifying $\Delta advantage$ with respect to the local level incumbent party from the 2004 election (columns 3 and 4), however, we find no significant relationship between aggregate MGNREGS spending in the pre-election years and voter response, meaning that we fail to reject the null in $H_O(14)$ under the local incumbent specification.

These results have three major implications. First, the fact that UPA candidates were "rewarded" for MGNREGS expenditures but local level incumbent parties were not implies that voters attribute MGNREGS to the UPA coalition even when a different party is in power at the local level. This evidence supports the claim that MGNREGS is seen as a UPA "flagship" program and supports our decision to define our analysis with respect to the UPA coalition throughout. Second, the fact that voters credited UPA with MGNREGS funds and voted in favor of the UPA as a result adds to a growing body of literature showing the importance of MGNREGS in the 2009 election results (Elliott 2011; Ramani 2009; Zimmermann 2012a). Third, because we find no evidence of blatant vote buying in the years leading up to the election, voters are not responding to clientelism but instead the fact that the program appears to have been well-targeted to the needs of mandals. Indeed, overt vote buying was unnecessary for the UPA coalition to secure their 2009 victory; catering to the needs of their constituents by allocating scarce resources where they were most essential was a winning strategy for UPA. This sentiment was echoed in a study by Sharma (2009, cited in Chamorro et al. 2010) which suggests that AP has implemented MGNREGS well because political will has created a cycle of good performance leading to more political support.

Table 5: Regression results for political reward in 2009 election for MGNREGS spending

	UPA advantage		Local incumbent advantage	
	(1)	(2)	(3)	(4)
	All mandals	Phase 1 and 2	All mandals	Phase 1 and 2
Total MGNREGS spending, 2006/07-2008/09	0.0298***	0.0208*	0.00272	-0.00114
	(0.0105)	(0.0110)	(0.00992)	(0.0105)
SC/ST caste (%)	0.000171	0.000391	-0.000289	-0.000179
	(0.000574)	(0.000655)	(0.000578)	(0.000657)
Illiterate (%)	0.00283***	0.00341***	-0.00156*	-0.00220**
	(0.000935)	(0.00100)	(0.000874)	(0.000952)
Agricultural laborers (%)	0.00214**	0.00136	0.00103	0.00150
	(0.00105)	(0.00115)	(0.000977)	(0.00109)
Cultivators (%)	-0.00146	-0.000731	0.00181	0.00265**
	(0.00124)	(0.00135)	(0.00118)	(0.00129)
Unirrigated land (%)	0.000192	5.97e-05	0.000401*	0.000311
	(0.000229)	(0.000247)	(0.000213)	(0.000235)
Landholdings that are small/marginal (%)	-0.000493	-0.00137**	0.000737	0.000389
	(0.000608)	(0.000658)	(0.000592)	(0.000652)
Land gini coefficient	-0.292**	-0.269*	0.139	0.225
	(0.141)	(0.150)	(0.142)	(0.153)
Long run average yearly rainfall rate (mm/hr)	-0.350	0.366	0.852	1.080
	(0.653)	(0.701)	(0.618)	(0.672)
Number of ag credit societies (in 1000s)	0.000729	0.000700	0.000835	-7.24e-05
	(0.00108)	(0.00134)	(0.000985)	(0.00125)
% of villages with medical facilities	0.0931***	0.0754**	-0.0335	-0.0265
	(0.0340)	(0.0364)	(0.0323)	(0.0352)
% of villages with paved road	0.00596	-0.0105	0.0256	0.0161
	(0.0274)	(0.0288)	(0.0264)	(0.0283)
Distance to nearest town from village	0.000242	-2.44e-05	5.98e-05	0.000177
	(0.000267)	(0.000289)	(0.000250)	(0.000273)
SC/ST reserved election in 2009 (1=yes)	0.0252*	0.0282**	0.0243*	0.0120
	(0.0134)	(0.0142)	(0.0126)	(0.0136)
SC/ST reserved election in 2004 (1=yes)	-0.0210	-0.0335**	-0.0174	-0.0110
	(0.0135)	(0.0146)	(0.0130)	(0.0140)
New or abolished AC in 2008 (1=yes)	-0.0208*	-0.0280**	-0.0146	-0.0207*
	(0.0117)	(0.0126)	(0.0113)	(0.0124)
Mandal split between ACs in 2004 (1=yes)	-0.0629	-0.130	-0.0323	-0.0946
	(0.0698)	(0.0907)	(0.0626)	(0.0829)
Mandal split between ACs in 2009 (1=yes)	0.0377*	0.0438**	-0.0153	0.00219
	(0.0196)	(0.0213)	(0.0187)	(0.0207)
District dummy variables	Y	Y	Y	Y
Number of mandals	1,039	914	929	815
R-squared	0.259	0.270	0.143	0.151

