Institutional Corruption and Election Fraud: Evidence from a Field Experiment in Afghanistan*

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Abstract

Elections in developing countries commonly fail to deliver accountability because of manipulation, often involving collusion between corrupt election officials and political candidates. We report the results of an experimental evaluation of Photo Quick Count—a monitoring technology designed to detect the illegal sale of votes by corrupt election officials to candidates—carried out in 471 polling centers across Afghanistan during the 2010 parliamentary elections. The intervention reduced theft of election materials by about 60 percent and vote counts for predictably corrupt candidates by about 25 percent, with estimates also suggesting a fraud-reducing spatial treatment externality. Last, we provide evidence that both the effect of monitoring and the strategic response of candidates seeking to recover votes depend on pre-existing political connections to election commission officials. We explain these results in the context of a theory of corrupt vote transactions in which the capacity of candidates to protect corrupt officials determines the effect of new monitoring regimes and the mix of corrupt activities officials will undertake on behalf of candidates.

JEL codes: P16 (Political Economy), D72 (Political Processes and Rent-Seeking), D73 (Corruption)

Keywords: Election Fraud, Corrupt Organizations, Information Communication Technology

**Authors' Note*: We are grateful to Glenn Cowan, Jed Ober, Eric Bjornlund, Evan Smith, and Jon Gatto at Democracy International (DI) and Nader Nadery, Jandad Spinghar, and Una Moore at the Free and Fair Elections Foundation of Afghanistan (FEFA). USAID Development Innovation Ventures (DIV) and DI provided funding for this experiment. We are indebted to James Andreoni, Eli Berman, Luke Condra, Gordon Dahl, Daniel Egel, Ray Fisman, Tarek Ghani, Clark Gibson, Susan Hyde, Radha Iyengar, Danielle Jung, David Laitin, David Lake, Craig McIntosh, Paul Niehaus, Ngoc Anh Tran, Maura O'Neill, Shanker Satyanath, Jacob Shapiro, Scott Worden, Christopher Woodruff and seminar participants at the NBER Political Economy Program, the 2011 New England University Development Consortium (NEUDC) conference, George Mason University, the Development and Conflict Research (DACOR) conference, the 2011 Northern California Institute on Global Conflict and Cooperation (IGCC) conference, UC San Diego, and USAID for extremely helpful comments. This project would not have been possible without the dedicated research assistance of Randy Edwards, Mohammad Isaqzadeh, and Shahim Kabuli. Mistakes remain with the authors.

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1 Introduction

Free and fair elections are central to democracy and provide a vital means of empowering citizens to hold politicians accountable.[1] Election fraud commonly undermines this critical function in many young democracies largely due to weak electoral institutions. In particular, the rents from political office provide strong incentives for candidates to bribe government election officials to illegally alter vote totals. Corruption—the illegal selling of votes by a government official with the power to alter votes—may in this way undermine fairness in elections.

This paper evaluates the effect of a novel technology designed to combat this type of corruption. During the September 2010 parliamentary (Wolesi Jirga) election in Afghanistan, we designed, implemented, and experimentally evaluated a novel election monitoring technology aimed at fraud involving collusion between candidates and election officials.[2] The experimental sample included 471 polling centers (7.8 percent of polling centers operating on election day) in 19 of the 34 provincial capitals in Afghanistan. The technology works by recording differences between immediate post-election polling center level counts and the corresponding numbers in the certified national aggregate. To obtain immediate post-election counts, pictures are taken at the polling center of elections returns forms.[3] We call this technology "photo quick count".[4] We evaluate this technology by randomizing the information available to polling center managers (PCMs). Specifically, we deliver a letter to the PCM in 238 of the 471 polling centers in our experimental sample explaining

[1]There is substantial empirical documentation of the benefits of programs aimed at increasing political accountability or empowering citizens through increased enfranchisement and political representation (Besley and Burgess 2002; Besley et al. 2005; Chattopadhyay and Duflo 2004; Fujiwara 2010; Pande 2003). Recent work indicates that in countries experiencing or emerging from violent contests for state control, such as Afghanistan, fair elections may also undermine popular support for insurgents by promoting an accountable and legitimate government and by providing a forum for reconciliation (Berman et al. 2011; Besley and Persson 2009; McChrystal 2009; United States Army 2006; World Bank 2011).

[2]The intervention occurred during an election of particular geopolitical relevance. The international community viewed this election as vital for the Afghan government's attempt to exercise control and achieve stability through the consolidation of democratic institutions. The 2010 election was only the second parliamentary election after the United States and Coalition forces overthrew the Taliban, and was a central benchmark in the US efforts to support democratic gains with the horizon of an eventual drawdown of international troops. This election also presented an important test of the Afghan government's ability to exert control over territory and the implementation of democratic practices.

[3]A standard practice in many countries is for an election official to record vote totals at a particular polling center on an election returns form. After votes are counted at the polling center, an official will post the form on the outside of the polling center, indicating vote totals at the polling centers to local residents.

[4]The pioneering application of cameras to monitoring was in using cameras to verify teacher attendance and thereby cut abseenteism (Duflo et al. 2011).

the logic of photo quick count and warning them that they will be subject to it. We find that photo quick count is effective and at only a fraction of the cost of more traditional monitoring techniques.[5] Monitoring reduces the incidence of theft or damaging of election materials at polling centers from 18.9 to 7.9 percent (a reduction of about 60 percent) and has a considerable negative effect on the number of votes cast for powerful candidates. Additionally, our estimates suggest that treatment externalities are negative for both measures, so these estimates may possibly understate the true effect.

This intervention targets corrupt political agents who have strong incentives to work to undermine the technology, possibly creating positive treatment externalities by manipulating at control polling centers.[6] A negative treatment externality might also arise if the intervention causes officials in charge of aggregating votes at control centers to increase their subjective assessment that they will be monitored. In this case, we would "doubly underestimate" our treatment effect, underestimating both the fraud reduction in treatment centers and the beneficial externality in control centers (Miguel and Kremer 2004). We address the possibility of spatial externalities in three ways.[7] First we use two separate measures of fraud that are differentially subject to externalities. The first measure, whether affiliates of the candidates damaged or stole materials at the polling center, should not be subject to much displacement as a strategic reaction would need to happen in a matter of hours. By contrast, our second measure—the number of votes for the most powerful candidate—is more likely exhibit displacement because of strategic re-adjustments during the month long aggregation process. In this way, using both measures also allows us to differentiate the short-term and long-term effects of photo quick count. Second, we make use of geocodes for the

[5]The relative savings come primarily from avoiding the travel and security costs of supporting international observers. Moreover, photo quick count is well-suited to adoption through pre-existing social networks—viral adoption—especially in light of the dramatic global increase in cellular connectivity and smartphone use in developing countries.

[6]A famous example of monitoring efforts being undermined is provided in Banerjee et al. (2008), where a NGO monitoring effort to increase attendance by nurse attendance in public health centers was rendered completely ineffective over the course of 18 months as senior officials allowed nurses to claim a larger number of exempt days. Yang (2008) similarly provides evidence that an initiative to reduce import duty-avoidance in the Philippines may have completely displaced duty-avoidance into shipping via duty-exempt export processing zones.

[7]At the design stage, we were unable to implement a randomized treatment saturation design, monitoring different electoral districts at different intensities, as there are too few electoral districts in Afghanistan. We also considered sending complete lists of all treatment polling centers to every polling center manager, but in collaboration with our Afghan partners, we determined this to be unsafe.

polling centers in our experimental sample to attempt to directly estimate treatment externalities using the approach in Miguel and Kremer (2004). Last, we develop and test a theory in which: (i) a corrupt official can illegally provide votes to a candidate using several alternative means and; (ii) a candidate has an exogenously given "protection capacity" to shield the official from being fined, which applies to only a subset of illegal transactions.

According to this simple model, the candidate reacts to monitoring by shifting from monitored to unmonitored illegal vote transactions as part of a "recovery strategy." The recovery strategy, in turn, depends on the protection capacity of the candidate. They can recover by moving votes from monitored to unmonitored polling centers (spatial recovery). They can also move votes to an earlier stage in the aggregation process which is unaffected by the monitoring innovation (temporal recovery). If the expected fine faced by the official is decreasing in protection capacity, then candidates with strong protection capacity have a broader set of recovery strategies than candidates with weak protection capacity.[8]

To test this implication, we use rich data on candidates' political networks dating back to the 1979 Soviet invasion of Afghanistan. We find some evidence which suggests that, consistent with the theory, candidates who are well-connected politically may prefer spatial recovery while candidates without such connections prefer temporal recovery. Correspondingly, photo quick count appears to have a negative treatment externality on vote sales to weakly connected candidates. We emphasize that these results rely on proxies for fraud, and a research design which is not first best in terms of measuring treatment externalities, and so we interpret them with caution. The treatment effects we document, however, appear to be robust to several different approaches to controlling for spatial treatment externalities.

While our results are consistent with the model presented in the next section, there are compelling alternative interpretations. For example, candidates with robust political connections may receive stronger support from election officials because they are directly involved in a repeated

[8]McMillan and Zoido (2004) provide the best empirical evidence on corrupt agents' willingness to pay for protection against prosecution for corruption. The authors show that the size of the bribes paid by media houses to Vladimiro Montesinos Torres, the secret-police chief for Peruvian President Alberto Fujimori, were conditional on their political connections to the regime or the opposition. The behavior documented in this paper is highly consistent with our results: the more influence a corrupt counterparty has on the expected downside for engaging in corruption the more leverage they have in defining the terms of the transaction.

game. In this case, officials may be willing to select strategies that provide candidates with more votes, even when they are more likely to be detected. An alternative and related model might be that connected candidates can engage officials in a broader set of unobserved parallel transactions or provide more attractive in-kind transfers than unconnected candidates. Because of the clandestine nature of corrupt vote transactions, we do not have data which allow us to adjudicate between these models. Our model, however, provides a simple framework for interpreting our results, which we develop using a rich set of primary and administrative data and the experimental application of a powerful monitoring technology.

Our findings also relate to four strands of literature in the economics of corruption. First, as in Bertrand et al. (2007) and Olken and Barron (2009), we find that corruption limits the ability of governments to correct externalities. The purpose of electoral law is to ensure that election outcomes reflect the will of the electorate. We find evidence this function is undermined by corrupt state officials in Afghanistan. Second, we provide an additional example of corrupt agents working to undermine a new monitoring initative as in Banerjee et al. (2008) and Olken (2007). Third, both the effect of our intervention, and the response of candidates to it, appear to depend on the pre-existing connections between candidates and election officials. This suggests the possibility of multiple equilibria in corruption as discussed in Olken and Pande (2011); the same intervention can have very different effects depending on pre-existing political relationships. Our focus is thus on the determinants of equilibrium patterns of corruption (Shleifer and Vishny 1993; Cadot 1987; Rose-Ackerman 1975) and specifically the role of bribe payer endowments in shaping corrupt transactions.[9] Along these lines, Fisman (2001) and Khwaja and Mian (2005) substantiate that political connections improve preferential access to capital from government lenders. Our theory provides a framework in which political connections might explain the inability of new monitoring initiatives to have sustained effect. In our model, rather than provide preferential access to capital, political connections provide preferential access to impunity. Last, our results indicate that the possibility for corruption is endogenous to the mix of types working in a state institution (Burgess et al. 2011). In corrupt settings, the rents available to agents who can leverage

[9]Svensson (2003) documents the relevance of firm profitability and outside options for corrupt transactions.

political connections are higher, potentially drawing such individuals to weaker institutions.

More generally, our experiment relates to the growing body of experimental and quasi-experimental assessments of initiatives to improve elections (Aker et al. 2010; Fujiwara 2010; Hyde 2007). Our project also draws direct inspiration from work in development economics on efforts to improve transparency and accountability (Duflo et al. 2011; Di Tella and Schargrodsky 2003; Ferraz and Finan 2008; Olken 2007; Yang 2008). Research on the role of monitoring and anti-corruption efforts in development is advancing rapidly; we direct readers to Olken and Pande (2011) and McGee and Gaventa (2011) for excellent reviews of research in this field.

Returning to the empirical results, we find that Photo Quick Count substantially reduced theft of election materials and votes for powerful political candidates. These results hold for several ways of defining the predictably corrupt candidate and are broadly robust when attempting to control for spatial treatment externalities. We also present evidence consistent with our theory which suggests that candidates connected to the senior elections official in their electoral district react to the intervention by substituting fraud toward polling centers where they do not expect monitoring and that unconnected candidates substitute fraud to an earlier stage in the aggregation process which cannot be detected by the technology.

Our results suggest several considerations for policies aimed at reducing corruption and improving the functioning of democracy. Photo quick count is highly compatible with implementation via Information Communications Technology (ICT). The cost of gathering and centralizing information on diffuse illegal behavior is now nominal. The rapid increase in cellular connectivity and in smartphone usage in weakly institutionalized countries suggests the possibility that this technology might also be adapted to citizen-based implementation. This should greatly increase the probability of detection for malfeasance and so may improve elections in countries with weak institutions.[10] Our results indicate promise for future experiments in this direction. Second, in weak institutions with partial constraints, corrupt officials may respond to monitoring by providing preferential access only to powerful individuals. The same monitoring intervention can have very different effects depending on the strength of pre-exising political connections and the ability of institutions to pro-

[10]See Becker (1968), Fisman and Miguel (2007), and Levitt (2004) for studies examining the impact of increasing the probability of detection for corruption on the amount of corruption.

vide complementary constraints on officials. This suggests that, in certain cases, monitoring can have the perverse effect of further empowering connected individuals by eliminating rivals. Policymakers, government agencies, and researchers, should remain conscious of recovery strategies and adaptation, particularly where institutions are weak. Last, improving the independence of electoral institutions and constraining the ability of agents to sell votes is critical to the disciplining role of elections in democracy.

We structure the rest of the paper as follows. Section 2 develops a theoretical model that relates corrupt vote transactions to protection capacity. Section 3 describes our experimental setting and relevant features of electoral institutions in Afghanistan. Section 4 introduces our experiment, data, and research design. Section 5 provides results, and Section 6 concludes.

2 Theoretical Framework

This section presents a basic model of corrupt transactions to help interpret our empirical results. The model characterizes transactions between a candidate maximizing the sum of legitimate and illegitimate votes and an official who sells illegal votes but has some probability of being caught and fined.[11] Our model departs from models of which we are aware in two ways. First, the official can engage in several different types of corruption, each subject to a different probability of detection. Second, the expected fine for corruption faced by the official depends on the type of candidate with whom they are transacting. In an environment with perfect information, the candidate pays the risk-neutral expected utility maximizing official an amount equal to the expected cost. Because the protection capacity of the candidate influences this expected cost, it is a key determinant of the price of illegal votes. According to this simple model, the candidate reacts to monitoring by shifting from monitored to unmonitored illegal vote transactions as part of a recovery strategy. The recovery strategy also depends on the protection capacity of the candidate, as it applies to some sales but not others.

[11] Corrupt transactions are therefore a gamble in the spirit of Becker and Stigler (1974) and Cadot (1987).

2.1 A Model of Corrupt Vote Transactions

Consider a one-period model with two agents: a candidate, interested in winning an election by obtaining both legal and illegal votes, and an official, who can provide the candidate with illegal votes. We assume perfect information, that votes are perfect substitutes in providing utility to the candidate, and that the official is a risk-neutral expected utility maximizer. The official controls two polling centers and has three means of providing illegal votes: manipulating the count *before* the election returns form is posted (v_b); changing vote counts on the returns form *after* it is posted at polling center 1 (v_a^1); and also at polling center 2 (v_a^2). The unit price for each type of illegal vote is w_b, w_a^1, and w_a^2 respectively.

We focus on a situation in which monitoring is announced at treatment polling center, and not announced in a control polling center. We therefore without loss of generality assume that only polling center 2 can be monitored, which we denote as $m_2 = 1$ in the monitored state and $m_2 = 0$ otherwise. The official faces a fine for manipulation F, and subjectively assesses that she will be caught transacting illegal votes with probability $\phi_b(v_b)$, $\phi_a^1(v_a^1; m_2)$, $\phi_a^2(v_a^2; m_2)$ respectively. We assume $\phi_a^1(v_a^1; m_2)$ is an explicit function of monitoring at station 2 to reflect the possibility that the candidate may update her assessment that she will be caught in polling center 1 if she receives news that monitoring will occur in polling center 2.[12] Photo quick count relies on a photograph of the returns form and therefore can only detect votes sold after results are posted, but not before. Consistent with this, $\phi_b(v_b)$ does not depend on m_2. We, additionally, assume that all ϕ functions are increasing and weakly concave so that the supply of illegal votes is (weakly) upward sloping.[13] Last, we assume that, because the treatment station is randomly selected, *after* vote sales in the absence of monitoring would be equal in both polling stations ($v_a^{1*}(0) = v_a^{2*}(0)$), so that $\phi_a^{1'}(v_a^1; m_2 = 0)$.

Candidates can intervene in the adjudication process to protect officials who have sold them

[12] We assume that subjective assessments in a given margin are not affected by the amount of rigging that is happening in different margins. This might not be valid if heavy rigging in one margin raises general suspicions and so increases the probability of detection of all illegal sales.

[13] This assumption is somewhat inconsistent with our description of the ϕ functions as subjective probabilities, which must bounded between 0 and 1, as a standard result gives that no convex function is bounded between 0 and 1. Identical predictions would follow from an isomorphic formulation in which the penalty F, were an increasing weakly convex function of v.

votes. We reflect this by assuming that the penalty is multiplied by $\theta_b \in [0,1]$ in the *before* margin and by $\theta_a \in [0,1]$ in the *after* margin. The candidate's type is defined by $\boldsymbol{\theta} = [\theta_b, \theta_a]$. For ease of exposition, we focus on candidates that are disproportionately able to intervene to protect the official for the sale of *after* votes ($\theta_a \leq \theta_b$), though the predictions of the model do not depend on this. To analyze the pattern of substitution, we examine the equilibrium both in the absence of monitoring at the treatment polling center $m_2 = 0$ and when monitoring is implemented $m_2 = 1$.

