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The Political Economy of MGNREGS Spending in Andhra Pradesh

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ABSTRACT

While government spending on pro-poor community asset creation and income-transfers could have compounding positive effects on poverty reduction, it is important to first study trends in the allocation of funds, particularly as they relate to the susceptibility of the program to political clientelism. This paper uses expenditure data at the local level in Andhra Pradesh from India's National Rural Employment Guarantee Scheme, a rights-based program distributing both public and private goods, to investigate the relationship between voting outcomes and program intensity in the seven years straddling a major election. By focusing on one state where accountability and transparency mechanisms have been employed and implementation efforts have been applauded, the authors 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, Mahatma Gandhi National Rural Employment Guarantee, political economy, clientelism, project allocation

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

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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 spillover 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, and 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 suboptimal social policy and may undermine the usefulness of infrastructure projects as poverty-reduction or growth-enhancing tools (Kurer 1996), uncovering instances where funds are distributed based on noneconomic reasons and curtailing the extent to which politics can infiltrate project allocation are crucial tasks.

However, another thread of research shows that voters may not actually respond to public goods allocation decisions, particularly where it is not obvious that the voters benefit from a large project with public good characteristics (Lizzeri and Persico 2001; Wantchekon 2003). In India, for example, although household surveys 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) found 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 a politician's 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 (MGNREGS), which employs 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. Therefore, it 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. Although seemingly ripe for political manipulation, MGNREGS is derived from the Mahatma Gandhi National Rural Employment Guarantee Act (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, in which labor is aggregated and public works are selected at the local level before final approval at higher levels of government. While the program's demand-driven nature 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* (subdistrict) level in Andhra Pradesh (AP), with a specific focus on clientelism. To date, other important political economy research on MGNREGS has focused on such issues as rent-seeking behavior (Niehaus and Sukhtankar 2013a) and leakage (Niehaus and Sukhtankar 2013b); however, we know of no studies that 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), this paper econometrically tests 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—that is, 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 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

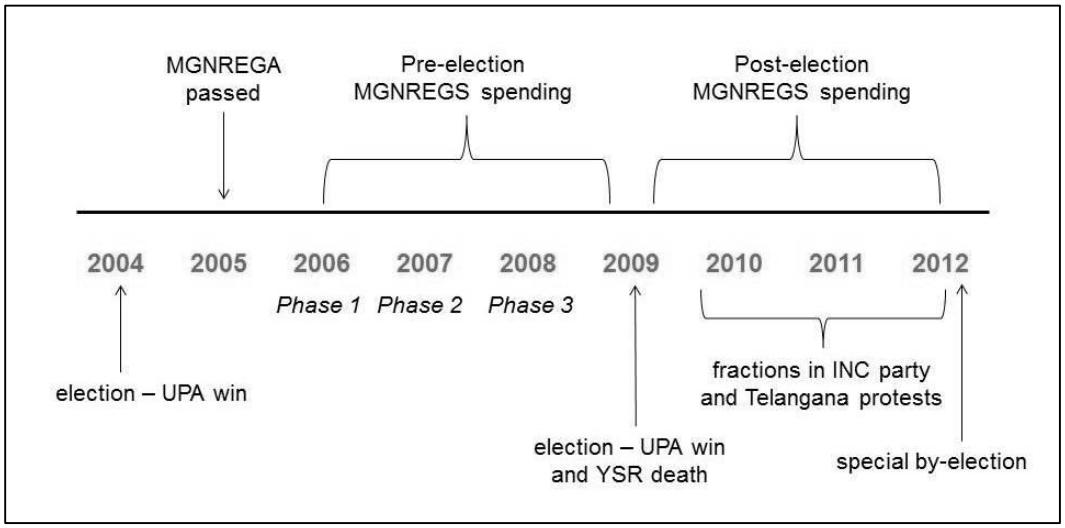
several years of MGNREGS implementation following the 2009 election, in which the incumbent party did, in fact, win re-election, they also are able to test for the existence of patronage effects.

The results are striking. They show no evidence of vote buying in the initial years of program implementation but do reveal significant patronage effects in which *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; thus, the distortionary effect of politically driven resource allocation is modest, likely due to the distinct demand-driven characteristics of the scheme and the local political context at the time. Through this analysis of MGNREGS, this paper also offers a range of hypotheses for empirically testing vote buying and patronage effects using any public project that straddles a major election.

2. CONTEXT

This section summarizes MGNREGS implementation and the relevant local political context in AP. For more details on the timing of MGNREGS rollout and the changing political situation between 2004 and 2012, see Figure 2.1.

Figure 2.1 Timeline of MGNREGS project implementation and political situation in Andhra Pradesh



Source: Authors.
Notes: UPA = United Progressive Alliance; INC = Indian National Congress; YSR = Y. S. Rajasekhara Reddy. Refer to Section 2 for more details.

MGNREGS in Andhra Pradesh

MGNREGS implementation was phased in over three sets of districts that were categorized based on backwardness level. In the first phase, the poorest districts gained access to funds in the 2006/2007 fiscal year (April–March), with each of the remaining two phases joining in succession in the following years.[1] Although MGNREGS is a national program implemented by individual states (hence, our interest in AP in particular), the MGNREGA provides space for a bottom-up approach to planning and selecting works. Section 16(3)(4) of MGNREGA stipulates that every *gram panchayat* (the village-level elected body), with participation from constituents, is responsible for aggregating local demand for work under MGNREGS, developing a list of projects that would benefit the larger community, and proposing 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

[1] In AP, 13 districts were included in phase 1 (2006/2007), 6 districts in phase 2 (2007/2008), and 3 districts in phase 3 (2008/2009). 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).