Note: All reported results are estimated per Equation 6. Sample for UPA advantage models includes those mandals with a UPA coalition candidate in both 2004 and 2009. Sample for models incumbent advantage includes mandals where we can track the incumbent party between the 2004 and 2009 elections. *** p<0.01, ** p<0.05, * p<0.1.

7. Conclusions

India's innovative and massive Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) was designed as a demand-driven program rooted in the constitutional "right to work" and incorporates a number of accountability and transparency mechanisms aimed at limiting the extent to which politics can influence program spending and implementation. The degree to which these intentions have come to bear is a question worth exploring, both for improving MGNREGS and designing other major government-funded programs around the world, especially since opponents of large-scale public works programs commonly raise concerns about prospective clientelism in resource allocation. With great heterogeneity in

conditions across India, we focus further on the experience in Andhra Pradesh (AP), one of the states where implementation is heralded as a "success story" and where the political climate largely mimics that at the national level. By testing covariates that broadly describe the "needs" of the mandal before the project began alongside voting trends at the assembly constituency level in both 2004 and 2009, we provide the first quantitative study to our knowledge that attempts to uncover how clientelism, namely vote buying and patronage by the United Progressive Alliance (UPA) coalition, influenced the mandal-level distribution of MGNREGS expenditures between 2006/07 and 2012/13.

In summary, we do not find evidence of vote buying before the 2009 election, but do find consistent evidence that the distribution of funds after the election was politically motivated, either as a patronage effect following the 2009 election or as a vote buying effect leading up to the by-election in 2012 or full election in 2014. We suspect that the emergence of clientelistic effects may have resulted, to some extent, from the power vacuum and struggle that occurred in AP following the sudden death of the re-elected Chief Minister from the UPA coalition, Y.S. Rajashekara Reddy. Alongside these findings, we also observe that expenditures were well-aligned with the needs of the mandal, especially characteristics of the population, land, and infrastructure before the start of the program but also the changing labor market dynamics across years and agricultural seasons. Even in the post-election period where clientelism is a major correlate, we still find that the needs of the mandals explain far more of the variation in MGNREGS expenditures than all of the political variables combined.

The fact that clientelism does not appear to have a major influence on spending levels means that the self-targeting, transparency, and accountability mechanisms, including widespread information disclosure and social audits, integrated into the MGNREGA appear to be working and reducing the potential for larger-scale clientelism to take hold in AP. Moreover, we find evidence that aggregate MGNREGS spending in the pre-2009 election years is positively related to a shift in voting patterns towards the UPA coalition in 2009, implying that voters "rewarded" the governing coalition for implementing a well-targeted program in the initial years, evidence that overt vote buying was unnecessary to secure their win.

This paper contributes to the political economy literature by exploring the relationship, in both directions, between election outcomes and spending on large-scale government-sponsored programs using MGNREGS, the largest public works project in the world with both "public

good" and "private good" characteristics, as a case study. We also offer a set of testable hypotheses for investigating the incidence of vote buying and patronage effects when a project timeline spans at least one major election. Further study of MGNREGS targeting, particularly from other areas of India where implementation is not as well-regarded, could shed light on how to improve the current program design – in India and elsewhere around the world – in order to limit the extent of politically-motivated fund allocation, even where it is relatively minor, and ensure that program expenditures conform with stated goals related to constituent needs and ultimately contribute to poverty reduction and economic growth.