Supply of Fraudulent Votes

When deciding whether to sell votes to the candidate, the election official considers the probability he will be caught and penalized along the lines of Becker and Stigler (1974). We add the power of the candidate to interfere in the adjudication process to this set of considerations, which, we show, creates separation. The core contribution of our model is to introduce this as a logic for why political connections might benefit candidates. The risk-neutral expected utility-maximizing official therefore solves:

$$\max_{v_b, v_a^1, v_a^2} E(U_o) = w_b v_b - \phi_b(v_b)\theta_b F + w_a^1 v_a^1 - \phi_a^1(v_a^1; m_2)\theta_a F + w_a^2 v_a^2 - \phi_a^2(v_a^2; m_2)\theta_a F$$

The official's first order conditions provide upward-sloping supply functions for each type of vote:

$$w_b(v_b) = \phi_b'(v_b)\theta_b F;$$
$$w_a^1(v_a^1; m_2) = \phi_a^{1'}(v_a^1; m_2)\theta_a F;$$
$$w_a^2(v_a^2; m_2) = \phi_a^{2'}(v_a^2; m_2)\theta_a F.$$

Demand for Fraudulent Votes

The candidate has an exogenous amount E to spend on illegal votes and obtains v_0 votes legitimately. Legitimate votes, as well as those obtained in the *before* or *after* margin, count equally toward the vote total. As we describe in section 3 below, in this election candidates ran at large in electoral districts with large magnitude. On average, between 8 and 9 candidates were competing for a single seat, with several seats available in each electoral district. The candidate in our model takes the prices w_b, w_a^1, and w_a^2 parametrically, consistent with a situation with many interested buyers. An additional consequence of this is that it was very hard to forecast the minimum number of votes necessary to win.[14] The candidate therefore solves:

$$\max_{v_b, v_a^1, v_a^2} U_c = v_0 + v_b + v_a^1 + v_a^2;$$

s. t.

$$E \geq w_b v_b + w_a^1 v_a^1 + w_a^2 v_a^2.$$

Prior to monitoring, $\phi_a^{1'}(v_a^1; 0) = \phi_a^{2'}(v_a^2; 0)$ and so $w_a^1(v_a^1; 0) = w_a^2(v_a^2; 0)$, making it sufficient to consider only the markets for v_b and v_a^1. The candidate's demand for fraudulent votes is thus given by:

$$v_b = \begin{cases} \frac{E}{w_b} & \text{if } w_b(v_b) \leq w_a^1(v_a^1; m_2) \\ 0 & \text{if } w_b(v_b) > w_a^1(v_a^1; m_2) \end{cases}; \qquad v_a^1 = \begin{cases} \frac{E}{w_a^1} & \text{if } w_a^1(v_a^1; m_2) \leq w_b(v_b) \\ 0 & \text{if } w_a^1(v_a^1; m_2) > w_b(v_b) \end{cases}.$$

[14] Our goal is to provide the simplest model which describes our results. To achieve this, we have assumed a utility function for the candidate that is restrictive in at least three ways. First, utility is linear in votes and makes no allowance for the importance of getting the minimum total that is necessary to win. We might instead prefer a s-shaped function, centered at the expectation of the minimum number of votes necessary to win so that marginal utility is highest right around the minimum winning total. For example the simple logistic function, $U(V) = \frac{1}{1+e^{-(V-\tilde{v})}}$ where $\tilde{v}$ is the minimum necessary number of votes to win and $V = v_0 + v_b + v_a^1 + v_a^2$ would provide such a utility function. All of the predictions we take to the data are robust to order-preserving transformations as they depend only on the equilibrium vote transactions v_b^*, v_a^{1*}, and v_a^{2*} . Second, the utility function assumes that fraudulent votes are additively separable. This might not be true if candidates sought to hedge against the probability that some votes are taken away. Last, the candidate's utility does not build in expectations that other candidates might be rigging. Such concerns might be dealt with in a handicap auction model in which officials auction votes to only the highest bidding candidate. We provide evidence that many candidates are buying votes below.

No Monitoring Equilibrium

Panel A in Figure 1 depicts supply and demand functions for v_b and Panel B depicts supply and demand functions for v_a^1. Point E1 in this figure corresponds to an equilibrium in which the candidate purchases only v_a^1. From the figure, we see that this equilibrium will occur when $\theta_a \phi_a^{1'}(v_a; 0)F < \theta_b \phi_b'(v_b)F$. More generally, the corner solution that obtains depends on the ratio $\tilde{\theta} = \frac{\theta_a}{\theta_b}$. We call this ratio, $\tilde{\theta}$, the candidate's "protection capacity". Plugging the vote supply functions into the indifference condition $w_b = w_a^1$ shows that this condition is equivalent to $\frac{\theta_a}{\theta_b} = \frac{\phi_b'(v_b)}{\phi_a^{1'}(v_a^1; m_2=0)}$. We denote this separating value as $\tilde{\theta}'$. If $\tilde{\theta} > \tilde{\theta}'$ the candidate transacts in votes before the returns form is posted, and if $\tilde{\theta} < \tilde{\theta}'$, the candidate transacts in votes after the posting of the returns form.

[Figure 1 about here]

Monitoring Equilibrium

We now solve for the equilibrium if $m_2 = 1$. The key change at this stage is that monitoring increases both $\phi_a'^1(v_a^1; m_2)$ and $\phi_a^{2'}(v_a^2; m_2)$, causing a change in corner solutions which depends on the candidate's protection capacity $\tilde{\theta}$. We assume that the subjective assessment of monitoring increases more in the directly monitored station. We therefore see from the official's first order conditions that $w_a^2(v_a^2; 1) > w_a^1(v_a^1; 1)$ for all $\tilde{\theta}$, so that $v_a^{2*}(1) = 0$. The increase in $\phi_a^{1'}(v_a^1; m_2)$ results in a shift of the v_a^1 supply curve to the left. The shift depicted in Figure 1 Panel B is sufficient to increase w_a^{1*} above the binding equilibrium price w_b^*. The new equilibrium is given by point E2. As depicted, the candidate substitutes entirely out of v_a^1 and v_a^2 and into v_b.

Importantly, the change in parameter values leads to a new separating value for $\tilde{\theta}$, $\tilde{\theta}'' = \frac{\phi_b'(v_b)}{\phi_a^{1'}(v_b; m_2=1)}$, which separates candidate types that prefer to transact in v_b from those that prefer to transact in v_a^1.

Predictions

We model the effect of photo quick count by comparing equilibrium vote sales when there is no monitoring ($m_2 = 0$) and when there is monitoring ($m_2 = 1$). The candidate will respond by ceasing to purchase v_a^2 as purchasing this type of vote is now a strictly dominated strategy. Whether this surplus is reallocated toward v_a^1 or v_b depends on the candidate's protection capacity $\tilde{\theta}$. Figure 2 maps the substitution response to $\tilde{\theta}$. If the candidate is relatively good at protecting in the before margin $\tilde{\theta} > \tilde{\theta}'$ there will be no change. Candidates of this type are in the top triangle. Candidates with intermediate values $\tilde{\theta} \in [\tilde{\theta}'', \tilde{\theta}']$ will substitute from v_a^2 to v_b (temporal recovery). These candidates are in the middle triangle. Candidates who are relatively good at providing protection in the after margin ($\tilde{\theta} < \tilde{\theta}''$), will move from rigging in the after margin in polling station two v_a^2 to rigging in the after margin in polling station 1 v_a^1 (spatial recovery). These candidates are in the bottom triangle.

[Figure 2 about here]

To summarize, we take four predictions to the data:

Prediction 1 - Fraud Reduction: Introducing monitoring will reduce transactions for votes in monitored polling centers. A simple comparison of the monitoring equilibrium with the no monitoring equilibrium shows that $v_a^{2*}(0) \geq 0$ and $v_a^{2*}(1) = 0$. If polling station 2 is monitored, then it is clearly better to rig either in polling station 1, which is unmonitored, or before the posting of the returns form.

Prediction 2 - Effects are Larger for More Powerful Candidates: In the no monitoring equilibrium, only candidates with $\tilde{\theta} < \tilde{\theta}'$ will purchase v_a^1 and v_a^2. The effect of monitoring will either be to reduce equilibrium sales in the *after* margin because the price of v_a^1 and v_a^2 have risen or to end these types of sales altogether. In either case, the effect of monitoring applies only to candidate types who transact in these margins prior to monitoring.

Prediction 3 - Spatial Recovery: Candidates with strong protection capacity (θ low) will react to monitoring by substituting across polling centers. If $\theta < \theta''$, the candidate will substitute from

v_a^2 to v_a^1.

Prediction 4 - Temporal Recovery: Candidates with weak protection capacity (θ high) will substitute from transacting *after* votes (v_a^1 or v_a^2) to *before* votes (v_b). If $\theta \in [\theta'', \theta']$, the candidate will completely substitute to v_b out of v_a^2 and v_a^1 as in Figure 2. Note that this implies a negative treatment externality: monitoring v_a^2 transactions also reduces v_a^1. The negative externality, or "chilling" effect, results because monitoring at polling center 2 increases the the subjective assessment of the likelihood of detection at polling center 1 ($\phi_a^1(m_2 = 0) < \phi_a^1(m_2 = 1)$). This assumption rules prohibits a temporal "chilling" effect and reflects the idea that photo quick count raises the probability that fraud in the *after* margin is detected, but technologically has no effect on the *before* margin. Our assumption is justified if the official understands this, but believes that monitoring may happen at polling centers where it is not announced. In the research design below, we explain how we design our letter to communicate this explicitly.

Discussion

Three features of our data allow us to test these predictions. First, we are able to develop a measure of protection capacity, based on detailed data on political networks. Second, a combination of administrative and primary data allows us to observe fraud both *before* and *after* the returns form is posted. Last, we have precise geographic coordinates for all of the polling centers in our experimental sample, so we can test for spatial treatment externalities.

Before proceeding to our research design, we mention two policy-relevant implications of our model. First, in this simple set-up, monitoring raises the price of illegal votes and so reduces the total number of votes that can be purchased with a given endowment E. Accordingly, a corrupt official sells fewer votes in the monitored equilibrium. Second, in this model, the spatial externalities for polling center 1, when polling center 2 is monitored, are *positive* if protection capacity is strong and *negative* if protection capacity is weak. Strong candidates are better able to recover and weak candidates suffer additional vote losses from the "chilling" effect. It is possible, therefore, in this model that monitoring has the perverse effect of further empowering the most egregious violators.

3 Institutional Background

In this section, we describe the experimental setting and relate it to our model. First, we explain how the electoral rules in Afghanistan give rise to a setting where: (i) a large number of candidates compete in parallel elections with close victory margins, creating a viable market for illegal votes; (ii) institutions are weak and election officials face limited accountability for assisting candidates; and (iii) candidates activate patronage networks to manipulate vote counts. To demonstrate how officials provide illegal votes after they post returns forms, we work through a simple example. Specifically, we compare a photograph of the election returns form at a polling center with the copy that was entered into the national count at the end of aggregation. We also describe the fraud monitoring technology that we designed and implemented: photo quick count.

3.1 Electoral Institutions in Afghanistan

In this section, we describe characteristics of Afghanistan's electoral institutions relevant to corrupt electoral practices. We outline the history and characteristics of the rules and institutions that govern elections in Afghanistan. We also discuss how informal networks that link political actors can undermine formal institutions.

After the US invasion and fall of the Taliban in 2001, Coalition forces helped to empanel a Constitutional Loya Jirga that established democratic institutions in Afghanistan after decades of internecine conflict, civil war, and Taliban rule. Hamid Karzai won the first presidential elections in 2004 with 55 percent of the vote. In 2005, Afghans voted in elections for the lower house of parliament, the Wolesi Jirga. Amid claims of rigging and substantial election day violence and a protracted recount, Karzai won re-election in 2009 after his main competitor, Dr. Abdullah Abdullah declined to participate in a recount. In 2010, the second Wolesi Jirga elections occurred amid a growing insurgency and a US commitment to begin withdrawing troops in July 2011. The international community viewed these elections as a critical benchmark in the consolidation of democratic institutions given doubts about the Karzai government's ability to excercise control in much of the country. Despite lingering memories of violence from the 2009 election, between 4 million and 5.4 million voters cast ballots in the Wolesi Jirga elections.

Afghanistan's 34 provinces serve as multi-member districts that elect members to the Wolesi Jirga. Each province is a single electoral district and the number of seats is proportional to its estimated population. Candidates run "at large" within the province without respect to any smaller constituency boundaries. Voters cast a single non-transferable vote (SNTV) for individual candidates, nearly all of whom run as indepedents.[15] Candidates compete for votes province-wide. The rules declare winning candidates as those who receive the most votes relative to each province's seat share. For example, Kabul province elects the most members to Parliament (33) and Panjsher province the fewest (2). The candidates who rank 1 to 33 in Kabul and 1 to 2 in Panjsher win seats to the Wolesi Jirga.

These rules hold implications for the dynamics of electoral malpractice. First, SNTV with large district magnitudes and a lack of political parties creates a wide dispersion of votes across candidates. The vote margins separating the lowest winning candidate from the highest losing candidate are often small. This lowers the minimum number of votes required for winning a seat in the parliament and suggests a high expected return for even small manipulation for many candidates. In contrast, electoral systems with dominant parties guarantee victory with large vote margins, and so non-viable candidates are less likely to rig. Second, because they compete for votes province-wide, candidates can attempt substitution of legitimate and fake ballots elsewhere. If monitoring leads to a loss of votes in one polling station, candidates will seek to recover lost votes in other polling stations. This directly supports our formulation of the candidate's perfect substitutes utility function in Section 2. Third, despite a province-wide race, candidate support usually correlates with geographic proximity. Candidates garner most of their votes in their home districts or towns where they remain popular. Given the areas that powerful candidates exert control over, influential candidates can rig in their home areas but are not likely to do so province-wide. Since provinces are multi-member, even powerful candidates have to compete with and share seats with other powerful candidates.

The weak institutions tasked with managing elections in Afghanistan also permit fraud. The Independent Election Commission (IEC) serves as the main electoral body responsible for polling,

[15] SNTV systems provide voters with one ballot that they cast for one candidate or party when multiple candidates run for multiple seats. If a voter's ballot goes towards a losing candidate, the rules do not re-apportion that vote.

counting votes, aggregation, and certifying winning candidates. Historically, the IEC has proven susceptible to influence by corrupt agents. Wide-scale rigging occured in the 2009 presidential elections. The IEC initially gave Karzai 53 percent of the vote, above the 50 percent threshold necessary to avoid a run-off. However, the Electoral Complaints Commission (ECC) reduced that margin to 47 percent after investigating numerous allegations of electoral corruption and malfeasance. Evidence from a random sample of physically inspected ballots provide evidence of manipulation, mostly in favor of Karzai (Callen and Weidmann Forthcoming).

Informal institutions also play an important role in determining political outcomes in Afghanistan.[16] Despite attempts to grow incipient democratic institutions, pre-existing power structures exert influence over political processes and frequently undermine them. As in many young democracies, extra-state networks of patronage that pre-date democratization determine lines of political accountability and control between powerful actors. Members of institutions, such as the Wolesi Jirga, candidates running for office, local government councils, and electoral officials make use of patronage networks. For example, Karzai enjoys strong links with government officials in Southern Afghanistan given his family roots in that part of the country. Former warlords fighting in the Northern Alliance against the Taliban exert strong control in Northern Afghanistan. Networks of these powerful actors support corruption. These connections inform our concept of protection capacity and influence how we operationalize the measure.

Despite weak electoral institutions, candidates and officials do face some possibility of punishment for rigging. The United Nations backed Electoral Complaints Commission (ECC) exists as a separate and independent body from the IEC. The ECC investigates complaints against polling officials, candidates, or citizens. Any Afghan can lodge such a complaint. Based on the seriousness of a complaint and its likelihood of affecting the election's outcome, the ECC may decide to cancel all of the votes at a given polling station, all of the votes for a particular candidate at a polling station, or the total votes for a candidate across their entire province. The ECC over-turned some 25 percent of the ballots in this process in the 2010 election. Under its purview of fighting corruption, the Attorney General may prosecute specific individuals, including election officials and

[16] Callen and Weidmann (Forthcoming) for non-experimental evidence consistent with patronage networks facilitating illegal vote transactions in Afghanistan.

candidates, it believes to have participated in election fraud and levy fines or prison sentences against them if found guilty. Theoretically the punitive capacity of the Attorney General and the ECC is important as the probability for being punished is non-zero (i.e. $F > 0$). In Section 5, we empirically investigate whether these linkages affect recovery strategies.

3.2 Experimental Setting

On Election Day (September 18, 2010), voting began at 7am and ended at 4pm. The count started immediately after voting concluded at individual polling centers and was completed the same evening. In the first period, our intervention announced monitoring to PCMs during voting. This intervention leaves two general types of manipulation unmonitored: (i) altering the count by attributing fake votes to the corrupt candidate (count manipulation); (ii) altering returns forms so that more votes are recorded for a given candidate than were actually cast as depicted in Figure 4 (returns form manipulation).[17] Count manipulation happens before the posting of the returns forms and so corresponds to v_b in our model. Returns form manipulation takes place after posting, corresponding to v_a^1 and v_a^2.[18] Figure 3 maps this electoral "chain of custody" to the four predictions made by our model. The international community invested heavily in this election due to its relevance for global geopolitical stability, creating a remarkable amount of administrative data on the electoral process. Section 4.2 describes how we use these data to develop proxies for v_b, v_a^1, and v_a^2 in order to test the four predictions of our model.