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

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) observed 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 substantiated this claim in AP, referring to the implementation approach as "supply driven" and "rigid top down" (97). In particular, Maiorano found that hired field assistants, as opposed to 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 (Chamorro et al. 2010) states that the supply of jobs (and therefore expenditures) seems 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 suggests that AP stands out as a success story in implementing MGNREGS as compared with other Indian states. 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 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. Although 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) noted that AP is one of eight states categorized as having "good" pro-poor implementation, though AP does not make it into the "best" group due to relatively high rates of self-selection out of MGNREGS by the poorest households. Thus, 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.

Politics in Andhra Pradesh

Because MGNREGS is implemented by the states and the program signage and materials often feature images of state-level political figures, such as the chief minister, it is expected 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 (INC), the main party within the UPA coalition, had just wrested power from the regional party, Telugu Desam, in the AP's Legislative Assembly election. Y. S. Rajasekhara Reddy (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, with 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 that the state-level incumbent coalition in the AP is the same incumbent coalition in the national Parliament, meaning it should be clear to constituents that the UPA is strongly affiliated with MGNREGS program implementation.

[3] To the contrary, data from the Public Evaluation of Entitlement Programs Survey of 2013 show that nearly three-quarters of surveyed households across 10 states, of which AP was not included, claimed they did not know which leader was responsible for initiating MGNREGA. An additional 15 percent could not identify the correct leader. AP is likely a special case given the match between national- and state-level governing political parties and that AP was the flagship MGNREGS state.

The next election, both at the state and national level, was held in April 2009, at the start of the 2009/2010 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), though 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 YSR's win signaled great satisfaction with his 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, YSR's son, Jaganmohan Reddy, left to form his own party (the YSR Congress) in 2011. 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 YSR's death.

Another complicating issue in AP is the long-standing fight for state succession by Telangana, one of the three cultural regions. Throughout his first tenure, YSR was a strong supporter of separation for these 10 districts, which 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 Hyderabad, the capital city of AP. 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), though perhaps not as strong as sometimes suggested (Ravishankar 2009). As evidence, Maiorano (2014) found 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 of 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 (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 that both needs-based and clientelistic-based motivations have been instrumental in guiding resource allocation and, ultimately, expenditures.[5] Similar to 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:

$$MGNREGS = f(vote\ buying, patronage, needs), \tag{1}$$

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

In the MGNREGS context, $needs$ can be viewed as two-dimensional—(1) livelihood-securing and (2) 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, project funds should 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—such as cultivators versus agricultural laborers—have explicitly different needs, MGNREGS expenditures should differ in places 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, it is expected that areas with greater need for improving infrastructure—in particular, agricultural infrastructure—will receive more funds.

Apart from the program's stated aim, it may be rational for policymakers 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) claimed 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, *vote buying* is broadly defined as distributing funds in

[5] This analysis focuses on MGNREGS expenditures instead of MGNREGS fund allocations for a number of reasons: (1) allocation amounts are simply funds budgeted and may not actually be spent, potentially due to similar political economy reasons; (2) 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); (3) 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 (4) expenditure data are theoretically less susceptible to manipulation due to the presence of social audits integrated into MGNREGA.

[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, because 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 to secure the employment opportunities, particularly in years with adverse agricultural conditions and reduced demand for hired labor.

[7] Although 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 toward small and marginal farmers by diverting funds from other areas of spending directly before elections. MGNREGS fits this set of characteristics well.

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), in an attempt to link project allocation and vote buying in specific contexts (for example, Brusco, Nazareno, and 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 toward 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 (for example, Finan 2004; Levitt and Snyder 1995; Miguel and Zaidi 2003).

[8] *Vote buying*, in this nonliteral 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 this paper uses the phrase *vote buying* for simplicity throughout.

4. EMPIRICAL METHODOLOGY AND HYPOTHESES

This section provides 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, this paper relies on three model specifications on which we test a range of hypotheses, all described in the following three subsections. The fourth subsection describes an additional model specification used to test the hypotheses related to voter reward.

Vote Buying Effects

Because MGNREGS started in 2006/2007, several years before the 2009 election, we expect the state-level incumbent political coalition to have used MGNREGS funds in 2006/2007, 2007/2008, and 2008/2009 to convince constituents to vote for them in the 2009 election. To estimate the extent to which vote 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:

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

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 the 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 multiparty system and the candidate with the highest percentage of votes wins, the $advantage$ term is defined 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] The $advantage$ term is defined with respect to the UPA coalition because MGNREGS is a UPA flagship program; we expect that constituents will credit allocation under this program to the political coalition that brought it about. When specifying this variable, we use a list of those parties that provided both "weak" and "strong" support to the UPA coalition before the elections.[11]

[9] Where UPA lost, this means the total votes from the winning party are used. Where UPA won, this means the total votes from the second place party are used.

[10] This paper's definition of *advantage* differs from the oft-cited definition provided by Gelman and King (1990). This 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, and PRBP. In the 2009 election, the coalition includes 6 parties in AP: INC, AIMIM, BSP, RJD, and JD(S), SP. Independent candidates are considered non-UPA supporters throughout.