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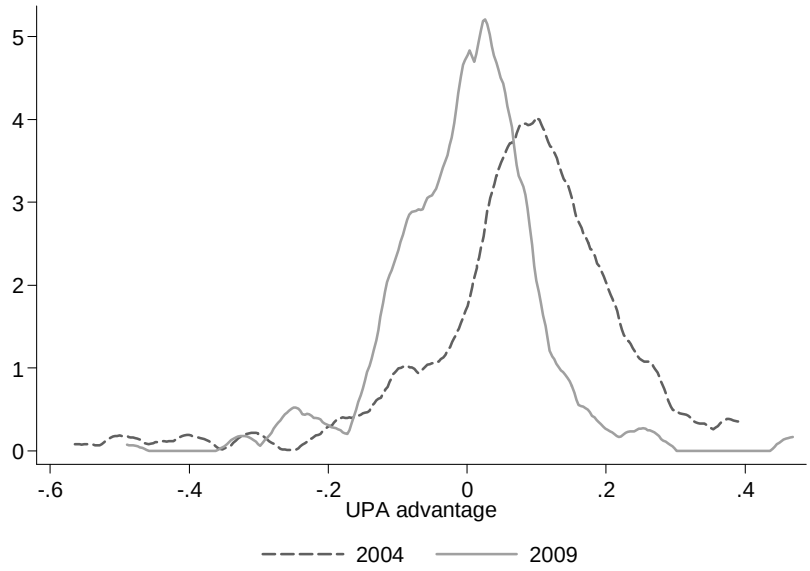
APPENDIX

Table A1: Total MGNREGS spending figures from various sources (in 1000s Rs.)

Fiscal year	National funds available[1]	Andhra Pradesh funds available[1]	Total Andhra Pradesh funds observed spent across mandals used in this analysis[2]
2006/07	120,735,556	11,422,439	5,766,143
2007/08	193,395,355	22,932,082	19,871,900
2008/09	373,970,615	37,066,960	16,754,406
2009/10	495,791,950	53,835,480	23,377,902
2010/11	541,721,425	91,070,968	34,674,508
2011/12	488,324,949	57,815,077	29,227,950
2012/13	424,642,606	45,578,855	37,524,884

Source: [1]National figure from here: http://MGNREGA.nic.in/NetMGNREGA/WriteReaddata/Circulars/Briefing_booklet13.pdf. 2011 and 2012 statistics were provisional at time of report. [2]Total across mandals used in this analysis, as aggregated from MGNREGS website: http://MGNREGA.ap.gov.in. For more details, see footnote 18.

Figure A1: Kernel density of UPA advantage variable by election year



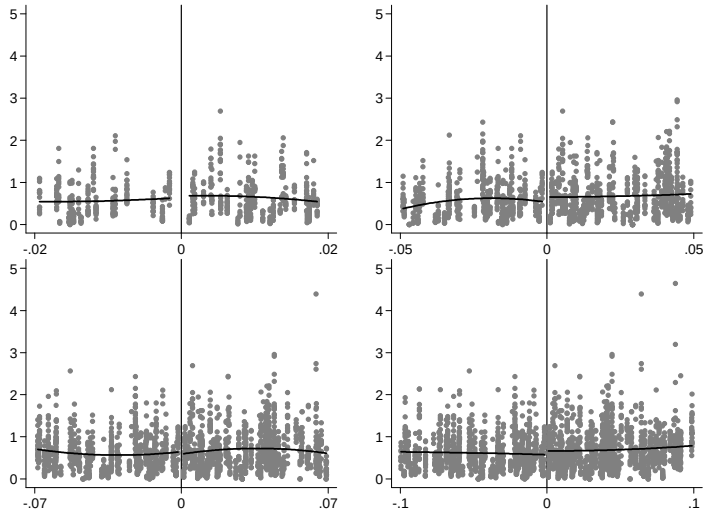
Note: Definition of UPA advantage can be found in equation (3).