[Figure 3 about here]

[17] Returns form manipulation can be perpetrated many different ways. These include stealing ballot boxes and sealed Tamper Evident Bags (TEBs) in order to alter their contents.

[18] In some cases, candidates can also influence the post-election fraud investigation and adjudication process. To avoid contamination of our results from this highly politicized and unpredictable process, we scraped the record of the votes from the initial publication of polling station results by the IEC on its website. The IEC posted these after the aggregation of tallies but before the ECC adjudication process and subsequent prosecution of candidates by the Attorney General.

3.3 A Simple Example

To see how rigging occurs on election returns forms, Figure 4 depicts photographs from our dataset. Our research team took the picture on the left immediately after the count. The IEC produced the picture on the right, as a scanned copy from the IEC aggregation center in Kabul of the same election returns form. The returns form on the left should be identical to the picture on the right since it is a carbon copy.[19]

[Figure 4 about here]

There are three major differences that demonstrate direct evidence of rigging. Someone has converted the Dari script for the polling center and polling station numbers to arabic numerals.[20] Second, the name of the presiding PCM has been changed. Third and most tellingly, while the sheet on the left records votes for most candidates that appear to result from normal polling, the figure on the right records no votes whatsoever. We find many similar examples in our data. From this it is clear that election officials assist candidates by manipulating returns forms. We see here that the official who altered totals made little effort to make the form comparable to the original, suggesting an amount of impunity.

While these data provide exceptional and precise documentation of fraud, we are not able to use them as an outcome for our analysis as the election returns forms were completely missing in 250 polling centers, more than half of our sample. Moreover, our treatment increased the probability that there was a returns form at the polling center by about six percent, so that attrition on this measure is strongly affected by treatment. Anticipating this, we trained our field staff taking the photographs investigate the reason tallies went missing, which we discuss in detail in Section 4.2.

[19] Because it is a carbon copy, it is not possible to have differences that are attributable to recording error.

[20] Polling centers typically have 3-10 stations within them. PCMs are the most senior IEC official at a polling center. They maintain responsibility for opening their center's stations on election day, conducting the vote, closing the polling center, overseeing the count, and posting the final returns form from each station in a visible location within the polling center.

3.4 Photo Quick Count

The fraud we document through this example suggests a powerful monitoring technology. Taking independent photographic records of election returns forms and separating them from the electoral chain of custody provides a means of detecting returns form manipulation. This design builds on Parallel Vote Tabulations (PVTs), which have been in use since the 1980s.[21] Two important technological developments allow us to build on the PVT concept. First, it is now common for Election Commissions to release disaggregated results and to post them on the internet. Second, the cheap availability of digital photography allows rapid and perfectly accurate recording of returns forms.[22]

Photo quick count allows us to investigate illegal vote transactions in three ways. First, it narrowly targets fraud through returns form manipulation and should only detect differences after PCMs post election returns forms. Second, while we announce our monitoring intervention *during* voting, it is not able to pick up cheating until *after* officials post the returns form, leaving the probability of detection for count manipulation, ϕ_b unchanged. Third, in the absence of our intervention, corrupt agents' subjective assessment that returns form manipulation is detected should be uniform across polling centers, consistent with our assumption that $\phi_a^1(0) = \phi_a^2(0)$. This makes the rigging of any one tally perfectly substitutable, from the perspective of the official, with rigging another. Our intervention changes this as we announce monitoring only at specific polling centers.

Illegal votes transacted in equilibrium depend on the probability of detection for both count manipulation and returns form manipulation. However, our technology only changes the probability of returns form manipulation detection. The first margin for recovering votes after our treatment is through count manipulation (increasing v_b), which we call temporal recovery. Commonly, this involves taking votes cast for one candidate and attributing them to another.

An alternative means of recovering votes is through returns form manipulation at unmonitored

[21] Through representative sampling and recording of ballots by field staff, PVTs predict national totals within a small margin of error (Cowan et al. 2002). PVTs are an important means of checking votes against results that electoral commission ultimately certify, but cannot identify whether differences occur from count manipulation or returns form manipulation. Exit polls can also be compared with certified results, under certain assumptions, to provide a check against electoral manipulation (Gibson and Long 2009; Bjornlund 2004).

[22] Our team has since implemented photo quick count using a custom application for smartphones during the February, 2011 parliamentary and presidential elections in Uganda with the support of Qualcomm, Inc.

centers (spatial recovery). This involves switching votes from v_a^2 to v_a^1. Given monitoring of returns forms in polling center 2, candidates will try and recover those lost ballots by engaging fraud in polling center 1. Our theory predicts strong protection capacity candidates should prefer spatial recovery because the expected fine an official faces for returns form manipulation is lower in this case.

4 Research Design

Our experiment estimates the effect of photo quick count on election fraud. The technology narrowly targets the manipulation of returns forms, one of several types of election fraud. The theory we present in Section 2 predicts that the intervention will: (i) reduce returns form manipulation at treatment polling centers; (ii) create a larger reduction in votes for candidates connected to the PEO than for unconnected candidates; (iii) cause connected candidates to manipulate returns forms at control polling centers (spatial recovery); (iv) cause unconnected candidates to manipulate the counting of votes before the posting of the returns form (temporal recovery) and; (v) reduce votes for unconnected candidates at control polling centers because of a "chilling" effect.

We focus primarily on the fraud-reducing effects of photo quick count as this is the core purpose of our experiment. We also provide evidence on the reactions of candidates consistent with the remaining predictions of our model. We next describe our experiment and empirical strategy for testing these predictions.

4.1 Experiment

Experimental Sample and Field Conditions

To maximize the safety of our field staff, we selected polling centers that met three safety criteria: (i) the polling center had to have the highest security rating given by the International Security Assistance Force (ISAF) and the Afghan National Police (ANP); (ii) the polling center had to be in a provincial center, which are much safer than rural areas; and (iii) the polling center had to be scheduled to operate on election day by the IEC.[23] Figure 5 maps the polling centers in our sample and indicates treatment status across the country. Figure 6 depicts the same in Kabul specifically. Our experimental sample comprises 471 polling centers (7.8 percent of polling centers operating on election day) in 19 of the 34 provincial capitals in Afghanistan.

[Figure 5 and Figure 6 about here]

Experimental Intervention

On election day (September 18, 2010), we randomly announced the use of photo quick count by delivering letters to 238 of the 471 polling centers in our experimental sample. We instructed Afghan researchers, who we had trained and hired through a local research firm, to deliver letters to Polling Center Managers (PCMs) between 10AM and 4PM, during polling. Researchers visited all 471 polling centers the following day in order to take a picture of the election returns form. Of the 471 polling centers, six did not open on election day. We drop these from our analysis.

The delivery of this letter constitutes the treatment in our experiment. The letter announced to PCMs that researchers would photograph election returns forms the following day (September 19). It also explained that photo quick count documents discrepancies between returns forms photographed at the polling center and results certified by the IEC. Figure 7 provides a copy of the letter (we provide the Dari translation in Appendix Figure A1). We asked Polling Center Managers (PCMs) to acknowledge receipt by signing the letter. PCMs at seventeen polling centers (seven percent of centers receiving letters) refused to sign. We designate a polling center as treated if the PCM received a letter (Letter Delivered = 1). Our results remain robust to redefining treatment as both receiving and signing a letter.

[Figure 7 about here]

To ensure balance, we stratify treatment on province. In the 450 PCs for which we had baseline data, we also stratify on the share of respondents from the baseline survey reporting at least

[23] Our fieldwork benefitted greatly from conversations with Andrew Beath, director of the current National Solidarity Program Impact Evaluation in Afghanistan `http://www.nsp-ie.org/index.html`.

occasional access to electricity and on respondents reporting that the district governor carries the most responsibility for keeping elections fair. All core specifications reflect our assignment strategy, by including stratum dummies as suggested by Bruhn and McKenzie (2009).[24] Specifications which include stratum dummies and covariates from the baseline survey will therefore have 450 or fewer observations. We re-randomize to achieve balance. Table 1 reports summary statistics and verifies balance.

[Table 1 about here]

4.2 Data

This election produced an unusual amount of data documenting details of the electoral process. We use the following administrative data in our empirical analysis: (i) systematic political background investigations of the main candidates from Democracy International (DI); (ii) geographic coordinates and security assessments of polling stations provided by the International Security Assistance Force (ISAF); (iii) complaints about illegal election activities filed at the ECC; (iv) disaggregated vote counts from the IEC; and (v) data on adherence to electoral laws and protocols from the Free and Fair Elections Foundation of Afghanistan (FEFA).[25] Additionally, we fielded a baseline survey of households living in the immediate vicinity of 450 of the 471 polling centers in our experimental sample a month before the election (August 2010).[26] Last, we obtain a primary measure of returns

[24]Bruhn and McKenzie (2009) suggest stratified treatment assignment on baseline measurements of the outcome of interest or variables that are highly correlated with this outcome to increase power. Because measures of fraud are unavailable prior to the election, we select our stratifying variables by identifying measures most highly correlated with fraud during the 2009 presidential election. Our strategy finds support in Callen and Weidmann (Forthcoming), who report evidence supporting the involvement of election officials in perpetrating fraud during the 2009 election. We are unable, however, to stratify on 2009 fraud measured using the very coarse measures in Callen and Weidmann (Forthcoming) as they only occur rarely in our experimental sample.

[25]Democracy International was the leading international mission observing the parliamentary elections and our institutional partner.

[26]The 21 polling centers in the experimental sample not surveyed at baseline are in Kabul. We subsequently added these using additional funding made available after the baseline. The survey contained 2,904 respondents. To attempt to obtain a representative sample of respondents living near polling centers, enumerators employed a random walk pattern starting at the polling center, with random selection of every fourth house or structure. Respondents within households are randomly selected using Kish grid. The survey had 50 percent male and female respondents each and enumerators conducted it in either Dari or Pashto.

form manipulation by sending field staff to investigate whether election materials were stolen or damaged the day following the election (September 19), which we describe in subsection 4.1.

Measuring Fraud

To measure fraud we cannot rely on the difference between our picture of the returns form and the corresponding data released by the IEC in Kabul because the returns forms were missing from many polling centers on the day following the election. We therefore rely on two proxies of returns form manipulation—primary reports that materials were stolen or damaged and votes for elite candidates—and on proxies for count manipulation from the ECC complaints process. As these measures are only proxies, they face limitations, which we discuss below.

Measure 1 - Returns Form Manipulation: On September 19, the day after the election, we sent field staff to all 465 polling centers in our sample which also operated on election day to take pictures of returns form and to investigate whether any of the materials had been stolen or damaged during the night of September 18.[27] We trained our staff to investigate by only interviewing local community members and not to engage IEC staff so as to not create an additional treatment effect. While this would not affect the internal validity of our estimates of program effect, our aim was to minimize the additional monitoring effect for the entire sample.

From these investigations we find 44 reports of candidate agents stealing the returns form along with the ballot boxes and other election materials, 18 reports of candidate agents merely tearing down the returns form, 15 reports of citizens stealing returns forms, 17 reports of citizens tearing down returns forms, and 28 reports of security officials stealing materials or denying our interviews access to photograph them. We focus on reports of theft by candidate agents, who are candidate representatives legally permitted to observe polling and typically present at most polling centers in their candidate's constituency. Altogether, we received reports of candidate agents stealing or damaging materials at 62 (13.16 percent) of the 465 operating polling centers. We therefore define our measure *Returns Form Manipulation* as an indicator equal to 1 if materials were reported stolen or damaged by a candidate agent at a given polling center (in the appendix, we provide evidence that the result is robust when using an indicator for returns forms going missing for any reason or

[27] While there are 471 polling centers in our data, six did not operate on election day.

for being removed by citizens).

There are several reasons to think that stealing or damaging tallies reflects an intention to manipulate the aggregation process. In many of the ECC complaints, there was speculation that the purpose of stealing the materials was to take them to a separate location, alter them, and then reinsert them into the aggregation process. Alternatively, candidates might seek to destroy all evidence of the polling center count, and then manufacture an entirely new returns form at the Provincial Aggregation Center. While we lack data to know specifically how this happens, we view a reduction in this measure as evidence that candidates withdrew from this margin. Either approach to rigging is likely to involve the Provincial Elections Officer, as he will have to permit the manufacturing of tallies at the Provincial Aggregation Center or allow stolen and manipulated materials to re-enter the aggregation process. This is equivalent to reducing purchases of v_a in our model.

Measure 2 - Count Manipulation: We obtain data on count manipulation from the ECC. These include complaints about the electoral process made by candidates, observers, and candidate agents. Complaints consistent with count manipulation occur widely in our sample. For example, a complaint made by a candidate about the Charahi Taymani neighborhood in Kabul reports "in Ismailya Polling station, ten of my family members voted for me, but the Declaration of Results Form displayed only seven." Similarly, at the Sayedullah Khan Bazaar High School in Terin Kot in Urozgan province, a candidate reports "382 votes were cast, but then the voting papers were inexplicably lost. Later that evening, I observed the brother of Sema Joyenda replacing the vote papers into the boxes." The ECC received 5,869 total complaints regarding the September 2010 parliamentary elections, of which 4,138 were made by candidates and 944 were made about IEC polling officials violating protocols. 650 of the 944 complaints about polling staff were made by candidates. In our sample of 1,977 polling stations in the 465 operating polling centers, 1,847 complaints were filed with the ECC. 1,217 of these complaints were filed by candidates and 900 were filed regarding polling center staff. We construct measures of *Count Manipulation* using these two variables as (a) the number of complaints filed by candidates about a given polling station and (b) the number of complaints filed against election commission staff about a given polling station.

These measures are problematic for at least three reasons. First, we cannot verify these complaints. Second, while many of the translated complaints report candidates manipulating the counting process, complaints in these categories may also be filed for other reasons. Last, it may be that candidates who are filing complaints do so strategically to try to cancel out their competitors' votes. While our data do not allow us to discern whether complaints reflect genuine malfeasance or are merely being lodged strategically, both represent substitution into alternative manipulation tactics and therefore provide at least rough proxies for v_b in our model.

Measure 3 - Votes for the Most Connected Candidate

We obtained data on votes disaggregated by candidate and polling station from a scrape of the IEC website on October 24, 2010.[28] We obtained the earliest possible returns in order to isolate the effects of our treatment from the many readjustments that were made during a year long arbitration process. When we obtained the data, results were missing for 98 of the 1,977 polling stations in our experimental sample (4.96 percent). Missing data are not predicted by treatment status (p-value = 0.439), attenuating concerns that the results we find on votes are due to treatment-related attrition.

We now describe how we identify candidates who are likely to rig in this election. Because there is no formal party system, we are unable to consider only candidates from the ruling party. Additionally, we cannot simply consider the incumbent because of the large district magnitude and heavy competition for seats. Instead, we rely on systematic investigations into the political histories of elite candidates provided by Democracy International. The investigations report history of government service, known political affiliates and supporters, as well as demographic, education, and occupation histories for 76 of the leading candidates in this election. 57 of these ran in the 19 electoral districts where our experiment took place. Table 2 provides summary statistics for the political connections data used in this paper.

[Table 2 about here]

We identify the most connected candidate for each of the 19 provinces in our sample in three stages. First, we use the DI political connections data to create a simple index of the political connections

[28]Web scraping involves collecting, downloading, and structuring html data which is availaible on the internet but not in a form ready for analysis.

for candidate i as:

$$Political\ Connection\ Index_i = Karzai_i + Government_i + DEO_i + PEO_i$$

where $Karzai_i$ equals 1 for an indirect connection to Karzai (e.g., through a relative) and 2 for a direct connection (e.g., having worked directly with the president), $Government_i$ equals 1 for having held a minor government post since 2001 (e.g., teacher) and 2 for having held a major government post (e.g., parliamentarian), DEO_i equals 1 if a candidate has a connection to the District Elections Officer, and PEO_i equals 1 if a candidate has a connection to the Provincial Elections Officer. Second, we take the top 10 vote recipients in our control sample in each province, removing those for which DI did not complete a political connections investigation. From this list, we identify the person with the highest Political Connection Index. We call this candidate the "most connected candidate." This measure therefore reflects an assumption that candidates who (i) receive lots of votes in neighborhoods where our intervention takes place and (ii) have robust political connections are the most likely to engage in election fraud, though our core results are robust to alternative definitions of the predictably corrupt candidate.

The Importance of Connections to the PEO

In practice, manipulating the returns form, particularly if it occurs in the Provincial Aggregation Center, will likely require the complicity of the PEO. Our intervention targets only returns form manipulation and so we expect that it will have a stronger effect on candidates who are connected to the PEO. Additionally, connected candidates should have an easier time convincing the PEO to react to the news of monitoring by moving votes to polling centers that were not warned that they would be monitored.[29]

We therefore define a candidate as "connected" if they have a connection specifically to the PEO. We focus on this connection because photo quick count directly targets fraud that likely

[29] In the model above, candidates' protection capacity determines the equilibrium price of returns form manipulation by affecting the expected fine corrupt officials face. Specifically, candidates' recovery strategy depends on their protection capacity $\tilde{\theta}$ in the following way: (i) candidates with strong protection capacity ($\tilde{\theta}$ low) should prefer spatial recovery, and (ii) candidates with weak protection capacity ($\tilde{\theta}$ high) should prefer temporal recovery, switching votes from returns form manipulation to count manipulation.

requires the complicity of the Provincial Elections Officer (PEO).[30] This divides our sample into twelve provinces with 244 polling centers where the most connected candidate has connections to the PEO (*PEO Connection* = 1) and seven provinces with 227 polling centers where the most connected candidate does not have a connection to the PEO (*PEO Connection* = 0).