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. This paper examines 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 by using two competing theories from the political science literature. One theory says 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, the relationship between MGNREGS funding and UPA coalition advantage in 2004 should 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, whereas 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, then the second necessary condition for the swing vote theory to hold is for the maximum of the marginal expenditure function to fall 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 there is no consensus in the political science literature about how this range is defined, we test separately 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 that 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 *mandals* with high levels of $advantage$ may differ in unobserved ways from *mandals* with lower levels of $advantage$, and perhaps in a way that is correlated with $MGNREGS$, we first estimate the model using ordinary least squares (OLS) and then using a series of instrumental variables (IVs) to test the robustness of the 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 given reports that farmers, reliant on good and consistent rainfall, were instrumental in the UPA's 2004 victory in AP (Rao and Suri 2006; *The Hindu* 2004), we include a rainfall shock variable for the total year and the main *rabi* season (November to March) in the fiscal year preceding the election. Although 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. While past election results are expected to be good predictors of current election outcomes, they should not influence MGNREGS implementation and expenditures several years later, following a subsequent election. Moreover, the UPA coalition was not formed until 2004; therefore, we use the 2004 UPA coalition parties to create a hypothetical UPA $advantage$ for 1999, which is another argument for the exogeneity of this instrument.[12]

Patronage Effects

Because the UPA coalition won re-election at the state and national level in 2009, we then investigate the extent to which patronage effects had an impact on MGNREGS spending levels in the years after 2009—namely, 2010/2011, 2011/2012, and 2012/2013.[13] We rely on three model specifications, the first of which is equation (2), in which the $advantage$ term and related election 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. 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 the vote-buying hypotheses, the patronage hypothesis implies that 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:

$$H_O(7): \alpha_1 = \alpha_2 = 0$$

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

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

[13] Because the 2009 election happened at the beginning of the 2009/2010 fiscal year, it 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, 2009/2010 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, the 2009/2010 MGNREGS spending is excluded from this analysis.

In the presence of patronage, those areas that did not vote for UPA in 2004 but did in 2009 should have been "rewarded" with MGNREGS spending after the 2009 election, implying that the UPA coalition considers changes in voting patterns over time when making decisions about fund allocation and spending. In addition, those areas that voted for the UPA in 2004 but not in 2009 should have been "punished" by receiving fewer funds, all else equal. The second model incorporates changes in voting patterns between the 2004 and 2009 elections, allowing a specific focus 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* in which UPA lost in 2004 but won in 2009; $winlose$ includes *mandals* in which UPA won in 2004 but lost in 2009; and $loselose$ includes *mandals* in which UPA lost in both elections. The final model is:

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

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

$$H_O(8): \beta_1 = \beta_2 = \beta_3 = 0$$

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

As with 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, because MGNREGS was already in progress and lagged rainfall and elections variables are likely correlated with post-2009 MGNREGS expenditures. Instead, this analysis relies 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 used 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 the 2009 and 2004 elections and $\Delta MGNREGS$ is the difference in total $MGNREGS$ spending between aggregate 2010/2011–2012/2013 and aggregate 2006/2007–2008/2009. This first difference method eliminates any *mandal*-level fixed effects, lessening concerns about endogeneity. We also include phase dummies, ρ_p, in this specifications because 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 $H_O(7)$:

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

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

Needs-Based Targeting

Strictly, MGNREGS is a right-to-work program, as opposed to an antipoverty 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. Although 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 are generically referred to as "needs-based targeting" using a series of variables that describe the state of the population of the *mandal* before MGNREGS began. The needs of individuals and their communities may change once they benefit from MGNREGS, thus creating an issue of endogeneity in estimation; for this reason, we use decisively exogenous baseline characteristics from before MGNREGS implementation began for all static needs variables 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, but at the *mandal* level instead.[14] Second, because we are interested in studying 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 included variables 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 when 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), where the needs variables are all ordered so 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 *mandal*'*s* time-varying needs, serving as a safety net against shocks, as opposed to simply being 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 underemployed agricultural 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* (June to October) and *rabi* (November to March)—that describes how many standard

[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, scheduled caste and tribe populations, drought-proneness and desert-proneness, and rural connectivity.

[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, more than 800 *mandals* were declared in drought in fiscal year 2005, more than 200 in 2006, nearly 1,000 in 2009, more than 900 in 2011, and more than 200 in 2012. However, because the Ministry of Rural Development is in charge of these declarations and because the criteria for declaration are somewhat loosely defined, we expect politics may be a contributing factor in the decision; therefore, we do not consider this declaration in the analysis.

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.

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. Although not the central focus of this 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 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:

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

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 2008/2009. We test the following hypothesis and conclude that there is evidence that MGNREGS expenditures are positively correlated with a shift in voters toward the UPA coalition:

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

$$H_A(14): \delta_1 > 0.$$

Because voters might view their local-level incumbent party as 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.

[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.

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 datasets, all data were manually merged for 1,061 *mandals* from 22 districts in AP; about 96 percent of the 1,109 rural *mandals* found in these 22 districts are in the Indian Population Census of 2001.[17] Definitions, data sources, and summary statistics for all of the variables used in the analysis can be found in Table A.1 in the Appendix.

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. Although 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 skeptical of the data quality. We downloaded reports from the website, which includes the total amount spent per fiscal year (April–March) at the *mandal* level, which is the variable of interest for this analysis. 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 of 2001, the Indian Agricultural Census of 2005/06, and the Indian Village Amenities Census of 2001, all of which were collected before the start of MGNREGS and act as a suitable baseline. Because MGNREGS is 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, which are all functions of observed rainfall levels across the two important rainfall seasons of *kharif* and *rabi*, are derived from geospatial datasets linked to *mandal*-level boundaries. In addition to these contemporaneous variables, we also include a measure of average yearly rainfall levels over a recent 12-year time frame as a control for the agricultural potential of the area. On average across all *mandals*, 2009/2010 and 2011/2012 were below average *kharif* seasons, whereas 2007/2008 and 2011/2012 were below average *rabi* seasons.