Table A2: Relevance tests for IV results in Table 2

	(1) IV-1	(2) IV-2	(3) IV-3
Full year rainfall shock (2003)	-0.0839***	-	-0.0662***
	(0.0162)		(0.0160)
Rabi season rainfall shock (2003)	0.0286***	-	0.0313***
	(0.00954)		(0.00937)
UPA advantage in 1999 AC election	-	0.210***	0.198***
		(0.0354)	(0.0357)
SC/ST caste (%)	-0.000471	-6.30e-05	-0.000395
	(0.000496)	(0.000475)	(0.000476)
Illiterate (%)	-0.00510***	-0.00525***	-0.00496***
	(0.00103)	(0.000971)	(0.000969)
Agricultural laborers (%)	-0.000721	-0.000767	-0.000792
	(0.000938)	(0.000902)	(0.000901)
Cultivators (%)	0.00162	0.00122	0.00138
	(0.00108)	(0.00109)	(0.00105)
Unirrigated land (%)	-0.000560**	-0.000582***	-0.000487**
	(0.000222)	(0.000216)	(0.000216)
Landholdings that are small/marginal (%)	-0.00105*	-0.000606	-0.000606
	(0.000602)	(0.000566)	(0.000562)
Land gini coefficient	0.0366	0.108	0.0860
	(0.122)	(0.117)	(0.114)
Long run average yearly rainfall rate (mm/hr)	-0.252	-0.419	-0.166
	(0.484)	(0.482)	(0.485)
Number of ag credit societies (in 1000s)	-0.000882	-0.000744	-0.000626
	(0.00111)	(0.00105)	(0.00102)
% of villages with medical facilities	-0.0615*	-0.0625**	-0.0634**
	(0.0326)	(0.0315)	(0.0313)
% of villages with paved road	-0.0244	-0.0110	-0.0140
	(0.0243)	(0.0245)	(0.0238)
Distance to nearest town from village	0.000286	0.000141	0.000226
	(0.000225)	(0.000220)	(0.000220)
Kharif season rain less than average (1=yes)	0.00405	0.00531	0.00488
	(0.00706)	(0.00698)	(0.00680)
Kharif less than average * rain shock (abs value)	-0.00506	-0.00914*	-0.00626
	(0.00554)	(0.00553)	(0.00542)
Rabi season rain less than average (1=yes)	-0.00606	-0.00393	-0.00237
	(0.00643)	(0.00634)	(0.00615)
Rabi less than average * rain shock (abs value)	0.0155*	0.00863	0.00771
	(0.00896)	(0.00944)	(0.00869)
Voter turnout in 2004 election (%)	0.00114	0.00144	0.00127
	(0.000992)	(0.000965)	(0.000962)
SC/ST reserved 2004 election (1=yes)	0.0182**	0.0256***	0.0243***
	(0.00888)	(0.00894)	(0.00869)
Split between ACs in 2004election (1=yes)	0.160***	0.155***	0.160***
	(0.0316)	(0.0289)	(0.0277)
Year dummy variables	Y	Y	Y
District dummy variables	Y	Y	Y
Observations	2,570	2,570	2,570
R-squared	0.217	0.232	0.248
Joint significance of IVs (F-value)	15.49	34.14	19.74

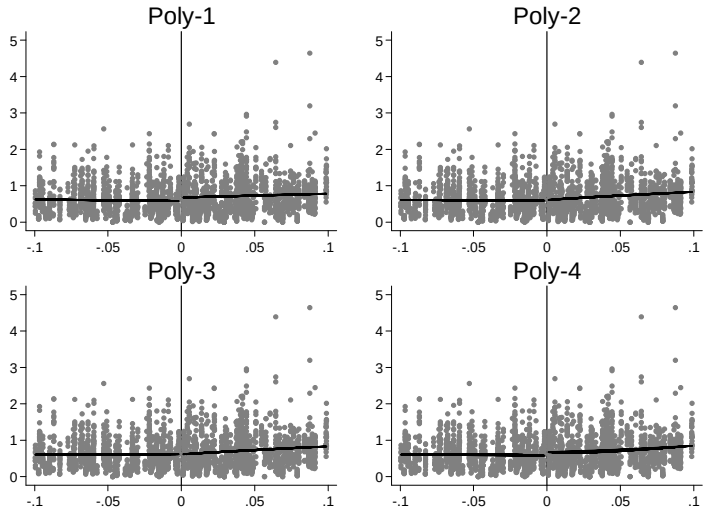
Note: Standard errors, in parentheses, are clustered at the mandal level (i=1,061). *** p<0.01, ** p<0.05, * p<0.1. We use the squared predicted values from these regressions as the IV for the squared endogenous term ($advantage^2$) following Wooldridge (2010). Full regression and associated test results can be found in Table 2.