4.3 Estimation

This section lays out our empirical strategy. We focus on testing the robustness of our core finding that photo quick count reduced fraud. We also describe how we test the remaining hypotheses from our motivating model above.

Testing for Fraud Reduction

To obtain estimates of the effect of photo quick count, we regress *Returns Form Manipulation* at polling center c on the treatment status of the polling center, covariates from our baseline survey, and a set of stratum fixed effects:

$$Returns\ Form\ Manipulation_c = \gamma_1 + \gamma_2 Letter\ Delivered_c + \boldsymbol{\gamma}_3'\mathbf{X}_c + \varepsilon_c \quad (1)$$

where $\mathbf{X}_c$ is a vector of polling center attributes including stratum fixed effects.[31] Equation 1 permits a test of the first prediction of the theory presented in Section 2, and provides a consistent estimate of the effect of photo quick count on *Returns Form Manipulation*.

In Section 5, we estimate a variant of Specification 1, replacing $Returns\ Form\ Manipulation_c$ with the number of votes cast for the candidate with the highest political connections index at polling station s ($Most\ Connected\ Candidate\ Votes_{cs}$) to provide a cardinal measure of the number of fraudulent votes eliminated through photo quick count. We also show that our results are robust to several different definitions of the most connected candidate. We also estimate a variant

[30] As the highest ranking provincial election official, the PEO holds considerable leverage over the punishments meted out to corrupt PCMs.

[31] During the treatment assignment, we created strata by first blocking on province and then dividing the provincial subsamples into above and below median reporting that electricity is available and that the District Governor is responsible for keeping elections fair. This creates 61 strata with between 1 and 30 polling centers in each cell.

of Specification 1 interacting treatment with our *PEO Connection* dummy variables, to test Prediction 2 of our model, that effects will be larger in the twelve provinces in which the most connected candidate is linked to the PEO.

Our core research design relies on primary fraud data and experimental assignment to obtain estimates of the effect of photo quick count. Our theory, however, predicts that candidates should implement a recovery strategy in response to the intervention. In order to understand the ultimate effect, we therefore investigate the broader general equilibrium response of candidates. To investigate recovery strategies, we now turn to an analysis of administrative records of count manipulation.

4.4 Testing for Temporal Treatment Externalities

Our field staff delivered letters announcing monitoring from 10AM to 4PM on September 18, when voting concluded. PCMs then counted ballots at the polling station and filled out an election returns form, completing the process around 8PM. Importantly, because of this timeline, photo quick count cannot detect count manipulation, while it is virtually guaranteed to detect any returns form manipulation. PCMs, aware that our researchers would take photographs of returns forms on the morning of September 19, could in response recover votes for candidates by engaging in count manipulation in place of returns form manipulation.

The fourth prediction of the model we present in Section 2 is that photo quick count should increase count manipulation. We investigate this using the specification:

$$Count\ Manipulation_{cs} = \beta_1 + \beta_2 Letter\ Delivered_c + \boldsymbol{\beta}_3' \mathbf{X}_{cs} + \nu_{cs} \tag{2}$$

where, $\mathbf{X}_{cs}$ is a vector of polling station attributes which includes stratum fixed effects. The temporal recovery prediction from our model corresponds to $\beta_2 > 0$.

Additionally, to test if candidates who lack a connection to the PEO prefer to substitute temporally, as predicted by our model, we repeat Specification 2, interacting *Letter Delivered* with the

PEO Connection dummy.

$$Count\ Manipulation_{cs} = \phi_1 + \phi_2 Letter\ Delivered_c + \phi_3 PEO\ Connection_c + \phi_4 Letter\ Delivered_c \cdot PEO\ Connection_c + \boldsymbol{\phi}_5' \mathbf{X}_{cs} + \eta_{cs}. \quad (3)$$

4.5 Testing for Spatial Treatment Externalities

We are interested in identifying spatial treatment externalities for three reasons. First, treatment externalities can confound our estimates of program effect. If photo quick count reduces fraud at both treatment polling centers and at nearby control polling centers, estimates which do not control for spatial externalities will "doubly underestimate" the effects of the program, understating the own effect and the benefits from the "chilling" effect (Miguel and Kremer 2004). Second, identifying the sign and magnitude of spatial externalities is essential for understanding the general equilibrium effect of the intervention, which is the ultimate quantity of policy interest. Last, we seek to test whether treatment externalities depend on elite infiltration of local electoral institutions. This will assist in understanding the conditions under which photo quick count might work, comprises a test of our theory, and may have general implications for the conditions under which anti-corruption efforts are likely to be effective.

To estimate causal treatment externalities, we would ideally compare increasing spatial treatment densities against a set of pure controls. In this election, however, candidates ran at large in a province, and elections returns forms were centrally aggregated (and potentially manipulated) at Provincial Aggregation Centers. Therefore, treatment in any polling center has the potential to create an externality for any other polling center in the same province, ruling out the ideal experimental design. To attempt to estimate the externalities, we therefore follow Miguel and Kremer (2004), and assume that untreated polling centers with no polling centers treated in a fixed halo around the polling center are "pure controls." This is a restrictive assumption in our setting, because, unlike helminth infection, it is not clear that fraud transmission dissipates as distance increases, especially given that election returns forms may all be manipulated in the same provincial aggregation center.

To estimate treatment externalities, we use the specification:

$$Votes_{cs} = \varphi_1 + \varphi_2 Letter\ Received_{cs} + \varphi_3 Treated\ PCs\ Within\ 1km + \varphi_4 Total\ PCs\ Within\ 1km$$
$$+ \varphi_5 Treated\ PCs\ Within\ 1-2km + \varphi_6 Total\ PCs\ Within\ 1-2km + \boldsymbol{\varphi}_7' \mathbf{X}_{cs} + \zeta_{cs} \quad (4)$$

where, as in Miguel and Kremer (2004), conditional on the number of PCs within a 1km halo, the number treated is random. We additionally estimate several variants of Specification 4 providing the full set of interactions with *Letter Received* and separating *Treated PCs Within 1km* into a set of 5 dummy variables to test for nonlinear effects in local treatment saturations.[32] In Appendix C, we take the alternative approach to estimating treatment externalities provided in Kremer and Miguel (2007), which allows for a more flexible treatment of distance, and find similar results.

5 Results

This section provides evidence that photo quick count reduced returns form manipulation and tests the predictions of our model by estimating equations 1 - 4.

5.1 Evidence of Fraud Reduction

Before formally testing for treatment effects, we plot the empirical distributions of votes for the most connected candidate. Figure 8 plots empirical densities of votes in treatment and control polling stations transformed to dampen the effects of outliers, separating out the twelve provinces in which the most connected candidate was also connected to the PEO.[33] From this, it appears that treatment reduces votes for the most connected candidate and that it is particularly effective in doing so where the candidate is connected to the PEO. Visually, it appears that the treatment both

[32] In our data, the maximum number of polling centers within a 1km radius is 5, so we create categorical dummies for 1 treatment PC within 1km, 2 treatment PCs within 1km, and so on.

[33] We plot log(votes + 1) because 17.4 percent of polling stations in our sample record zeroes for the most connected candidate and because it appears that photo quick count increases the share of polling stations recording zero votes for the most connected candidates, correlating attrition in log(votes) with treatment. It is not obvious how we would recover $E[Votes|Treatment]$ and the associated treatment effects from a regression using this transformation. We therefore use Negative Binomial regressions to dampen the effects of outliers and obtain more efficient regression estimates below.

reduces the average number of votes for the most connected candidate and increases the number of polling stations recording zero votes for the most connected candidate.

[Figure 8 about here]

Panel A of Table 3 tests the intuition given by Figure 8 by estimating several variants of Equation 1 in columns 1 - 3, sequentially adding stratum fixed effects and covariates to check robustness. Votes for the most connected candidate can only take nonnegative integer values and the empirical distribution has a long right tail due to a few extreme outliers (median = 7 and mean = 20.176). We therefore test that our results are not being driven by outliers. We cannot take the log of this measure, as 344 of the 1,977 polling stations in our sample (17.4 percent) record zeros and our treatment should increase zeros for a candidate, which would correlate attrition in the log(votes) measure with our treatment. In column 4 we therefore report results from a negative binomial regression including controls and stratum fixed effects.[34] Dampening the effects of outliers increases the precision of the estimate and increases the level of significance at which we reject the null of no effect, though the point estimate is reduced from 4.791 votes to 3.413 votes.

[Table 3 about here]

Returns form manipulation is likely to involve the PEO, especially if it happens at the provincial aggregation center. Columns 5 - 6 therefore include an interaction term to test for heterogeneous effects in the twelve provinces where the most connected candidate is known to have a connection to the PEO. The point estimate on the interaction term is many times larger and is statistically significant, suggesting that treatment effects are larger for connected candidates. A more powerful test for a heterogeneous effect is to test for differences in the treatment effect point estimate for connected and unconnected samples. We fail to reject equality of effects across samples, but with a relatively small p-value (0.132 in column 6). Moreover, this p-value drops considerably moving

[34]We use negative binomial regressions rather than Poisson regressions as we find strong evidence of overdispersion (i.e. that the variance of the distribution is greater than the mean), which provides appropriately more conservative standard errors. We thank Gordon Dahl for very helpful discussions on this point.

from an OLS to negative binomial specification, which suggests that the failure to reject is because the treatment effects are imprecisely estimated due to noise in the votes measure.

Panel B of Table 3 reports treatment effects on our alternative measure of vote rigging—the stealing and damaging of returns forms by candidate agents. Such activities must take place between when the count at the polling center concludes (around 8PM) and before our field staff arrive to take pictures the next day (around 10AM). We find that returns forms are damaged in about 18.9 percent of the controls and only in about 7 percent of the treatment sample. This corresponds to an estimated drop of roughly 58 percent in incidents of returns form caused by the receipt of the letter. Probit specifications in columns 4 and 6 yield broadly similar estimates to the linear probability specifications. In this case, in columns 5 and 6, we find no evidence that effects are disproportionately large for candidates with connections to the PEO. There are many potential explanations for this, but we speculate it may be because, while adding votes at the Provincial Aggregation Center requires the complicity of the PEO, stealing and damaging materials at the polling station does not. It is possible, therefore, that the differences between columns 5 and 6 in Panel A and in Panel B reflect candidates' need to involve the PEO when manipulating returns forms at the Provincial Aggregation Center, but not in stealing materials.

We report estimates of effects on both measures for two reasons. First, the timing of our intervention made it difficult to quickly redeploy candidate agents to new polling centers to steal materials. This measure therefore provides an estimate of the effect possibly subject to fewer externalities. We also include the second measure to obtain a cardinal estimate of treatment effects, which may provide a basis for cost comparisons with other monitoring technologies.

Robustness to Alternative Definitions of the Most Connected Candidate

Table 4 estimates the core treatment effects regression, Equation 1, using several alternative definitions of the most connected candidate. We perform this exercise for two reasons. First, this allows us to check the robustness of our result to our method for identifying predictably corrupt candidates.. Second, it provides evidence that multiple candidates in a given electoral district engage in returns form manipulation in parallel. This election had a very large district magnitude, with between eight and nine candidates running for every seat and many seats available in every province. It therefore seems plausible that several of the lead contenders might be able to strike a bargain with the PEO.[35]

[Table 4 about here]

We provide five alternative definitions of the most connected candidate, one corresponding to each of the four variables in our political connections index, and one in which we remove the most connected candidate and consider the runner up. In all cases, the point estimate on the reduction is about 5 votes, as in Table 3. While none of the OLS point estimates are significant at conventional levels, we find that the results are strongly significant using negative binomial regressions, which dampen the effects of outliers. To check that the significance of the effect is not unique to count models, we also transform the dependent variable by taking the ascending rank in terms of number of votes in our sample of 1,977 polling stations. If the treatment had no effect, then the average rank should be the same. However, we find that the treatment sample has an average rank that is about 75 positions below the average rank in the control sample. Last, we note that the estimated marginal effect is lower (by about two votes) when we throw out the most connected candidate and consider only the runner up. This suggests that fewer of the runner up candidates are actively engaged in returns form manipulation. This provides additional evidence that this is a tactic mostly pursued by well-connected and elite candidates with connections to the election commission.

5.2 Tests of Temporal Treatment Externalities

The first window for recovering votes after our treatment occurs (between 10AM and 4PM) is by altering the physical counting of votes (between 4PM and 7PM), which we term count manipulation. This typically involves the PCM taking votes cast for one candidate and attributing them to another. Temporal recovery has the advantage of requiring only the complicity of the local PCM,

[35] In our model, we do not treat the case in which many candidates bid for votes, rather we assume one candidate takes the price parametrically. There are two alternative approaches which would yield similar predictions. We could assume many identical candidates purchasing votes from a monopoly supplier. Alternatively, we could consider an auction in which candidates can buy either exclusive rights to votes from the PEO, or pay a smaller price to share it with several competitors. In this case, as long as a sufficient number of seats are available, a candidate should prefer the cheaper option of sharing some illegal votes, with all of the remaining predictions going through.

but it has a few drawbacks: it is limited only to one polling center increasing coordination costs and it must occur in the presence of observers and candidate agents during the count. We focus on two types of complaints in our data. The first includes complaints made to the ECC about the behavior of polling center officials. The second includes complaints made by parliamentary candidates to the ECC about a specific polling stations.

Table 5 reports estimates of Equation 2, our test of temporal recovery. In Panel A, we measure *count manipulation* using the number of complaints filed by candidates, while in Panel B we use the number of complaints made against polling officials as our dependent variable. The point estimates in columns 1 and 2 of Panel A indicate that treatment roughly doubles the number of complaints made by candidates from about 1.8 to 3.2. Corresponding estimates in Panel B indicate that complaints against polling officials increase from around 1 to 2. Both results are consistent with temporal recovery. We sequentially add stratum fixed effects and a rich set of covariates to show robustness of the estimated effect on complaints.

[Table 5 about here]

For both measures, we introduce dummy variables for the provinces where candidates are known to have a connection to the PEO. These results are reported in columns 4 - 6. While the results are not significant at conventional levels, the point estimates suggest that most of the substitution toward complaints is being carried out by candidates with a connection to the PEO. Columns 7 - 9 present additional tests using data from FEFA, based on the availability of indelible ink to prevent multiple voting at the polling station. Domestic civil society election monitors working for FEFA gathered the data we use on adherence to anti-fraud election protocols.[36] We focus on the availability of indelible ink and whether this ink could be washed off as measures of pre-treatment vulnerability to rigging. A lack of truly indelible ink to prevent multiple voting provides information about the pre-monitoring allocation of fraud. Problems with ink to prevent multiple voting provide

[36]FEFA visited 201 (89 percent) of the 227 control polling centers from our sample and 202 (85 percent) of the 238 treatment polling centers. We fail to reject the null hypothesis of equality for visits by FEFA monitors with a p-value of 0.25. We observe whether ink is available in 177 (78 percent) of our 227 controls and in 175 (77 percent of our 238 treatments). We also fail to reject the null of differences in this mean with a p-value of 0.25.

an observable proxy for other types of malfeasance. Consistent with prediction 4 of our theory, both the complaints measure and the availability of (truly indelible) ink measure indicate that weakly connected candidates use temporal substitution, while that effect is statistically zero for well-connected candidates.[37]

5.3 Tests of Spatial Treatment Externalities

Recalling the discussion of optimal recovery in the theory, we now turn to testing prediction 3 regarding spatial recovery. Logistically, it is considerably easier to substitute spatially with the assistance of a PEO. Election returns forms are centrally aggregated into a provincial total at Provincial Aggregations Centers; spatial substitution for a PEO may be as simple as only manipulating on forms which correspond to PCs in which the PCM was not warned of monitoring. Prediction 3 of our model correspondingly indicates that candidates with a connection to the PEO will prefer spatial substitution.

Table 6 provides a test of our identifying assumption that, conditional on the number of polling centers within a fixed distance, the number treated is random. We estimate Specification 4, replacing the dependent variable with the same baseline variables we use to test for balance in treatment assignment in Table 1. We find only one case, in column 3, in which the neighboring treatment status predicts a baseline variable.

[Table 6 about here]

Table 7 reports estimates several variants of Specification 4. Columns 1 - 4 report marginal effects from negative binomial regressions, and include the full set of covariates and stratum fixed effects. Across specifications, we find that the estimated marginal effect of treatment does not appear to be affected by including controls for spatial externalities, and that the estimates resemble those reported in Table 3 above. We designate control polling centers with no treatments within a 2km halo as the omitted category in specifications 2 - 5, reflecting our assumption that that

[37] In unreported results, we also show that treatment effects of the core treatment are larger in these polling stations.

these are "pure controls." While this assumption is restrictive, we find that the average number of votes for the most connected candidates in the pure controls (42.939) is much larger than in the complementary set of impure controls (17.784) and that this difference is statistically significant (p-value = 0 .004, clustering standard errors at the polling center level).

[Table 7 about here]

According to the estimates in columns 2 and 3, having 1 neighbor treated removes about 4.5 votes for the most connected candidate and that having 2 neighbors treated removes a similar amount, about 5.5. The standard error of the estimates on these dummies grows as we increase the number of treated polling centers in the 1km halo because the probability of high treatment saturation arising from the randomization is unlikely. The effects appear to dissipate after 2 neighbors are treated, though this might be due to a lack of statistical power to estimate to estimate the effect of high saturation. In column 4, we provide the full set of interactions with own treatment. While highly restrictive assumptions belie these estimates, they indicate that treatment effects are much more effective where local treatment saturations are high. If corruption can adapt, then all margins must be shut before it is eliminated.