All election outcome data were aggregated from various documents made available by the Election Commission of India. These documents include number of votes by candidate and party for both the 2004 and 2009 elections. We use the assembly constituency (AC) election results—as opposed to local-level election or parliamentary constituency election results—for a number of reasons: (1) the state, led by the Members of the Legislative Assembly (MLAs), has ultimate implementation authority under MGNREGS; (2) MLAs, who are elected via the assembly constituency elections in AP, influence MGNREGS implementation via pressure on and oversight of field assistants who are hired by the *Mandal* Parishad Development Officer; and (3) the importance of the field officer role in AP 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). Each assembly constituency can have several *mandals*; 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. (Figure A.1 in the Appendix provides more details on the distribution of the advantage term across all *mandals* for both elections.)

Although the advantage variable is the 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 in which a *mandal* is split between

[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.

[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 were downloaded on September 11, 2013.

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 also control for those cases in which *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, wherein 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]

[19] Bardhan and Mookherjee (2012) found 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) went further and suggested that politicians "buy" turnout instead of explicit votes, because it is impossible to monitor voting behavior in a secret ballot environment.

6. RESULTS

This section tests the 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.

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 2006/2007, phase 1 and 2 *mandals* in 2007/2008, and all *mandals* eligible in 2008/2009.[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*.

Table 6.1 presents the estimation results for equation (2) in the pre-2009 years. 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 hold not only with an OLS estimator but also when controlling for potential endogeneity using the three alternate IV specifications. The fact that our results do not change when including instruments that hold up under a number of diagnostic tests lends credence to the claim that the endogeneity of the $advantage$ term does not influence the OLS results. Even so, our inability to reject $H_O(1)$ means 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 hypotheses $H_O(2)$ through $H_O(5)$.

Table 6.1 Regression results for MGNREGS expenditure models, pre-2009 election

Variable	(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)

[21] It should be noted, however, that we do observe several out-of-phase *mandals* receiving MGNREGS funds a year before they should. This includes 6 phase 2 *mandals* in 2006/2007 and 68 phase 3 *mandals* in 2007/2008. Although there could be political economy reasons for early phase-in, this paper does not concern itself with that dimension.

Table 6.1 Continued

Variable	(1) OLS	(2) IV-1	(3) IV-2	(4) IV-3
Number of ag credit societies (in 1,000s)	–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 (absolute 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 (absolute 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	Yes	Yes	Yes	Yes
District dummy variables	Yes	Yes	Yes	Yes
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
Underidentification test (F-value, p-value)	–	30.859 (0.000)	23.962 (0.000)	45.755 (0.000)
Overidentification test (Hansen J statistic, p-value)	–	2.682 (0.1015)	–	3.320 (0.1902)

Source: Author's calculations.

Notes: OLS = ordinary least squares; IV = instrumental variable; UPA = United Progressive Alliance; SC/ST = scheduled castes and tribes; AC = assembly constituency. 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 2006/2007, 2007/2008, and 2008/2009. *** 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; and (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 A.3. See text for more details on how these variables were constructed.

Because we might expect that the fiscal year directly before the 2009 election (2008/2009) 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 A.5) but still find no individual year when we can reject the null hypothesis of no vote buying. Moreover, because it may be that the INC party, instead of the full UPA coalition, used MGNREGS funds for vote-buying purposes, we re-estimate equation (2) using an $advantage$ term specific to INC (Table A.4) but still find no independent or joint significance of the $advantage$ term. Because of concerns that the politics surrounding the Telangana succession effort may be driving some of the results, we also drop the Telangana districts from our sample and re-estimate equation (2) on the limited subsample (Table A.4).[22] In this case, we do find that the coefficient estimate

[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*.

on the squared $advantage$ term is negative and statistically significant and that the coefficient estimates on both $advantage$ terms are jointly significant at the 5 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.

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. Table 6.2 reports the results from three model specifications—equations (2), (4), and (5)—using post-2009 data.

Table 6.2 Regression results for MGNREGS expenditure models, post-2009 election

Variable	(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**	0.370**
			(0.167)	(0.168)
SC/ST caste (%)	0.00405***	0.00400***	–0.00399	–0.00467*
	(0.00149)	(0.00150)	(0.00261)	(0.00283)
Illiterate (%)	0.00851***	0.00850***	0.0195***	0.0190***
	(0.00172)	(0.00172)	(0.00401)	(0.00406)
Agricultural laborers (%)	0.000573	0.000623	–0.0128**	–0.0121**
	(0.00217)	(0.00218)	(0.00504)	(0.00514)
Cultivators (%)	0.00983***	0.0101***	0.0355***	0.0350***
	(0.00304)	(0.00298)	(0.00646)	(0.00649)
Unirrigated land (%)	0.00110**	0.00113**	0.00252**	0.00244**
	(0.000444)	(0.000445)	(0.00112)	(0.00113)
Landholdings that are small/marginal (%)	–0.00445***	–0.00447***	–0.00807***	–0.00816***
	(0.00127)	(0.00127)	(0.00299)	(0.00302)
Land gini coefficient	–0.839***	–0.858***	–0.155	–0.121
	(0.278)	(0.274)	(0.684)	(0.686)
Long-run average yearly rainfall rate (mm/hr)	3.272**	3.323**	18.93***	18.83***
	(1.454)	(1.460)	(1.996)	(2.031)
Number of ag credit societies (in 1,000s)	–0.0124***	–0.0123***	–0.0252***	–0.0258***
	(0.00289)	(0.00283)	(0.00591)	(0.00595)
% of villages with medical facilities	–0.156**	–0.157**	–0.599***	–0.604***
	(0.0793)	(0.0802)	(0.171)	(0.172)
% of villages with paved road	–0.0929	–0.0837	–0.0980	–0.0886
	(0.0606)	(0.0605)	(0.155)	(0.156)
Distance to nearest town from village	0.00296***	0.00309***	0.00557***	0.00557***
	(0.000561)	(0.000567)	(0.00137)	(0.00141)