Figure A2: Diagnostic test for RDD plausibility—local linear approach (non-parametric)



Notes: Instead of choosing an optimal bandwidth following Imbens and Kalyanaraman (2012), we show a range of possibilities, none of which show any discontinuity at UPA advantage=0. In all graphs, the x-axis shows UPA advantage in 2009 while the y-axis shows MGNREGS spending per capita (in 1000 Rs.) in the post-2009 years.

Figure A3: Diagnostic test for RDD plausibility—global polynomial approach (parametric)



Notes: The four graphs shown here represent increasing orders of polynomials included in the regression. While the full sample is used in estimation, we restrict the x-axis to a more narrow range in order to look for a discontinuity at advantage=0. In all graphs, the x-axis shows UPA advantage in 2009 while the y-axis shows MGNREGS spending per capita (in 1000 Rs.) in the post-2009 years.

Table A3: Alternate specification and robustness checks for equation 2

	Without Telangana Districts		With INC advantage instead	
	(1) Pre-2009	(2) Post-2009	(3) Pre-2009	(4) Post-2009
UPA advantage in last election	0.0502	0.711***	-	-
	(0.0565)	(0.129)		
UPA advantage in last election squared	-0.527**	-1.144***	-	-
	(0.231)	(0.404)		
INC advantage in last election	-	-	0.0198	0.378***
			(0.0424)	(0.104)
INC advantage in last election squared	-	-	-0.00888	0.290
			(0.105)	(0.424)
SC/ST caste (%)	0.000787	0.00373*	0.000637	0.00405***
	(0.00129)	(0.00218)	(0.000834)	(0.00149)
Illiterate (%)	0.00399***	0.00678***	0.00448***	0.00851***
	(0.00124)	(0.00180)	(0.00107)	(0.00172)
Agricultural laborers (%)	0.00261	-0.00117	0.00307**	0.000573
	(0.00173)	(0.00242)	(0.00135)	(0.00217)
Cultivators (%)	0.00563**	0.0157***	0.00206	0.00983***
	(0.00240)	(0.00370)	(0.00161)	(0.00304)
Unirrigated land (%)	0.000599*	0.000365	0.000798***	0.00110**
	(0.000348)	(0.000520)	(0.000242)	(0.000444)
Landholdings that are small/marginal (%)	-0.00176	-0.00600***	-0.00301***	-0.00445***
	(0.00113)	(0.00167)	(0.000782)	(0.00127)
Land gini coefficient	-0.279	-1.068***	-0.509***	-0.839***
	(0.217)	(0.378)	(0.163)	(0.278)
Long run average yearly rainfall rate (mm/hr)	-0.0645	2.777	1.573**	3.272**
	(1.012)	(1.844)	(0.783)	(1.454)
Number of ag credit societies (in 1000s)	-0.00566***	-0.0102***	-0.00619***	-0.0124***
	(0.00149)	(0.00263)	(0.00142)	(0.00289)
% of villages with medical facilities	-0.166**	-0.102	-0.168***	-0.156**
	(0.0704)	(0.0989)	(0.0499)	(0.0793)
% of villages with paved road	-0.0483	-0.0285	-0.0615*	-0.0929
	(0.0509)	(0.0773)	(0.0344)	(0.0606)
Distance to nearest town from village	0.00168***	0.00338***	0.00105***	0.00296***
	(0.000388)	(0.000756)	(0.000297)	(0.000561)
Kharif season rain less than average (1=yes)	0.0828***	0.0198	0.0330***	-0.0362*
	(0.0237)	(0.0235)	(0.0122)	(0.0209)
Kharif less than avg. * rain shock (abs value)	-0.0192	0.0533***	0.0331***	0.103***
	(0.0134)	(0.0169)	(0.0106)	(0.0156)
Rabi season rain less than average (1=yes)	-0.00249	-0.107***	0.0235*	0.00154
	(0.0186)	(0.0337)	(0.0124)	(0.0216)
Rabi less than avg. * rain shock (abs value)	0.123***	0.00800	-0.0293	-0.232***
	(0.0376)	(0.0541)	(0.0182)	(0.0250)
Voter turnout in last election (%)	-0.00493***	-0.00339	-0.00185	-0.00282
	(0.00190)	(0.00251)	(0.00121)	(0.00221)
SC/ST reserved last election (1=yes)	-0.0177	-0.0143	0.0204	0.00675
	(0.0202)	(0.0284)	(0.0149)	(0.0238)
Split between ACs in last election (1=yes)	-0.117*	-0.0835**	-0.102***	-0.0529
	(0.0621)	(0.0329)	(0.0394)	(0.0326)
Year dummy variables	Y	Y	Y	Y
District dummy variables	Y	Y	Y	Y
Observations	1,301	1,890	2,570	3,183
R-squared	0.517	0.607	0.494	0.508
Joint signif. of "clientelism" variables (p-value)	0.0484	0.0000	0.5954	0.0011