Columns 5 and 6 replace *returns form manipulation* as the dependent variable. We argue that this measure is less susceptible to spatial treatment externalities. Stealing boxes and returns forms takes place within a few hours of the conclusion of polling. Adjustments must therefore take place the night after the election, whereas votes can be altered until the vote is certified, four weeks later. Consistent with this interpretation, we do not find any evidence of spatial treatment externalities for this measure. This increases our confidence that the treatment effect on *returns form manipulation*—the damaging and stealing of elections materials—is only weakly affected by spatial treatment externalities.

[Table 8 about here]

Table 8 reports estimates of Specification 4, separating the sample into the seven provinces in which the most connected candidate is also connected to the PEO and the twelve provinces without this connection. The result that treatment effects are largely for candidates with a known connection to the PEO, a connection which is very likely to facilitate fraud at the Provincial Aggregation Center, from Table 3 receives additional support. In columns 1 - 4, we find evidence of a "chilling" effect for provinces in which the candidate is connected to the PEO. As before, these effects appear to dissipate, with the largest effect coming from having the first neighbor treated. Again, as before, the high saturation sample is small, so that standard errors are larger for estimates of the effect of high treatment saturation. In columns 5 - 8, we observe results for the most connected candidate. Here the evidence is mixed. The effect of treating additional PCs between 1 and 2 kilometers away is consistently and significantly large and positive. Similarly, in columns 6 and 7, we find that treatment saturations need to be higher, before the "caution" effect starts to operate. We emphasize that these are estimated on small samples, with the maintained assumption that controls with no treatments in a 2km halo provide a counterfactual, but the results do provide weak evidence in support of the spatial recovery prediction of our model. Again, as in the previous table, we also find evidence that treatment effects are highest where the treatment saturation is highest.

6 Conclusion

Free and fair elections are critical for democracy to fulfill its key function of empowering citizens to hold politicians accountable. Elections fail in new democracies for a range of reasons, but commonly because of weak institutions with limited constraints on the ability of election officials to manipulate on behalf of a candidate. Corruption, traditionally defined as the illegal sale of preferential treatment by government agents, therefore can also undermine fair elections.

This paper provides results from an experimental evaluation of a novel photo quick count technology intended to reduce the corrupt sale of votes by election officials to candidates. The technology is effective, scalable, well-suited to citizen-based implementation and "viral" adoption, and cost-effective relative to traditional international election monitoring.[38] We exploit the ran-

[38] Viral adoption refers to the adoption of new technology based on information that spreads through pre-existing social networks in a self-replication process. Typically viral adoption relies on ICT to spread information about new technologies.

domized evaluation of this technology, along with unusually rich administrative data on the election process, to test a set of predictions from a model of trade in corrupt votes between a candidate and an election official.

We provide experimental evidence consistent with a logic for the relevance of political connections in determining the effectiveness of anti-corruption monitoring interventions. The effect of our intervention, and the response of candidates to it, appear to depend on the pre-existing connections between candidates and election officials. Candidates with connections to the Provincial Elections Officer exhibit a larger response to Photo Quick Count and, while our results are weaker here, may be better able to respond to it. This is consistent with the possibility of multiple equilibria in corruption as discussed in Olken and Pande (2011) and the endogenous corruption equilibria documented in (Burgess et al. 2011). We also find evidence suggesting a particularly pernicious effect of corruption; it can undermine the disciplining role of elections in democracy. Moreover, this corruption appears to benefit the predictably corrupt candidates, potentially creating an endogenous high corruption equilibrium. Along these lines, we argue that political connections might provide preferential access to impunity, undermining the ability of the state to correct externalities in a way that advantages the most corrupt election officials and candidates running for election.

We draw several policy implications from this. First and most importantly, our results indicate that ICT-based corruption monitoring technologies represent a promising and potentially highly cost-effective means of reducing corruption. Second, corrupt networks have both incentives and strong means to adapt to changes that result from monitoring. At a minimum, anti-corruption efforts, especially in weakly institutionalized contexts, should attempt to account for these and also remain sensitive to the possibility of perverse allocative consequences. Specifically, resilient corrupt agents might benefit from monitoring as it pushes less powerful individuals out of the market for illegal government goods. Finally, monitoring is likely to be most cost-effective when it is not possible to predict. Foreknowledge may be met by adaptation, undermining effectiveness.

Our findings produce a natural set of questions for future research. First, data on the response of prices for government favors to an unannounced shock to the detection probability would constitute a direct test of the core mechanism of our model. Second, a natural extension of this research would be to investigate the longer term effects of fraud reduction on the effectiveness of government in improving social welfare and on citizens' attitudes toward government. Third, our paper suggests a further work on the institutional and political factors influencing the effectiveness and sustainability of government monitoring efforts. Finally, and perhaps more practically, our results suggest that identifying and operationalizing innovative uses of ICT to quickly gather information on corruption, waste and abuse, is an interesting research direction for the fields of political economy and development.

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Table 1: Randomization Verification

	Control	Treatment	T-C	p-value
	(1)	(2)	(3)	(4)
Plans to turnout during election (=1)	0.788	0.797	0.009	0.682
	[0.237]	[0.232]	(0.022)	
Believes vote is secret (=1)	0.664	0.650	-0.014	0.561
	[0.267]	[0.255]	(0.025)	
Candidate will know how I voted (=1)	0.088	0.090	0.002	0.868
	[0.147]	[0.153]	(0.014)	
Can identify sitting MP (=1)	0.372	0.386	0.013	0.664
	[0.327]	[0.318]	(0.031)	
People in precinct will vote for same cand. (=1)	0.238	0.249	0.010	0.673
	[0.253]	[0.258]	(0.024)	
Problems with ballot transport are likely (=1)	0.533	0.534	0.001	0.974
	[0.304]	[0.302]	(0.029)	
Police in PC help security (=1)	0.738	0.737	-0.000	0.987
	[0.237]	[0.241]	(0.023)	
People like you are threatened to vote one way (=1)	0.217	0.202	-0.015	0.482
	[0.232]	[0.223]	(0.022)	
Local violence likely on elect. day (=1)	0.501	0.483	-0.018	0.570
	[0.317]	[0.347]	(0.032)	
MP Candidate from same Qawm (=1)	0.233	0.232	-0.001	0.973
	[0.221]	[0.227]	(0.021)	
Trad. auth. helps settle disputes (=1)	0.287	0.293	0.006	0.800
	[0.267]	[0.240]	(0.024)	
Pashtun (=1)	0.326	0.318	-0.008	0.830
	[0.388]	[0.407]	(0.038)	
Tajik (=1)	0.426	0.433	0.007	0.858
	[0.383]	[0.390]	(0.037)	
Income generating activity (=1)	0.602	0.607	0.005	0.793
	[0.198]	[0.192]	(0.019)	
Monthly income (1,000 AFs)	10.613	10.553	-0.061	0.910
	[4.817]	[6.356]	(0.540)	
Electrified (=1)	0.726	0.706	-0.020	0.491
	[0.300]	[0.323]	(0.030)	
District Governor keeps elect. fair (=1)	0.111	0.114	0.004	0.814
	[0.170]	[0.169]	(0.016)	
Visited by international election monitors (=1)	0.144	0.174	0.030	0.380
	[0.350]	[0.378]	(0.034)	
Visited by domestic election monitors (=1)	0.885	0.849	-0.037	0.245
	[0.319]	[0.359]	(0.032)	
Indelible ink washes or not available (=1)	0.789	0.744	-0.045	0.255
(pre-treatment)	[0.409]	[0.438]	(0.039)	
# Observations	227	238		

Notes: Standard deviations reported in brackets and standard errors reported in parentheses. Data on election monitoring visits are provided by Democracy International. Remaining variables are from on 2,904 responses to baseline interviews performed during August 2010 in 450 of the 471 polling center precincts in our experiment sample. Randomization was blocked on province and stratified on shares reporting some electricity and that the District Governor keeps elections fair.

Table 2: Summary Statistics for Political Connections Data

Variable	Mean	Std. Dev.
Connected to Provincial Elect. Officer (=1)	0.491	0.504
Connected to District Elect. Officer (=1)	0.228	0.423
Served in Senior Post Since 2001 (=1)	0.614	0.491
Served in Junior Post Since 2001 (=1)	0.158	0.368
Connected Directly to Karzai (=1)	0.298	0.462
Indirectly Connected to Karzai (=1)	0.281	0.453
# Observations	57	

Notes: Data are from systematic investigations of candidates' political history over the period December 1979 - August 2010 commissioned by Democracy International. We use data on the 57 candidates running in the 19 electoral districts in which our experiment took place. The full set of variables available in this data set are described in the data appendix.

Table 3: Evidence of Fraud Reduction

Dependent Variable:	Number of Votes for the Most Connected Candidate							
	(1)	(2)	(3)	(4)	(4a)	(5)	(6)	(6a)
Panel A	OLS	OLS	OLS	NB	$\partial y/\partial x$	OLS	NB	$\partial y/\partial x$
Received Letter (=1) ($\hat{\gamma}_2$)	-5.923*	-4.729	-4.791*	-0.240**	-3.413**	0.101	0.013	0.188
	(3.303)	(3.053)	(2.904)	(0.118)	(1.692)	(4.113)	(0.166)	(2.333)
Letter $*$ PEO Connection ($\hat{\gamma}_3$)						-10.124*	-0.537**	-6.691**
						(5.953)	(0.228)	(2.587)
Constant ($\hat{\gamma}_1$)	23.262***	23.619***	35.442***	2.308***		35.239***	2.085***	
	(2.558)	(2.095)	(7.179)	(0.428)		(7.010)	(0.398)	
P-value from test of $\hat{\gamma}_2 = \hat{\gamma}_3$						0.274	0.132	
Stratum FEs	No	Yes	Yes	Yes		Yes	Yes	
Full Covariates	No	No	Yes	Yes		Yes	Yes	
R-Squared [Log-Likelihood]	0.006	0.230	0.241	[-6,556.552]		0.245	[-6,548.175]	
# Observations	1,879	1,786	1,786	1,786		1,786	1,786	
# Clusters	437	420	420	420		420	420	

Dependent Variable:	Election Returns Form Manipulation (=1)							
	(1)	(2)	(3)	(4)	(4a)	(5)	(6)	(6a)
Panel B	OLS	OLS	OLS	Probit	$\partial y/\partial x$	OLS	Probit	$\partial y/\partial x$
Received Letter (=1) ($\hat{\gamma}_2$)	-0.110***	-0.109***	-0.105***	-0.536***	-0.110***	-0.066	-0.457**	-0.096**
	(0.031)	(0.031)	(0.031)	(0.153)	(0.031)	(0.031)	(0.194)	(0.041)
Letter $*$ PEO Connection ($\hat{\gamma}_3$)						-0.077	-0.140	-0.028
						(0.063)	(0.238)	(0.046)
Constant ($\hat{\gamma}_1$)	0.189***	0.188***	0.216***	-0.880***		0.220***	-0.868***	
	(0.026)	(0.025)	(0.077)	(0.096)		(0.077)	(0.097)	
P-value from test of $\hat{\gamma}_2 = \hat{\gamma}_3$						0.919	0.366	
Stratum FEs	No	Yes	Yes	No		Yes	No	
Full Covariates	No	No	Yes	No		Yes	No	
R-Squared [Log-Likelihood]	0.026	0.228	0.243	[-176.433]		0.245	[-175.075]	
# Observations	465	444	444	465		436	457	

Notes: *Level of significance*: *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. NB = Negative Binomial regression. Robust standard errors are reported in parentheses (standard errors in Panel A are clustered at the the polling center level). The Most Connected Candidate is defined in Section 4.2. The full set of covariates is the share of respondents who are Pashtun, Tajik, who anticipate violence on election day, and whether the polling center was visited by international election monitors. PEO Connection = 1 for the 7 provinces in which the Most Connected Candidate has a connection to the Provincial Elections Officer and 0 for the remaining 12 provinces in the sample.

Table 4: Evidence of Fraud Reduction: Alternative Definitions of Most Connected Candidate

Dependent Variable	Change from Core Definition (# Candidates)	Specification	Estimated Coefficient $\hat{\varphi}_2$	Constant $\hat{\varphi}_1$	Marginal Effect	R^2 [Log-Likelihood]	#Obs	# Clusters
Highest Votes in the Control Sample With:								
1. Connection to District Elections Officer (DEO)	7 of 19	OLS	-4.702	43.284***		0.457	1818	428
			(3.222)	(7.309)				
		NB	-0.280***	2.272***	-4.756***	[-7022.666]	1818	428
			(0.098)	(0.304)	(1.711)			
		Rank	-74.899**	951.815***		0.463	1818	428
			(35.577)	(85.083)				
2. Connection to Provincial Elections Officer (PEO)	6 of 19	OLS	-5.057	40.400***		0.37	1818	428
			(3.070)	(6.952)				
		NB	-0.288***	2.336***	-4.625***	[-6914.276]	1818	428
			(0.099)	(0.309)	(1.636)			
		Rank	-75.978**	961.812***		0.433	1818	428
			(36.098)	(87.039)				
3. Connection to Karzai (Karzai)	3 of 19	OLS	-4.250	36.704***		0.239	1790	421
			(2.841)	(6.798)				
		NB	-0.237**	2.306***	-3.483**	[-6628.386]	1790	421
			(0.119)	(0.440)	(1.765)			
		Rank	-85.238**	1166.717***		0.404	1790	421
			(38.803)	(96.730)				
4. History of Government Service (Gov't)	7 of 19	OLS	-4.738	42.791***		0.461	1826	430
			(3.197)	(7.287)				
		NB	-0.329***	2.308***	-5.492***	[-7025.849]	1826	430
			(0.097)	(0.302)	(1.678)			
		Rank	-96.925***	974.058***		0.477	1826	430
			(35.521)	(85.6)				
5. Runner Up by DEO + PEO + Karzai + Gov't	19 of 19	OLS	0.189	21.668***		0.538	1808	427
			(1.982)	(3.721)				
		NB	-0.187**	1.820***	-1.594**	[-5866.296]	1808	427
			(0.084)	(0.281)	(0.723)			
		Rank	-76.982**	924.537***		0.535	1790	421
			(30.805)	(77.83)				

Notes: *Level of significance*: *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Robust standard errors clustered at the Polling Center level reported in parentheses. Results are for regressions of the form: $Most\ Connected\ Cand.\ Votes_{cs} = \varphi_1 + \varphi_2 Letter\ Received_{cs} + \boldsymbol{\varphi}_3'\mathbf{X}_{cs} + \zeta_{cs}$ using several alternate definitions of $Most\ Connected\ Cand.\ Votes_{cs}$. Our data are from 19 distinct electoral districts; we look at the effect on votes for one candidate in each electoral district. NB = Negative Binomial regression. Rank regressions are OLS regressions where the dependent variable is redefined as the relative ascending rank within the sample. All regressions include stratum fixed effects and control for the share of respondents who are Pashtun, Tajik, who anticipate violence on election day, and whether the polling center was visited by international election monitors.

Table 5: Temporal Recovery

Dependent Variable	Count Manipulation 1: Number of ECC Complaints by Candidates								
Sample	Full Sample						Ink Problems		
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Received Letter (=1)	1.438**	1.406*	1.360*	2.805*	2.655	2.736*	4.059**	4.614*	4.616**
	(0.716)	(0.750)	(0.717)	(1.464)	(1.612)	(1.598)	(2.038)	(2.413)	(2.301)
Letter ∗ PEO Connection				-2.360	-2.309	-2.535	-3.544*	-4.320*	-4.515*
				(1.516)	(1.661)	(1.717)	(2.090)	(2.456)	(2.456)
Constant	1.881***	1.727***	2.970	2.927***	1.791***	2.930	2.790***	1.598***	4.064
	(0.295)	(0.289)	(3.748)	(0.533)	(0.287)	(3.709)	(0.642)	(0.336)	(5.094)
Stratum FEs	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Full Covariates	No	No	Yes	No	No	Yes	No	No	Yes
R-squared	0.008	0.152	0.178	0.055	0.159	0.185	0.065	0.197	0.238
# Observations	465	444	444	457	436	436	352	341	341

Dependent Variable	Count Manipulation 2: Number ECC Complaints Against Polling Official								
Sample	Full Sample						Ink Problems		
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Received Letter (=1)	0.898	1.052*	1.038*	1.843	1.957	2.062	2.987*	3.677*	3.700**
	(0.614)	(0.588)	(0.561)	(1.261)	(1.296)	(1.276)	(1.752)	(1.889)	(1.797)
Letter ∗ PEO Connection				-1.580	-1.692	-1.909	-2.773	-3.498*	-3.660*
				(1.275)	(1.309)	(1.343)	(1.766)	(1.902)	(1.891)
Constant	1.476***	1.163***	2.416	2.991***	1.220***	2.415	3.259***	1.094***	3.370
	(0.320)	(0.234)	(2.749)	(0.634)	(0.231)	(2.721)	(0.815)	(0.272)	(3.742)
Stratum FEs	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Full Covariates	No	No	Yes	No	No	Yes	No	No	Yes
R-squared	0.005	0.206	0.241	0.084	0.213	0.247	0.106	0.262	0.306
# Observations	465	444	444	457	436	436	352	341	341

Notes: *Level of significance*: $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. All regression include province and stratum fixed effects. Robust standard errors are reported in parentheses. The full set of covariates is the share of respondents who are Pashtun, Tajik, who anticipate violence on election day, and can identify the sitting member of parliament and whether the polling center was visited by international election monitors. The Ink Problems sample corresponds to polling centers in which domestic monitors report at least one station having no indelible ink to prevent multiple voting or that report at least one station where the indelible ink is washable.