Table 6.2 Continued

Variable	(1) Equation (2)	(2) Equation (4)	(3) Equation (5)	(4) Equation (5)
Kharif season rain less than average (1 = yes)	–0.0362*	–0.0353*	–	–
	(0.0209)	(0.0210)		
Kharif less than average * rain shock (absolute value)	0.103***	0.104***	–	–
	(0.0156)	(0.0158)		
Rabi season rain less than average (1 = yes)	0.00154	–0.000478	–	–
	(0.0216)	(0.0216)		
Rabi less than average * rain shock (absolute value)	–0.232***	–0.229***	–	–
	(0.0250)	(0.0248)		
Voter turnout in 2009 election (%)	–0.00282	–0.00247	–	–
	(0.00221)	(0.00223)		
SC/ST reserved 2009 election (1 = yes)	0.00675	–0.00405	–	–0.0751
	(0.0238)	(0.0243)		(0.0765)
SC/ST reserved 2004 election (1 = yes)	–	–	–	0.141*
				(0.0769)
Split between ACs in 2009 election (1 = yes)	–0.0529	–0.0546*	–	0.0814
	(0.0326)	(0.0329)		(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	Yes	Yes	–	–
District dummy variables	Yes	Yes	No	No
Phase dummy variables	No	No	Yes	Yes
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

Source: Author's calculations.

Notes: UPA = United Progressive Alliance; SC/ST = scheduled castes and tribes; AC = assembly constituency; mm/hr = millimeter per hour. 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 2010/2011, 2011/2012, and 2012/2013.

We test $H_O(6)$ using the set of regression results in column 1 of Table 6.2. Indeed, in this case, we reject (at the 1 percent level) the null hypothesis 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 A.6), meaning the effects cannot be attributed to any one of the three postelection years in particular. The results also hold when using an $advantage$ term specific to the INC coalition and when dropping the Telangana districts (Table A.4). In addition, when returning to the estimates in Table 6.2, we are 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 relationship holds with the INC specification, though not with the non-Telangana districts. In this case, there is a negative and statistically significant squared term, though 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 that a 1 percent 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 similar-sized effect when using only the INC $advantage$ term). Given that an average MGNREGS allocation per capita of about 540 rupees can be seen in any given fiscal year (Table A.1), this means that a 1 percent 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 postelection years, a magnitude that is only sizable when considering relatively high levels of UPA $advantage$ or *mandals* in which per capita expenditure levels are much larger than average. Although 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 its 2009 $advantage$ level when distributing MGNREGS funds to *mandals*, we move to test whether the coalition's 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 6.2. 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 groups that did not vote for UPA in 2009 ($loselose$ and $winlose$) were "punished" with fewer 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 fewer funds than the group that switched from UPA supporters in 2004 to nonsupporters in 2009 ($winlose$). However, the previously non-UPA *mandals* that moved toward 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 that the state-level incumbent coalition did not necessarily consider the 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.

To ensure that our results hold up with controls for prospective endogeneity, we first explore the feasibility of regression discontinuity design (RDD) methods. Although RDD is an attractive method in which 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 (nonparametric) regression under a range of bandwidths and global polynomial (parametric) regression approaches, we find no evidence of discontinuity at $advantage = 0$ (Figures A.2 and A.3); therefore, we cannot rely on regression discontinuity in these data.[23] The fact that RDD is not a viable option, 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 6.2, 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 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 our panel analysis (0.38). Because differencing eliminates *mandal*-level fixed effects, the resemblance of these terms lends further credibility to our post-2009 patronage claims.

Needs

This section investigates the third set of hypotheses that MGNREGS funds were allocated based on the *mandal's* needs. With respect to the baseline (time-invariant) labor-related needs described in $H_O(10)$ and $H_O(11)$, *mandals* with a higher percentage of illiterate individuals received more funds across all panel model specifications (Tables 6.1 and 6.2) but that areas with more SC/ST (that is, 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 due to 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 the election, all districts were participating in the program.

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

The coefficient estimates on the percentage of primary agricultural laborers and cultivators, however, show a changing story before and after the elections. Across most specifications, *mandals* with a higher percentage of agricultural laborers received more funds in the pre-election period but a lower amount of funds in the postelection period, with the opposite relationship observed for primary cultivators. This finding implies that MGNREGS initially was well targeted to areas with larger numbers of casual agricultural laborers, which is 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 area's agricultural potential 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 more than 75 percent of total MGNREGS projects in AP (Deininger and Liu 2013). This finding 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 categories and areas with more inequality in landholding size receive less MGNREGS spending. This finding signals that areas with mostly larger farms and more equality across farm sizes, in addition to areas with higher long-run average rainfall, (all characteristics that are associated with areas of high agricultural activity and potential) received more funding. To the extent that these features are associated with environments in which 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 describes other measures of infrastructure in the *mandal* that likely function as proxies for a range of other infrastructure and needs-based variables. 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 fewer funds per capita. However, *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, areas with less-than-average rainfall in both seasons were more likely to receive more funds; for the *kharif* season in particular, we also find a positive and significant relationship in which the magnitude of those negative shocks was highest (see interaction terms).