Notes: All reported results are estimated per Equation 2. Standard errors, reported in parentheses, are clustered at the mandal level (i=630 in the non-Telangana specifications and i=1,061 in the full sample INC models). Pre-2009 years include 2006/07, 2007/08, and 2008/09 where the 2004 election variables are used. Post-2009 years include 2010/11, 2011/12, and 2012/13 where the 2009 election variables are used. Results can be compared with those in Tables 2 and 3. *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Regression results by year for MGNREGS fund expenditure model, pre-2009 election

	(1) 2006/07	(2) 2007/08	(3) 2008/09
UPA advantage in 2004 election	0.0175	-0.0851	-0.00926
	(0.0320)	(0.0634)	(0.0489)
UPA advantage in 2004 election squared	-0.155	0.118	-0.0903
	(0.106)	(0.234)	(0.180)
SC/ST caste (%)	0.000772	0.00140	-9.40e-05
	(0.000538)	(0.00103)	(0.000757)
Illiterate (%)	0.00205**	0.00516***	0.00451***
	(0.000991)	(0.00164)	(0.00126)
Agricultural laborers (%)	0.000407	0.00500***	0.00270*
	(0.00101)	(0.00185)	(0.00138)
Cultivators (%)	0.00199*	0.00175	0.00232
	(0.00109)	(0.00219)	(0.00166)
Unirrigated land (%)	0.000197	0.000874**	0.000990***
	(0.000214)	(0.000398)	(0.000305)
Landholdings that are small/marginal (%)	-0.00209***	-0.00406***	-0.00237***
	(0.000534)	(0.00107)	(0.000814)
Land gini coefficient	-0.406***	-0.657***	-0.402**
	(0.123)	(0.242)	(0.187)
Long run average yearly rainfall rate (mm/hr)	-0.291	2.532**	1.003
	(0.573)	(1.151)	(0.921)
Number of ag credit societies (in 1000s)	-0.00282***	-0.00964***	-0.00574***
	(0.00105)	(0.00214)	(0.00142)
% of villages with medical facilities	-0.0881***	-0.189***	-0.206***
	(0.0300)	(0.0585)	(0.0450)
% of villages with paved road	-0.0135	-0.0776*	-0.0691*
	(0.0210)	(0.0465)	(0.0366)
Distance to nearest town from village	0.000790***	0.00140***	0.00106***
	(0.000228)	(0.000467)	(0.000351)
Kharif season rain less than average (1=yes)	0.0328	-0.148***	0.0347*
	(0.0204)	(0.0436)	(0.0189)
Kharif less than average * rain shock (abs value)	-0.0141	0.920***	-0.00108
	(0.0158)	(0.328)	(0.0273)
Rabi season rain less than average (1=yes)	0.00832	-0.00465	0.0557**
	(0.0148)	(0.0637)	(0.0265)
Rabi less than average * rain shock (abs value)	0.0105	0.113	0.0563
	(0.0246)	(0.225)	(0.0480)
Voter turnout in 2004 election (%)	-0.000510	-0.000491	-0.00190
	(0.000930)	(0.00184)	(0.00141)
SC/ST reserved 2004 election (1=yes)	-0.00647	0.0385*	0.00832
	(0.0109)	(0.0220)	(0.0170)
Split between ACs in 2004 election (1=yes)	-0.108*	-0.0890	-0.0555
	(0.0630)	(0.148)	(0.0930)
District dummy variables	Y	Y	Y
Observations	617	914	1,039
R-squared	0.467	0.503	0.480