Table 6: Validating the Randomization to Test for Spatial Treatment Effects

	Transport Problems	Expects Violence	Vote is Secret	Can Identify MP	Traditional Authority
Panel A	(1)	(2)	(3)	(4)	(5)
Received Letter (=1)	0.002	0.001	-0.026	0.015	0.003
	(0.026)	(0.026)	(0.023)	(0.020)	(0.022)
Treated PCs within 1km (0-5)	-0.023	0.028	-0.029	0.002	-0.014
	(0.025)	(0.023)	(0.023)	(0.017)	(0.020)
Total PCs within 1km (0-5)	0.004	-0.009	0.025*	0.001	0.019
	(0.015)	(0.015)	(0.013)	(0.010)	(0.012)
Treated PCs within 1-2km (0-12)	-0.003	0.002	-0.016	0.006	-0.007
	(0.019)	(0.019)	(0.017)	(0.014)	(0.015)
Total PCs within 1-2km (0-24)	0.007	-0.000	0.009	-0.010	-0.004
	(0.010)	(0.011)	(0.009)	(0.008)	(0.008)
Constant	0.520***	0.476***	0.641***	0.400***	0.297***
	(0.032)	(0.030)	(0.028)	(0.028)	(0.026)
# Observations	440.000	441.000	444.000	444.000	444.000
R-Squared	0.324	0.436	0.339	0.645	0.356
	Pashtun	Income	Electrified	District Gov. Keeps Fair	Visited by Int'l Monitors
Panel B	(1)	(2)	(3)	(4)	(5)
Received Letter (=1)	-0.010	-89.935	-0.015	0.006	0.042
	(0.018)	(492.307)	(0.016)	(0.012)	(0.035)
Treated PCs within 1km (0-5)	-0.003	883.868	-0.006	0.016	0.042
	(0.014)	(635.788)	(0.013)	(0.010)	(0.038)
Total PCs within 1km (0-5)	0.005	-490.745	0.009	-0.012*	0.008
	(0.009)	(355.279)	(0.008)	(0.006)	(0.021)
Treated PCs within 1-2km (0-12)	0.016	-354.672	-0.013	0.005	0.021
	(0.011)	(403.780)	(0.011)	(0.009)	(0.028)
Total PCs within 1-2km (0-24)	-0.013**	316.854	0.010*	-0.005	0.008
	(0.007)	(217.885)	(0.005)	(0.005)	(0.015)
Constant	0.345***	10088.521***	0.694***	0.132***	-0.004
	(0.021)	(553.848)	(0.020)	(0.015)	(0.042)
# Observations	444.000	439.000	444.000	442.000	444.000
R-Squared	0.818	0.322	0.780	0.506	0.226

Notes: *Level of significance*: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Robust standard errors are reported in parentheses. Dependent variables are drawn from the baseline survey of 2,904 respondents, performed in the immediate vicinity of polling centers in one month before the election in August 2010. All regressions include stratum and province fixed effects.

Table 7: Spatial Treatment Externalities

Dependent Variable:	Number of Votes for the Most Connected Candidate				Returns Form Manipulation (=1)	
	(1)	(2)	(3)	(4)	(5)	(6)
Specification:	NB	NB	NB	NB	OLS	OLS
	$\partial y/\partial x$	$\partial y/\partial x$	$\partial y/\partial x$	$\partial y/\partial x$		
Received Letter (=1)	-3.645**	-3.726**	-3.547**	-1.298	-0.114***	-0.102**
	(1.588)	(1.605)	(1.593)	(2.243)	(0.033)	(0.049)
Treated PCs within 1km (0-5)	-0.022					
	(1.364)					
Total PCs within 1km (0-5)	-1.491*	-0.889	-1.244	-1.013	0.003	0.004
	(0.793)	(0.761)	(0.789)	(0.757)	(0.020)	(0.021)
Treated PCs within 1-2km (0-12)	0.993		1.559	2.065*	-0.034	-0.034
	(1.227)		(1.252)	(1.221)	(0.024)	(0.026)
Total PCs within 1-2km (0-24)	-0.577		-0.672	-0.356	0.016	0.017
	(0.609)		(0.627)	(0.576)	(0.011)	(0.012)
1 treated PC within 1km (=1)		-4.521*	-4.293*	-4.895*	-0.029	-0.025
		(2.392)	(2.494)	(2.759)	(0.058)	(0.079)
2 treated PCs within 1km (=1)		-5.559**	-5.516*	-8.681***	-0.036	-0.029
		(2.812)	(2.845)	(2.945)	(0.087)	(0.097)
3 treated PCs within 1km (=1)		-3.636	-2.315	-7.697**	-0.021	-0.015
		(3.936)	(4.235)	(3.541)	(0.106)	(0.142)
4 treated PCs within 1km (=1)		-0.822	1.347	-1.264	-0.124	-0.146
		(5.529)	(6.255)	(6.169)	(0.114)	(0.140)
5 treated PCs within 1km (=1)		-5.344	-4.239	-5.955	-0.099	-0.103
		(4.579)	(5.231)	(4.397)	(0.199)	(0.206)
Treat ∗ 1 treated PC within 1km				0.924		-0.012
				(4.775)		(0.093)
Treat ∗ 2 treated PCs within 1km				11.252		-0.020
				(9.894)		(0.126)
Treat ∗ 3 treated PCs within 1km				16.015		-0.024
				(11.317)		(0.128)
Treat ∗ 4 treated PCs within 1km				3.692		0.037
				(8.799)		(0.131)
Treat ∗ 5 treated PCs within 1km				-13.634***		-0.060
				(0.733)		(0.198)
Treat ∗ treated PCs within 1-2km				-1.895**		-0.002
				(0.840)		(0.017)
Constant					0.106	0.106
					(0.096)	(0.101)
R-Squared [Log-Likelihood]	[-6536.736]	[-6528.762]	[-6525.238]	[-6510.091]	0.252	0.253
# Observations	1786	1786	1786	1786	-	-
# Clusters	420	420	420	420	444	444
Mean Dep. Var. in controls	24.457	24.457	24.457	24.457	0.226	0.226
Mean Dep. Var. control + no treated PCs 0-2km	42.939	42.939	42.939	42.939	0.180	0.180

Notes: *Level of significance*: $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. Robust standard errors clustered at the the polling center level reported in parentheses. NB = Negative Binomial regression. The omitted category is untreated polling centers which have 0 treated PCs within 2 kilometers. The Most Connected Candidate is identified using the procedure described in Section 4.2. The full set of covariates is the share of respondents who are Pashtun, Tajik, who anticipate violence on election day, and whether the polling center was visited by international election monitors. All regressions include province and stratum fixed effects.

Table 8: Treatment Externalities by Connection to the Provincial Elections Officer

Dependent Variable:	Number of Votes for the Most Connected Candidate				Number of Votes for the Most Connected Candidate			
Sample:	PEO Connection = 0				PEO Connection = 1			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Received Letter (=1)	-0.850	-1.069	-0.900	2.495	-5.793***	-8.368***	-6.151***	-5.597**
	(2.154)	(2.113)	(2.103)	(3.868)	(2.072)	(2.332)	(2.092)	(2.427)
Treated PCs within 1km	-0.061				1.461			
	(1.594)				(2.083)			
Total PCs within 1km	-1.008	-0.904	-0.795	-0.536	-2.666**	-0.318	-1.616	-1.663*
	(1.035)	(1.018)	(1.020)	(1.004)	(1.124)	(1.153)	(1.042)	(0.952)
Treated PCs within 1-2km	-2.118		-1.387	-1.336	8.141***		8.915***	9.079***
	(1.345)		(1.299)	(1.243)	(2.071)		(1.916)	(1.764)
Total PCs within 1-2km	0.922		0.851	0.859	-4.187***		-4.342***	-3.313***
	(0.713)		(0.681)	(0.639)	(1.011)		(0.966)	(0.886)
1 treated PC within 1km (=1)		-7.376**	-7.589***	-6.105*		1.237	4.297	-2.298
		(3.009)	(2.933)	(3.526)		(4.951)	(4.835)	(3.268)
2 treated PCs within 1km (=1)		-6.699*	-6.589*	-8.130*		-6.993**	-6.176*	-10.992***
		(3.680)	(3.539)	(4.433)		(3.501)	(3.191)	(2.352)
3 treated PCs within 1km (=1)		-3.027	-3.896	-6.454		-9.590***	-2.739	-7.513**
		(5.403)	(4.898)	(5.378)		(3.249)	(5.199)	(3.419)
4 treated PCs within 1km (=1)		0.816	-0.332	-1.794		-3.643	13.087	-0.343
		(7.619)	(6.758)	(7.233)		(7.302)	(14.908)	(8.546)
5 treated PCs within 1km (=1)		-1.749	-1.311	-3.326		-9.669**	-6.403	-7.638*
		(7.962)	(7.910)	(6.405)		(3.979)	(5.992)	(4.500)
Treat ∗ 1 treated PC within 1km				-5.589				9.808
				(4.553)				(9.473)
Treat ∗ 2 treated PCs within 1km				3.182				49.402
				(9.719)				(34.515)
Treat ∗ 3 treated PCs within 1km				0.751				37.913
				(7.113)				(28.215)
Treat ∗ 4 treated PCs within 1km				-4.039				34.664
				(5.930)				(27.279)
Treat ∗ 5 treated PCs within 1km								-12.439***
								(0.838)
Treat ∗ treated PCs within 1-2km				-0.547				-3.204***
				(1.128)				(0.989)
Log-Likelihood	-3350.899	-3335.899	-3331.737	-3337.852	-3133.114	-3154.746	-3120.587	-3106.565
# Observations	913	913	913	913	873	873	873	873
# Clusters	188	188	188	188	232	232	232	232
Mean Dep. Var. in controls	21.410	21.410	21.410	21.410	27.703	27.703	27.703	27.703
Mean Dep. Var. control + no treated PCs 0-2km	49.625	49.625	49.625	49.625	40.770	40.770	40.770	40.770

Notes: *Level of significance*: $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. Robust standard errors clustered at the polling center level are reported in parentheses. Results are marginal effects from Negative Binomial regressions with full covariates and stratum fixed effects. The omitted category is untreated polling centers which have 0 treated PCs within 2 kilometers. The Most Connected Candidate is identified using the procedure described in Section 4.2. All regressions include full covariates and province and stratum fixed effects. The full set of covariates is the share of respondents who are Pashtun, Tajik, who anticipate violence on election day, and whether the polling center was visited by international election monitors. PEO Connection = 1 for the 7 provinces in which the Most Connected Candidate has a connection to the Provincial Elections Officer and 0 from the remaining 12.