In the post-2009 years, the relationships are not as well behaved. Areas with below-average *kharif* rainfall are less likely to receive funds, but only after controlling for the magnitude of those shocks, which are positive and statistically significant. For the *rabi* season, areas with higher negative rainfall shock receive fewer funds. After disentangling these relationships by estimating average partial effects, 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 in which the rainfall needs were considered even more than in the pre-2009 period. This is because "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 (from 100 to 150) when rainfall levels were far below average. Using 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 postelection years. This finding is particularly unfortunate given that the areas with a higher percentage of agricultural laborers received less MGNREGS, meaning those households that rely more on causal agricultural labor opportunities may have had more difficulty earning income in these postelection years, particularly during the main *rabi* season.

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, 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 the coalition 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 *mandal* 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 A.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 R2) 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 R2. Table 6.3 presents these estimates for all year—pre-2009 and post-2009—model specifications.

Table 6.3 Decomposition of R2 for MGNREGS fund expenditure models

Variable	(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***

Source: Author's calculations.

Notes: The included numbers represent Shapley values, or the percentage of the R2 that can be explained by a particular group of regressors. We calculate these values using the "rego" user-written command in Stata. See Table A.1 for which variables are included in each category. The relevant matched regression results for these estimates are the specifications displayed in the first columns of Tables 6.1 and 6.2 (equation (2) estimated with ordinary least squares). The first column of this table includes all fiscal years between 2006/2007 and 2013/2013 except 2009/2010.

Across all included fiscal years (column 1), the advantage variables that allow us to measure clientelism can explain only about 1 percent of the variation in MGNREGS spending levels. By contrast, the four categories of variables that encapsulate the needs of the *mandal* explain more than 42 percent of the variation. In the postelection 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* 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 flexibly to changing labor market dynamics over time, though they do flow to poorer areas more generally.

Voter Response in the 2009 Election to MGNREGS Expenditures

Although there is little to no evidence of vote buying in the 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 6.4. When specifying $\Delta advantage$ with respect to the UPA coalition in both elections (columns 1 and 2), aggregate MGNREGS spending in the pre-election years is positive and statistically significantly correlated with the movement of voters toward UPA candidates. This finding allows us to reject the null in $H_O(14)$ that MGNREGS expenditures were uncorrelated with the UPA's 2009 victory. When respecifying $\Delta advantage$ with respect to the local-level incumbent party from the 2004 election (columns 3 and 4), however, no significant relationship exists 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 there is no evidence of blatant vote buying in the years leading up to the election, voters are not responding to clientelism; rather they may be responding to the fact that the program appears to have been well targeted to the needs of the *mandals*. Indeed, overt vote buying was unnecessary for the UPA coalition to secure its 2009 victory; catering to the needs of 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 6.4 Regression results for political reward in 2009 election for MGNREGS spending

Variable	UPA advantage		Local incumbent advantage	
	(1) All *mandals*	(2) Phase 1 and 2	(3) All *mandals*	(4) Phase 1 and 2
Total MGNREGS spending, 2006/2007–2008/2009	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 1,000s)	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	Yes	Yes	Yes	Yes
Number of *mandals*	1,039	914	929	815
R-squared	0.259	0.270	0.143	0.151

Source: Author's calculations.

Notes: UPA = United Progressive Alliance; SC/ST = scheduled castes and tribes; AC = assembly constituency. 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* for which 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 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 for 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 AP, a state in which 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 UPA coalition—influenced the *mandal*-level distribution of MGNREGS expenditures between 2006/2007 and 2012/2013.

In summary, we do not find evidence of vote buying before the 2009 election. However, we 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 the full election in 2014. We suspect that the emergence of clientelistic effects may have resulted, to some extent, from the power vacuum and the struggle that occurred in AP following the sudden death of the re-elected chief minister from the UPA coalition. In addition, 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 postelection period, when 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 toward the UPA coalition in 2009, implying that voters "rewarded" the governing coalition for implementing a well-targeted program in the initial years. This evidence indicates that overt vote buying was unnecessary to secure the 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. It uses MGNREGS, the largest public works project in the world with both *public good* and *private good* characteristics, as a case study. This paper also offers 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. This study will also help ensure that program expenditures conform with stated goals related to constituent needs and ultimately contribute to poverty reduction and economic growth.

APPENDIX: SUPPLEMENTARY TABLES

Table A.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 1,000 rupees [Rs.]) by MGNREGS (total tech and admin) at the *mandal* level per capita in each fiscal year (2006/2007–2012/2013)	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 2010/2011–2012/2013 and 2006/2007–2008/2009	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 or patronage)						
UPA advantage in 2004	Percentage 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	Percentage 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* that 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)
Labor-related needs of *mandal*						
Scheduled castes and tribe (SC/ST) caste (%)	Percentage 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 (%)	Percentage 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 (%)	Percentage 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 (%)	Percentage 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)