Notes: All reported results are estimated via OLS per Equation 2. Standard errors are found in parentheses.

Table A5: Regression results by year for MGNREGS fund expenditure model, post-2009 election

	(1) 2010/11	(2) 2011/12	(3) 2012/13
UPA advantage in 2009 election	0.306**	0.509***	0.263**
	(0.132)	(0.113)	(0.108)
UPA advantage in 2009 election squared	0.531	-0.0716	0.413
	(0.495)	(0.424)	(0.409)
SC/ST caste (%)	0.00284**	0.00488***	0.00473***
	(0.00144)	(0.00124)	(0.00120)
Illiterate (%)	0.0119***	0.00793***	0.00678***
	(0.00237)	(0.00205)	(0.00196)
Agricultural laborers (%)	0.00411	-0.00172	0.000349
	(0.00265)	(0.00231)	(0.00222)
Cultivators (%)	0.00683**	0.00969***	0.0130***
	(0.00313)	(0.00271)	(0.00259)
Unirrigated land (%)	0.00183***	0.000712	0.00108**
	(0.000581)	(0.000502)	(0.000478)
Landholdings that are small/marginal (%)	-0.00190	-0.00557***	-0.00501***
	(0.00154)	(0.00133)	(0.00127)
Land gini coefficient	-0.818**	-0.895***	-0.787***
	(0.351)	(0.303)	(0.294)
Long run average yearly rainfall rate (mm/hr)	3.062*	5.749***	1.578
	(1.647)	(1.546)	(1.387)
Number of ag credit societies (in 1000s)	-0.0149***	-0.0102***	-0.0111***
	(0.00269)	(0.00232)	(0.00223)
% of villages with medical facilities	-0.285***	-0.0827	-0.108
	(0.0852)	(0.0736)	(0.0703)
% of villages with paved road	-0.144**	-0.0542	-0.0552
	(0.0686)	(0.0591)	(0.0570)
Distance to nearest town from village	0.00517***	0.00224***	0.00142**
	(0.000668)	(0.000577)	(0.000550)
Kharif season rain less than average (1=yes)	-0.170	0.116	-0.0415
	(0.124)	(0.0751)	(0.0321)
Kharif less than average * rain shock (abs value)	-0.776*	0.0813**	0.0772*
	(0.448)	(0.0383)	(0.0458)
Rabi season rain less than average (1=yes)	0.0644	-0.0182	0.0226
	(0.157)	(0.0631)	(0.0380)
Rabi less than average * rain shock (abs value)	-1.645	-0.187**	0.220**
	(1.702)	(0.0732)	(0.0990)
Voter turnout in 2009 election (%)	-0.00249	-0.00609***	-7.28e-05
	(0.00269)	(0.00232)	(0.00224)
SC/ST reserved 2009 election (1=yes)	-0.0289	0.0218	0.0424
	(0.0311)	(0.0271)	(0.0258)
Split between ACs in 2009 election (1=yes)	-0.0489	-0.0513	-0.0548
	(0.0482)	(0.0416)	(0.0399)
District dummy variables	Y	Y	Y
Observations	1,061	1,061	1,061
R-squared	0.516	0.516	0.614

Notes: All reported results are estimated via OLS per Equation 2. Standard errors are found in parentheses.