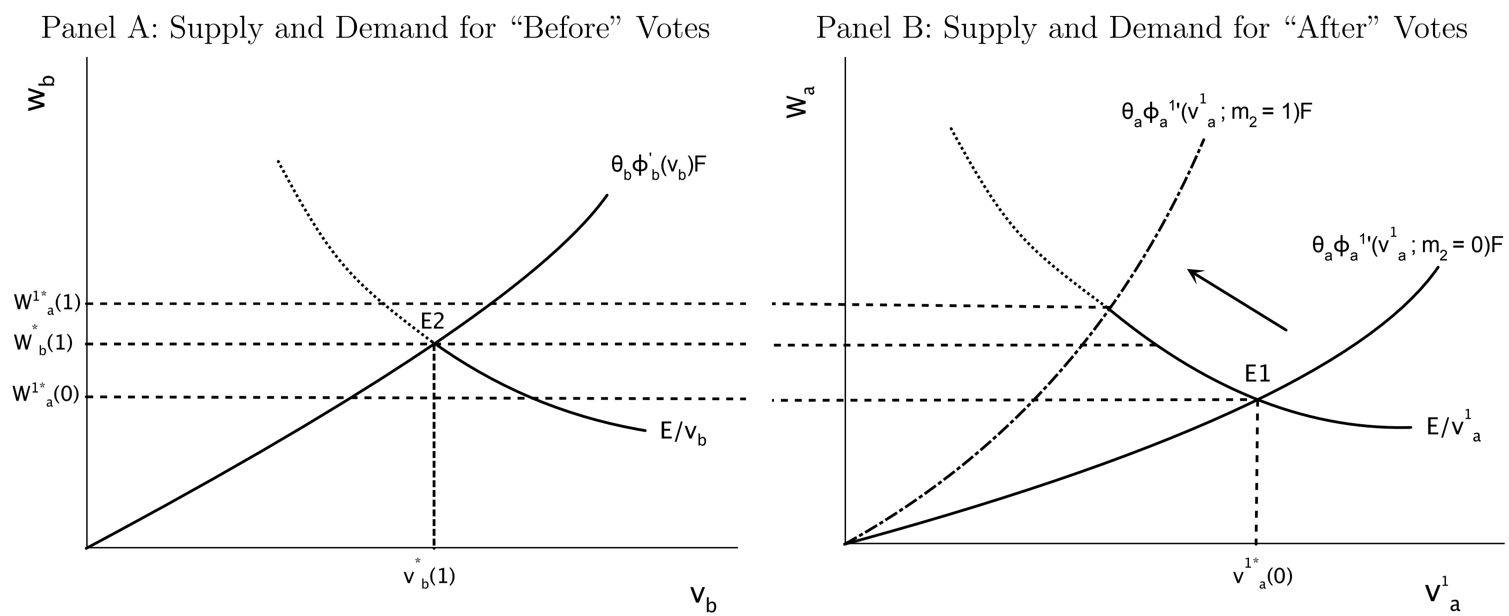


Figure 1: The Effect of Monitoring on the Market for Fraudulent Votes

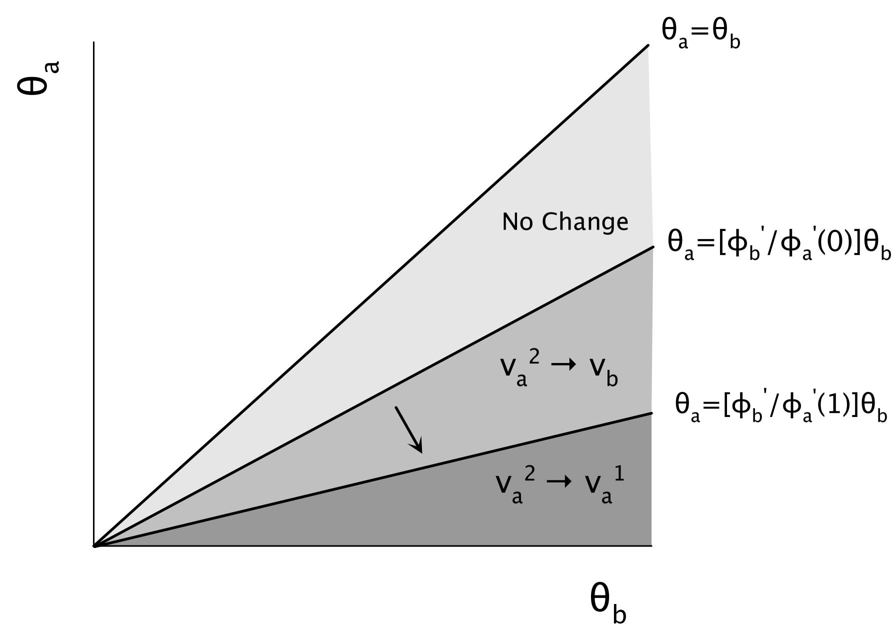


Figure 2: Separating Values for $\tilde{\theta}$

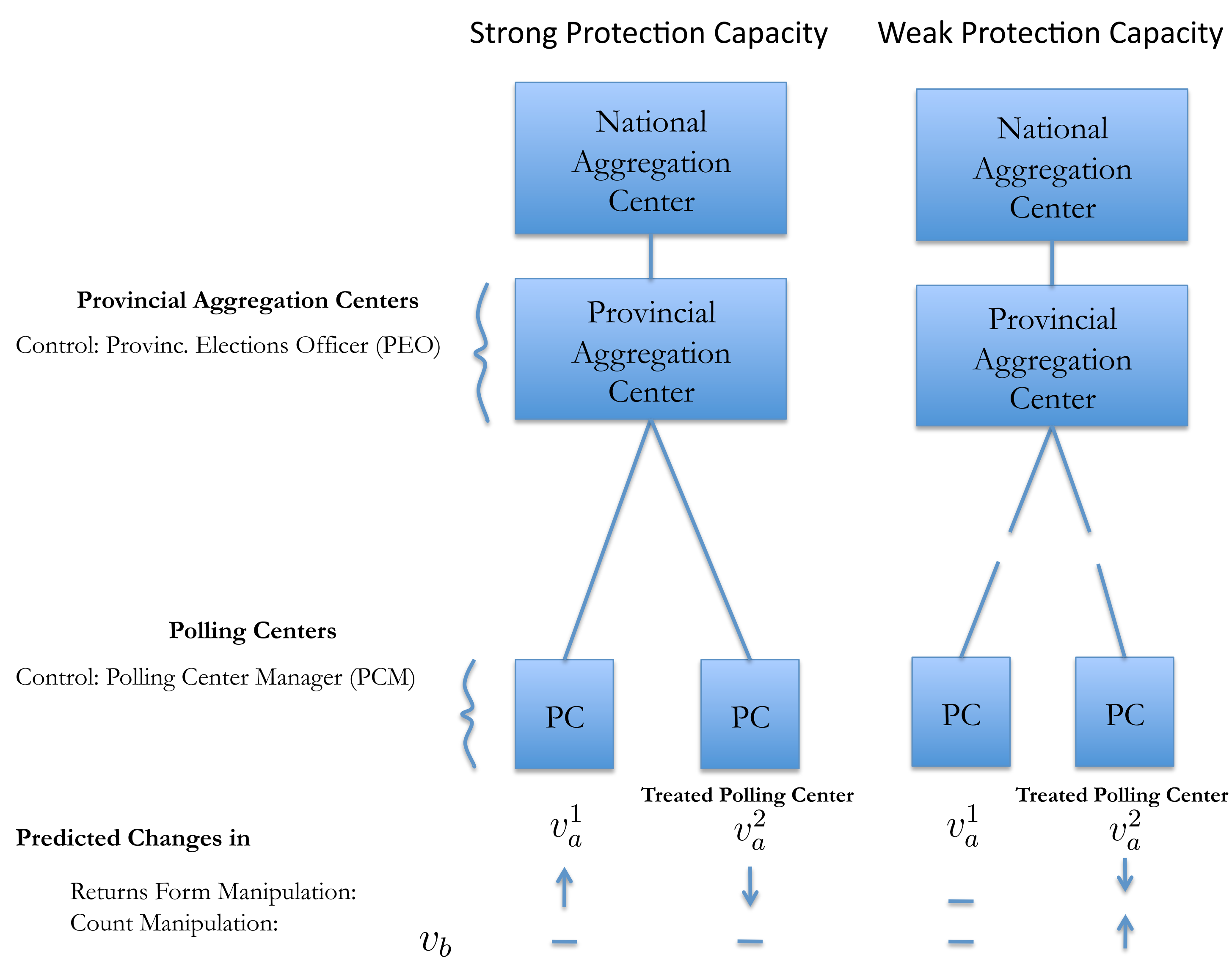
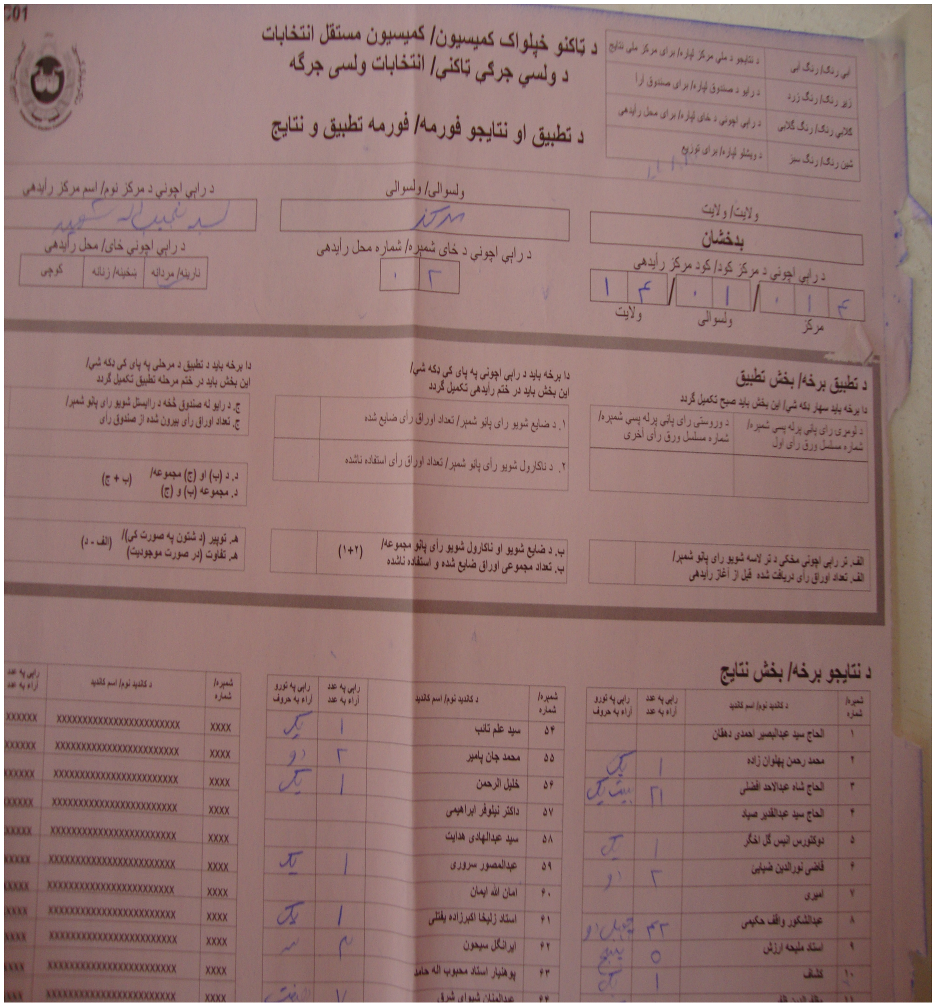


Figure 3: The Aggregation Process and Theoretical Predictions

Panel A: Election Returns Form at the Polling Center



Panel B: Election Returns Form at the National Aggregation Center

Figure 4: Election Returns Form for the Same Polling Center Before and After Aggregation

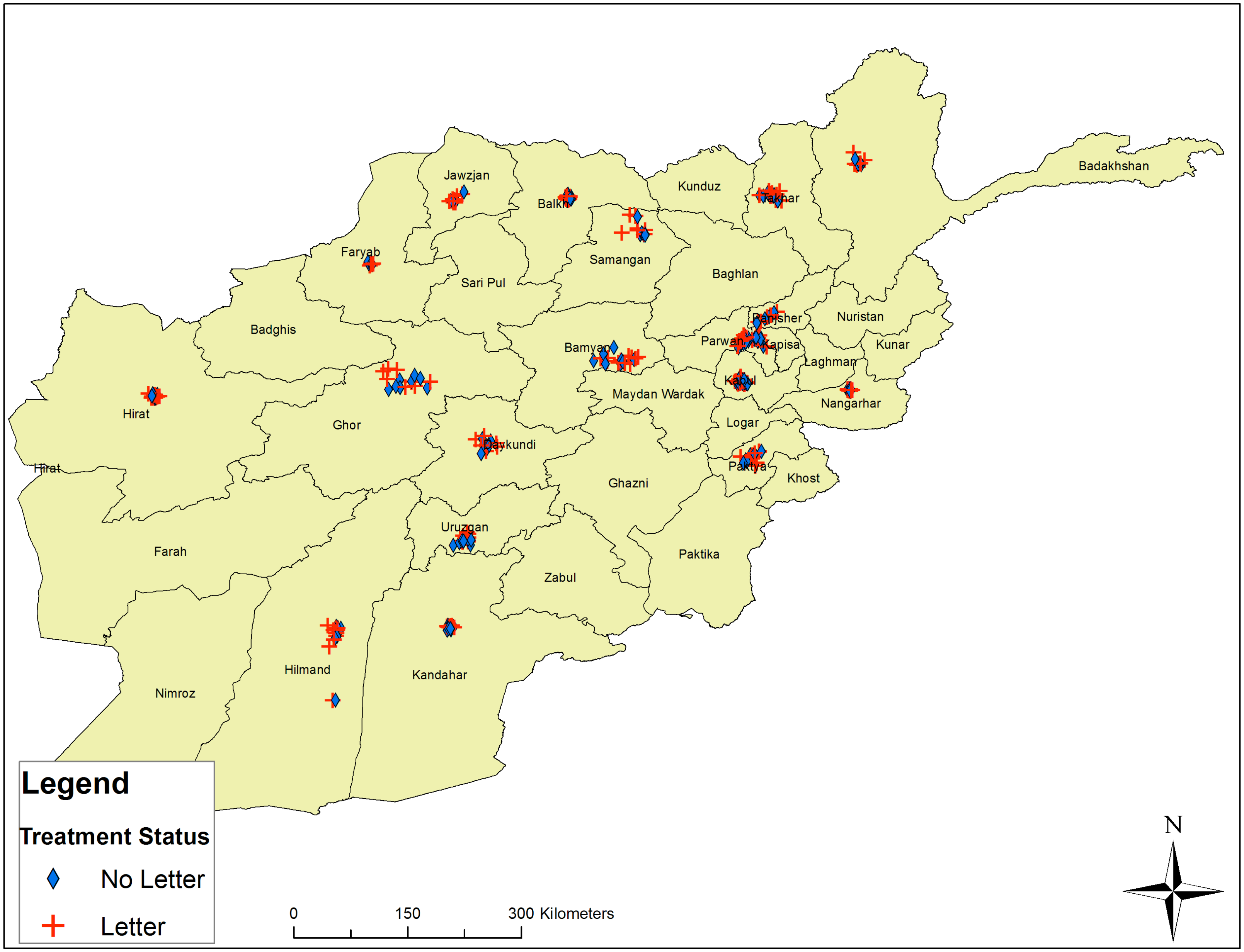


Figure 5: Experimental Sample Map

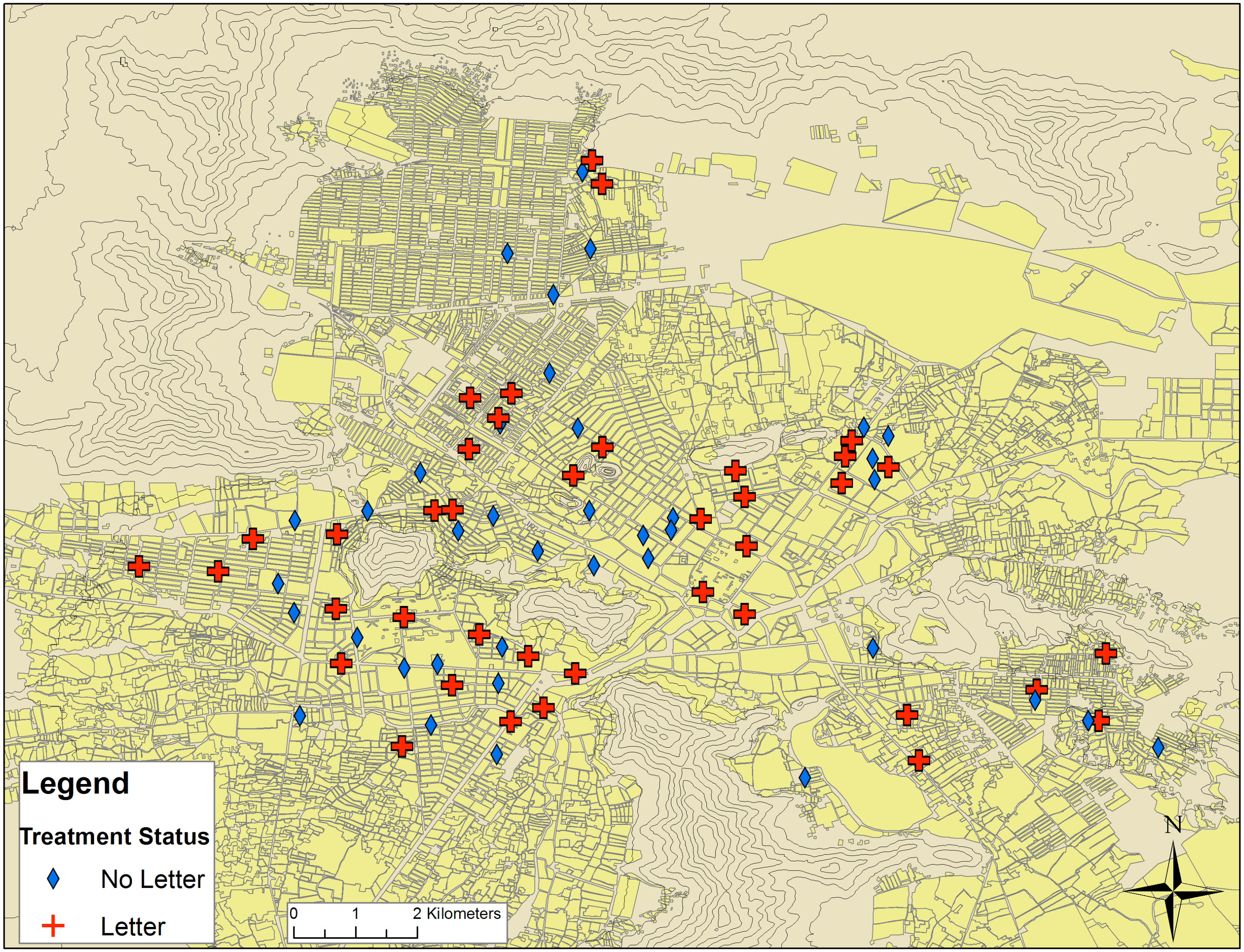


Figure 6: Experimental Sample in Kabul

Polling Center Name: …………………..

Polling Center Code:…………………….

Date: ………………………………………

Dear Sir or Madam-

Greetings! I am an official election observer with the Opinion Research Center of Afghanistan (ORCA). My organization is providing this letter to collect some important information about your polling center and share it with our main office. Your polling center has been randomly selected from among polling centers in this province.

In our attempts to help Afghanistan have free and fair elections, I will return to this polling center tomorrow morning in order to take pictures of the results for every candidate in every station on the tally sheets after they have been posted.

The information will be posted on a website that belongs to local and international election observers so that it will be used by the people of Afghanistan, the international community, and local and international media. We will also compare the photos taken with the tally certified by the IEC in Kabul.

As recognition that you have read and understood this letter, please sign here: ___________

Thank you kindly for your help and cooperation.

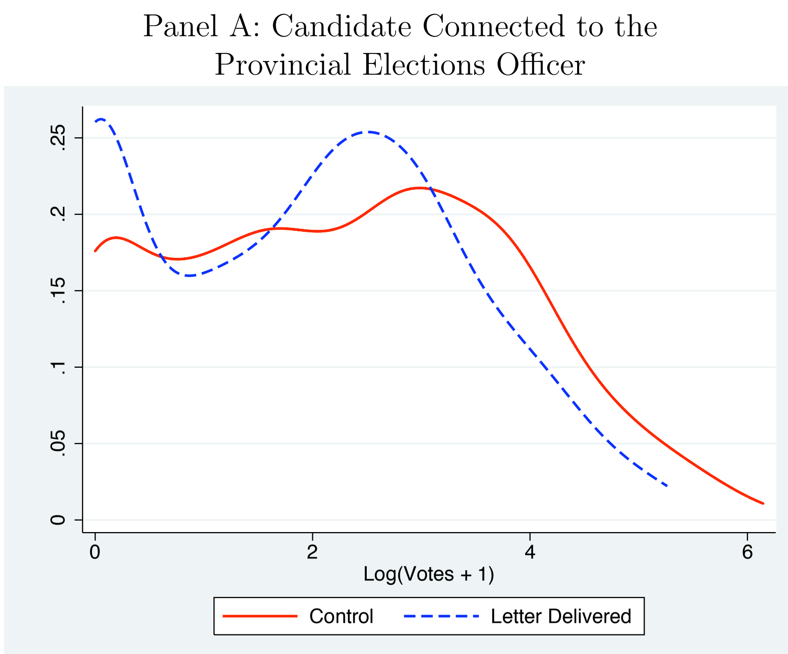
Sincerely,

Haj Abdul Nabi Barakzai

Deputy Head of ORCA

Name and Signature of manager of polling station:………………………………………

Figure 7: Letter Delivered to Polling Center Managers



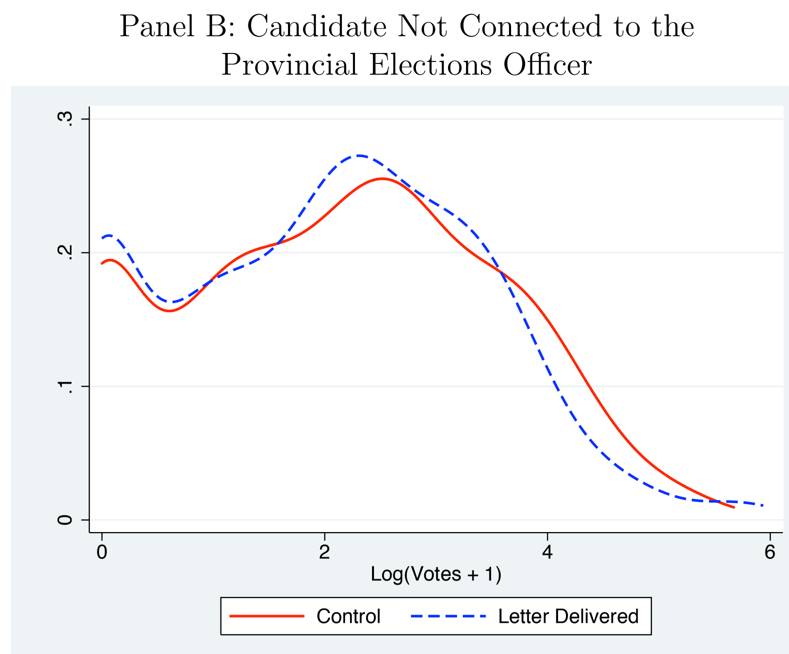


Figure 8: Log(Votes+1) for the Most Connected Candidate

APPENDIX for Online Publication Only

A Data

DEO is a dummy equal to 1 for candidates know to have connections to the District Elections Officer (DEO) since the Soviet Invasion. **PEO** is a dummy variable equal to 1 for all candidates who have a connection to the Provincial Elections Officer. **Connection to Karzai (Karzai)** takes a value of 0 of candidates have no known connection to President Hamid Karzai, 1 if candidates are know to have an indirect condition (e.g. related to a direct associate of Karzai), and 2 if candidates are known to have a direct connection (e.g. formerly serving in his cabinet). **History of Government Service (Gov't)** takes a value of 0 for candidates never having served in the government, 1 for candidates having served in a minor post (e.g. as a teacher or doctor) and 2 for candidates having served in a senior post (e.g. as a government minister or having previously served as a Member of Parliament). These data are from a political connections data set commissioned by Democracy International.