Table A.1 Continued

Variable name	Variable description	Data source	Phase 1 (n=639)	Phase 2 (n=297)	Phase 3 (n=125)	All *mandals* (n=1,061)
Land-related needs of *mandal*						
Unirrigated land (%)	Percentage of gross cropped area not under irrigation in *mandal*	Indian Agricultural Census 2005/2006	57.3 (30.7)	52.9 (31.3)	35.5 (31.8)	53.5 (31.7)
Landholdings that are small/marginal (%)	Percentage of total operational landholdings in *mandal* that are ≤ 2 hectares	Indian Agricultural Census 2005/2006	49.7 (13.4)	54.8 (16.4)	62.1 (13.7)	52.6 (13.7)
Land gini coefficient	Computed gini coefficient of landholding size classes using categorical variables at *mandal* level	Indian Agricultural Census 2005/2006	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)
Infrastructure-related needs of *mandal*						
Number of ag credit societies (in 1,000s)	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)
Villages with medical facilities (%)	Population-weighted percentage 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 percentage 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)
Rainfall-variability needs of *mandal*						
Kharif season rain less than average	Binary variable for rainfall in current *kharif* season was less than average across 2001–2012 (June–October)	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–October) $\lvert rain\ shock_t \rvert = \frac{\lvert rainfall_t - rainfall_{mean} \rvert}{rainfall_{sd}}$	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 (November–February)	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* (November–February), *see kharif for definition*	NASA	0.78 (0.72)	0.62 (0.54)	0.74 (0.51)	0.73 (0.66)

Table A.1 Continued

Variable name	Variable description	Data source	Phase 1 (n=639)	Phase 2 (n=297)	Phase 3 (n=125)	All mandals (n=1,061)
Voter turnout in 2004 election (%)	Percentage of eligible voters who voted in 2004 assembly constituency (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 (%)	Percentage of eligible voters who 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 *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 *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	Percentage 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)

Source: Authors.

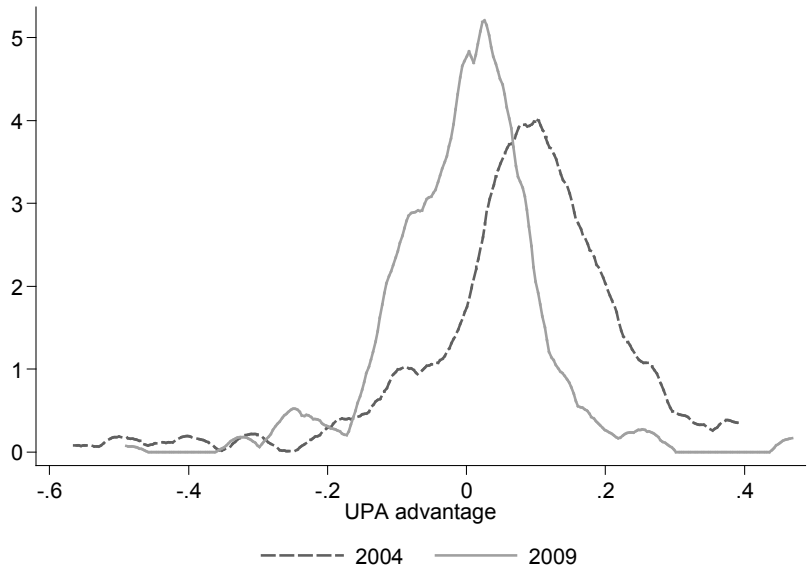
Note: UPA = United Progressive Alliance; AC = assembly constituency; SC/ST = scheduled castes and tribes; mm/hr = millimeter per hour. Standard deviations in parentheses. See Section 5 for more details.

Table A.2 Total MGNREGS spending figures from various sources (in 1,000s Rs.)

Fiscal year	National funds available1	Andhra Pradesh funds available1	Total Andhra Pradesh funds observed spent across *mandals* used in this analysis2
2006/2007	120,735,556	11,422,439	5,766,143
2007/2008	193,395,355	22,932,082	19,871,900
2008/2009	373,970,615	37,066,960	16,754,406
2009/2010	495,791,950	53,835,480	23,377,902
2010/2011	541,721,425	91,070,968	34,674,508
2011/2012	488,324,949	57,815,077	29,227,950
2012/2013	424,642,606	45,578,855	37,524,884

Sources: 1 National figure from http://MGNREGA.nic.in/NetMGNREGA/WriteReaddata/Circulars/Briefing_booklet13.pdf. 2011/2012 statistics are 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 8 in the main text.

Figure A.1 Kernel density of United Progressive Alliance advantage variable by election year



Source: Author's calculations.

Note: United Progressive Alliance (UPA) advantage is defined as $advantage_{UPA} = \frac{votes_{UPA} - votes_{other}}{votes_{total}}$.

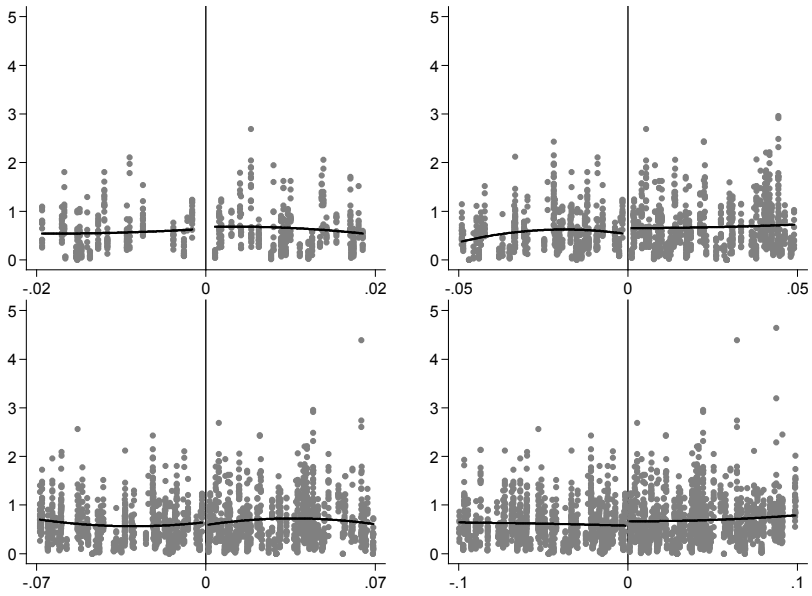
Table A.3 Relevance tests for instrumental variable (IV) results in Table 6.1