Number of Votes for the Most Connected Candidate is the number of votes at a given polling station for the candidate who: (i) is among the top ten vote getters in the controls; (ii) was researched as part of the systematic post-1979 political history investigations commissioned by Democracy International (DI); and (iii) scores highest on $Political\ Connection\ Index_i = Karzai_i + Government_i + DEO_i + PEO_i$.

PEO Connection is a dummy variable equal to 1 for provinces in which the most connected candidate has a connection to the Provincial Elections Officer. This divides our sample into twelve provinces with 244 polling centers where the most connected candidate has connections to the PEO ($Protection\ Capacity = 1$) and seven provinces with 227 polling centers.

Election Returns Form Manipulation is a dummy variable equal to one if our enumerators received reports that the reason the election returns form were missing on September 19, 2010 (the day after the election) because they had been either stolen or ripped down by candidate agents. In our sample, 44 polling centers have reports of candidate agents stealing the tally along with the ballot boxes and other election materials and 18 polling centers have reports of candidate agents merely tearing down the tallies. These data are from primary data collection done by Afghan researchers hired by the authors.

Number of ECC Complaints by Candidates is the number of complaints originated by registered parliamentary candidates about a given polling center regarding any matter. **Number of ECC Complaints Against Polling Official** is the number of ECC complaints made specifically regarding misbehavior by polling center staff. These data were provided by the Electoral Complaints Commission.

Ink Problems is a dummy variable equal to 1 for polling centers in which the indelible ink that is applied to voters' fingers to prevent multiple voting is either washable or is not available at all. These data are collected by domestic election monitors from Free and Fair Elections of Afghanistan (FEFA).

All remaining variables used in this analysis are from a survey conducted in the immediate vicinity of the polling centers in our experimental sample during the month preceding the election (August, 2010). The survey contained 2,904 respondents. To attempt to obtain a representative sample of respondents living near polling centers, enumerators employed a random walk pattern starting at the polling center, with random selection of every fourth house or structure. Respondents within households are randomly selected using Kish grid. The survey had 50 percent male and female respondents and enumerators conducted it in either Dari or Pashto. Either 6 or 8 individuals where interviewed in the immediate vicinity of the polling centers.

B Robustness to Alternative Measures of Returns Form Manipulation

In our results above, we measure *returns form manipulation* as a dummy variable equal to 1 for any polling center in which candidate agents—representatives of the candidates who can lawfully be in the polling center to represent the interests of their employing candidate—stole or damaged returns forms. We focus on candidate agents because, as direct employees of the candidates, they are most likely to be involved in rigging. However, citizens, security officials, or election staff themselves might also steal election materials in order to manipulate them. In Table A1 we therefore report the results of estimating Specification 1 using whether returns forms are missing for any reason as a dependent variable. Similar to our results above, we find that Photo Quick Count also reduces this measure of fraud.

C Additional Tests for Spatial Treatment Externalities

This section reports additional results on spatial treatment externalities, which provide additional tests of Prediction 4 in our model. Specifically, we follow Kremer and Miguel (2007) (we follow Miguel and Kremer (2004) above) and test for spatial externalities using the specification:

$$Most\ Connected\ Cand.\ Votes_{cs} = \varphi_1 + \varphi_2 Letter\ Received_{cs} + \sum_{i=1}^{3} \psi_i \bar{T}_c^i + \boldsymbol{\varphi}_6' \mathbf{X}_{cs} + \zeta_{cs}$$

where $\bar{T}_c^1$ indicates the sum of treatment statuses for the 5 nearest polling centers, $\bar{T}_c^2$ indicates the sum of treatment statuses of the next 5 nearest polling centers and $\bar{T}_c^3$ is the sum of treatment statuses of the next nearest 5 polling centers after that. Thus, each of the sums form a mutually exclusive group. Given the random assignment of polling centers to treatment, the fraction of nearby polling centers that is treated is also randomly assigned conditional on the total number of polling centers in the provincial center.[39]

The advantage of this approach is that it does not rely on the arbitrary selection of halos of a certain radius for each polling center. The drawback is that results are not as easily interpreted as being relative to a set of "pure controls", which previously had been polling centers which were not themselves treated and which had no neighbors treated within 2 kilometers. Here, the pure controls are polling centers which are not treated and which have no treatments in the 15 nearest neighbors.

This specification, run only on the weak protection capacity sample, allows us to test for the

[39] Because our randomization was stratified on province, inclusion of stratum fixed effects will control for the total number of polling centers.

"chilling" effect. The "chilling" effect in our model predicts that $\psi_i < 0$, $\forall i \in \{1, 2, 3\}$ in the weak protection capacity sample, and spatial recovery predicts that $\psi_i > 0$, $\forall i \in \{1, 2, 3\}$ in the strong protection capacity sample.

Table A3 estimates this specification with votes for the most connected candidate as the dependent variable in Panel A and *returns form manipulation* in Panel B. Panel A columns 1 - 4 report estimates on the subsample of provinces where the most connected candidate was not connected to the PEO. The negative and significant coefficients on the spatial lags are consistent with the chilling effect discussed in Section 2, resulting from the increase in officials' subjective assessments of the probability of monitoring. The surprisingly large coefficients on the neighboring polling stations may be due to the fact that this substitution all takes place in one centralized location, the Provincial Aggregation Center.

Columns 5 - 8 of Panel A confirm two insights from above. First, we see that contamination of our controls, as a result of spatial recovery, requires us to reinterpret the estimates on votes for the most connected candidate in Table 3. Column 4 replicates Column 5 in Panel B of Table 3. The effect size is lessened with the inclusion of spatial lags, suggesting that spatial recovery increases *returns form manipulation* in unmonitored stations. The second insight is that the negative and signficant estimate for ψ_2, on the strong protection capacity sample accords with spatial recovery. This is an especially surprising result, given the countervailing "chilling" effect we document in columns 1 - 3 of Panel A. Taken together, this suggests candidates may have offset some of the total effects of the intervention through spatial recovery.

In Panel B, we see that the negative and significant effects on *returns form manipulation* in Table 3 are sustained and are not much affected by the inclusion of spatial lags. The estimates increase slightly, however, when accounting for the "chilling" effect. The small point estimates on the spatial lags are consistent with our interpretation of the effect on *returns form manipulation* as reflecting a partial equilibrium response. The effects on votes for the most connected candidate in Panel A, by contrast, reflect a series of changes that occur later in the aggregation process outside of the polling center. Officials have both more time and face lower costs to spatially coordinating a response, as at this stage returns forms are in a centralized aggregation center.

Table A1: Robustness to Other. Measures of Form Manipulation

	Returns Form Missing				
	(1) OLS	(2) OLS	(3) OLS	(5) Probit	(6) $\partial y/\partial x$
Recieved Letter (=1) (d)	-0.073	-0.088**	-0.093**	-0.416***	-0.163***
	(0.046)	(0.041)	(0.040)	(0.150)	(0.058)
Constant	0.573***	0.567***	0.620***	-0.452	
	(0.033)	(0.029)	(0.090)	(0.689)	
R-Squared	0.005	0.383	0.414		
Log-Likelihood	-335.082	-214.715	-203.178	-183.433	-183.433
# Observations	465.000	444.000	444.000	314.000	314.000
Stratum FEs	No	Yes	Yes	Yes	
Full Covariates	No	No	Yes	Yes	

Notes: *Level of significance*: *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Robust standard errors are reported in parentheses. Returns Form Missing is a dummy equal to 1 if the returns form is missing for any reason. The full set of covariates is the share of respondents who are Pashtun, Tajik, who anticipate violence on election day, and whether the polling center was visited by international election monitors.

Table A2: Evidence of Fraud Reduction - Robustness to Spatial Treatment Externalities

Dependent Variable:	Number of Votes for the Most Connected Candidate				
Panel A	(1)	(2)	(3)	(4)	(4a)
	OLS	OLS	OLS	NB	$\partial y/\partial x$
Received Letter (=1)	-8.158**	-5.571*	-5.543*	-0.400**	-7.883**
	(3.350)	(2.969)	(2.889)	(0.170)	(3.396)
Nearest 5 Neighbors Treat (1-5)	-4.196**	-2.397	-1.912	-0.198***	-3.837***
	(1.647)	(2.018)	(1.793)	(0.076)	(1.415)
Second Nearest 5 Neighbors Treat (1-5)	-4.593**	-1.181	-1.075	-0.195**	-3.788**
	(2.076)	(2.064)	(2.065)	(0.096)	(1.804)
Third Nearest 5 Neighbors Treat (1-5)	-2.744*	-1.190	-1.556	-0.122	-2.364
	(1.641)	(2.035)	(2.122)	(0.091)	(1.779)
Constant	53.181***	35.808***	48.070***	4.455***	
	(11.212)	(11.596)	(13.839)	(0.511)	
Province + Stratum FEs	No	Yes	Yes	Yes	
Full Covariates	No	No	Yes	Yes	
R-Squared [Log-Likelihood]	0.022	0.232	0.243	[-7108.977]	[-7108.977]
# Observations	1879	1786	1786	1879	1879
# Clusters	437	420	420	437	437
Dependent Variable:	Election Returns Form Manipulation (=1)				
Panel B	(1)	(2)	(3)	(4)	(4a)
	OLS	OLS	OLS	Probit	$\partial y/\partial x$
Received Letter (=1)	-0.132***	-0.128***	-0.127***	-0.642***	-0.132***
	(0.033)	(0.035)	(0.035)	(0.172)	(0.034)
Nearest 5 Neighbors Treat (1-5)	-0.056***	-0.041*	-0.039*	-0.228**	-0.046**
	(0.019)	(0.022)	(0.023)	(0.092)	(0.018)
Second Nearest 5 Neighbors Treat (1-5)	-0.036**	-0.029	-0.033	-0.160*	-0.033*
	(0.017)	(0.022)	(0.023)	(0.093)	(0.019)
Third Nearest 5 Neighbors Treat (1-5)	0.000	-0.014	-0.016	0.033	0.007
	(0.013)	(0.022)	(0.022)	(0.077)	(0.015)
Constant	0.430***	0.406***	0.380**	0.155	
	(0.096)	(0.139)	(0.160)	(0.534)	
R-Squared [Log-Likelihood]	0.053	0.237	0.256	[-156.033]	[-156.033]
# Observations	465	444	444	416	416

Notes: *Level of significance*: $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Robust standard errors are reported in parentheses (standard errors in *Panel B* are clustered at the the polling center level). NB = Negative Binomial regression. The Most Connected Candidate is identified using the procedure described in Section 4.2. The full set of covariates is the share of respondents who are Pashtun, Tajik, who anticipate violence on election day, and whether the polling center was visited by international election monitors.

Table A3: Protection Capacity and Spatial Recovery

Dependent Variable:	Number of Votes for the Most Connected Candidate									
Sample:	PEO Connection = 0					PEO Connection = 1				
Panel A	(1)	(2)	(3)	(4)	(4a)	(5)	(6)	(7)	(8)	(8a)
	OLS	OLS	OLS	NB	$\partial y/\partial x$	OLS	OLS	OLS	NB	$\partial y/\partial x$
Received Letter (=1)	0.060	-2.317	-2.966	-0.139	-1.888	-9.866**	-6.735	-5.454	-0.376**	-5.190**
	(4.351)	(4.093)	(3.816)	(0.169)	(2.316)	(4.218)	(4.278)	(4.364)	(0.159)	(2.312)
Nearest 5 Neighbors Treat (1-5)		-4.967*	-3.947*	-0.240***	-3.253***		1.931	2.931	0.069	0.934
		(2.611)	(2.060)	(0.089)	(1.258)		(2.249)	(2.566)	(0.132)	(1.794)
Second Nearest 5 Neighbors Treat (1-5)		-5.511**	-5.279**	-0.367***	-4.978***		5.897*	6.995**	0.290**	3.952**
		(2.355)	(2.193)	(0.105)	(1.544)		(3.372)	(3.506)	(0.117)	(1.573)
Third Nearest 5 Neighbors Treat (1-5)		-3.555	-3.749	-0.225**	-3.048**		3.022	4.351	0.199	2.713
		(2.570)	(2.688)	(0.106)	(1.422)		(3.335)	(3.791)	(0.130)	(1.782)
Constant	20.481***	55.303***	60.565***	3.971***		27.012***	-3.374	1.216	0.760	
	(2.402)	(13.615)	(15.515)	(0.694)		(3.474)	(19.011)	(25.587)	(1.306)	
Full Controls	No	No	Yes	Yes		No	No	Yes	Yes	
R-Squared [Log-Likelihood]	0.206	0.226	0.257	[-3340.696]		0.256	0.264	0.284	[-3153.340]	
# Observations	913	913	913	913		873	873	873	873	
# Clusters	188	188	188	188		232	232	232	232	
Dependent Variable:	Election Returns Form Manipulation (=1)									
Sample:	PEO Connection = 0					PEO Connection = 1				
Panel B	(1)	(2)	(3)	(4)	(4a)	(5)	(6)	(7)	(8)	(8a)
	OLS	OLS	OLS	Probit	$\partial y/\partial x$	OLS	OLS	OLS	Probit	$\partial y/\partial x$
Received Letter (=1)	-0.070	-0.087*	-0.081	-0.541*	-0.106*	-0.141***	-0.165***	-0.169***	-1.174***	-0.297***
	(0.045)	(0.050)	(0.049)	(0.318)	(0.063)	(0.043)	(0.049)	(0.051)	(0.300)	(0.071)
Nearest 5 Neighbors Treat (1-5)		-0.035	-0.039	-0.165	-0.032		-0.046	-0.045	-0.214	-0.055
		(0.032)	(0.034)	(0.161)	(0.032)		(0.030)	(0.032)	(0.162)	(0.041)
Second Nearest 5 Neighbors Treat (1-5)		-0.014	-0.021	-0.088	-0.017		-0.047	-0.051	-0.203	-0.052
		(0.029)	(0.028)	(0.160)	(0.031)		(0.034)	(0.035)	(0.193)	(0.048)
Third Nearest 5 Neighbors Treat (1-5)		-0.043	-0.049*	-0.285*	-0.056*		0.024	0.017	0.083	0.021
		(0.027)	(0.028)	(0.163)	(0.032)		(0.035)	(0.036)	(0.163)	(0.042)
Constant	0.159***	0.390**	0.359*	-5.639***		0.214***	0.410*	0.541*	1.816	
	(0.034)	(0.179)	(0.198)	(1.197)		(0.036)	(0.222)	(0.277)	(1.726)	
Full Controls	No	No	Yes	Yes		No	No	Yes	Yes	
R-Squared [Log-Likelihood]	0.196	0.210	0.258	[-46.937]		0.255	0.279	0.298	[-57.928]	
# Observations	201	201	201	107		243	243	243	137	

Notes: *Level of significance*: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Robust standard errors are reported in parentheses (standard errors in *Panel B* are clustered at the the polling center level). NB = Negative Binomial regression. The Most Connected Candidate is identified using the procedure described in Section 4.2. The full set of covariates is the share of respondents who are Pashtun, Tajik, who anticipate violence on election day, and whether the polling center was visited by international election monitors. PEO Connection = 1 for the 7 provinces in which the Most Connected Candidate has a connection to the Provincial Elections Officer. All regressions include province and stratum fixed effects.

ORCA

Opinion Research Center of Afghanistan

نام مرکز رائ دهی: ____________________ تاریخ: ___________________

___ مرکز رائ دهی: _______________کود

به حضور محترم آقای / خانم

مسئولیت نظارت 472 مراکز رائ برحسب توافقنامه کمیسیون مستقل انتخابات دفتر اورکا دهی را بر عهده دارد.

میباشد و برای او (ORCA) دفتربه مربوطیک تن از نظارت کننده گان رسمیدارنده مکتوب معلومات تا بتواند مرکز رای دهی تسلیم نمودهدراین تا این مکتوب را وظیفه سپرده شده است . این مرکز دفتر مرکزی شریک بسازدجمع آوری نموده و با مرکز رای دهی این و دقیق را ازموثق این ولایت تمام مراکز رای دهی میانبه صورت تصادفی از گر به شمول چندین مراکز دیرای دهی انتخاب شده است.

فردا صبح . ناظر ما یک انتخابات آزاد و مشروع در افغانستان کمک خواهیم کرد تقویتبرایما . نصب میگردد اخذ نمایدمرکز رای دهیاین که در را نتایج کاندیدان لست آمد تا تصاویر از دخواه

گذاشته مربوط به ناظرین انتخاباتی داخلی و خارجی این نتایج در سایت انترنتی تصاویر از این نتایج ، موسسات خارجی، و مطبوعات داخلی و خارجیخواهد شد تا تمام مردم افغانستان نتایج را با نتایج که از طرف اینتصاویر حاصله از ناظرحیث مناستفاده کنند. و همچنان ما انتخابات در کابل نشر میشود مقایسه خواهیم کرد. مستقلکمیسیون

در پائین ایدبرای تائید اینکه این مکتوب بدسترس شما قرار گرفته و شما انرا مطالعه نموده مضا نمائید. لطف نموده ا

از همکاری شما قبلاً اظهار سپاس.

بااحترام

حاجی عبدالنبی بارکزی

معاون دفتر اورکا

یامضاسم و ____________________ :آمر محترم مرکزرائ دهی

Figure A1: Dari Translation of Letter Delivered to Polling Center Managers