Instrumental variable	(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 1,000s)	–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 (absolute 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 (absolute 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 2004 election (1 = yes)	0.160***	0.155***	0.160***
	(0.0316)	(0.0289)	(0.0277)
Year dummy variables	Yes	Yes	Yes
District dummy variables	Yes	Yes	Yes
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

Source: Author's calculations.

Notes: UPA = United Progressive Alliance; AC = assembly constituency; SC/ST = scheduled castes and tribes; mm/hr = millimeter per hour. 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 6.1.

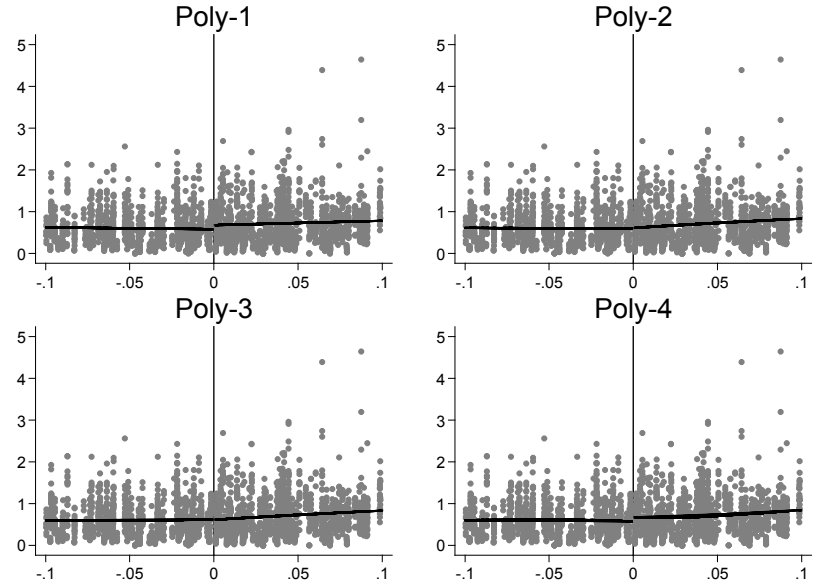
Figure A.2 Diagnostic test for regression discontinuity design plausibility—local linear approach (nonparametric)



Source: Author's calculations.

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 United Progressive Alliance (UPA) advantage = 0. In all graphs, the *x*-axis shows UPA advantage in 2009, and the *y*-axis shows MGNREGS spending per capita (in 1,000 Rs.) in the post-2009 years.

Figure A.3 Diagnostic test for regression discontinuity design plausibility—global polynomial approach (parametric)



Source: Author's calculations.

Notes: These four graphs represent increasing orders of polynomials included in the regression. Although the full sample is used in estimation, we restrict the *x*-axis to a narrower range in order to look for a discontinuity at advantage = 0. In all graphs, the *x*-axis shows UPA advantage in 2009, and the *y*-axis shows MGNREGS spending per capita (in 1,000 Rs.) in the post-2009 years.

Table A.4 Alternate specification and robustness checks for equation (2)

Variable	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 1,000s)	–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 average * rain shock (absolute 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 (absolute 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	Yes	Yese	Yes	Yes
District dummy variables	Yes	Yes	Yes	Yes
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

Source: Author's calculations.

Notes: UPA = United Progressive Alliance; INC = Indian National Congress; SC/ST = scheduled castes and tribes; AC = assembly constituency; mm/hr = millimeter per hour. 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 2006/2007, 2007/2008, and 2008/2009, where the 2004 election variables are used. Post-2009 years include 2010/2011, 2011/2012, and 2012/2013, where the 2009 election variables are used. Results can be compared with those in Tables 6.1 and 6.2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.5 Regression results by year for MGNREGS fund expenditure model, pre-2009 election

Variable	(1) 2006/2007	(2) 2007/2008	(3) 2008/2009
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 1,000s)	–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 (absolute 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 (absolute 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	Yes	Yes	Yes
Observations	617	914	1,039
R-squared	0.467	0.503	0.480

Source: Author's calculations.

Notes: UPA = United Progressive Alliance; SC/ST = scheduled castes and tribes; AC = assembly constituency; mm/hr = millimeter per hour. All reported results are estimated via ordinary least squares per equation (2). Standard errors are in parentheses.

Table A.6 Regression results by year for MGNREGS fund expenditure model, post-2009 election

Variable	(1) 2010/2011	(2) 2011/2012	(3) 2012/2013
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 1,000s)	–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 (absolute 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 (absolute 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	Yes	Yes	Yes
Observations	1,061	1,061	1,061
R-squared	0.516	0.516	0.614

Source: Author's calculations.

Notes: UPA = United Progressive Alliance; SC/ST = scheduled castes and tribes; AC = assembly constituency; mm/hr = millimeter per hour. All reported results are estimated via ordinary least squares per equation (2). Standard errors are in parenthesis.

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