The Role of Institutions in Providing Public Goods and Preventing Public Bads: Evidence from a Public Sanitation Field Experiment in Rural Kenya

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Abstract: Why are some communities able to prevent actions that harm the viability of public goods, while others are not? Why might the same set of institutions operate in very different ways in two otherwise similar communities? In this paper, I outline a theory that shows how the extent to which third-party governance is embedded in local norms and networks can explain variation in the availability of public goods and the effectiveness of law-enforcement institutions over space and time. Analysis of data from a large-scale field experiment supports some of the implications of this theory, showing that anti-littering rules enforced only by government agents are ineffective at motivating long-term behavior change. The more general theoretical implication of these findings is that formal enforcement does matter for public goods outcomes, but that third party enforcement institutions must be locally embedded in order to maintain the availability of public goods over time and that in some cases, sustained collective action may be an effective substitute for third party enforcement.

The lack of basic public goods such as security, sanitation, health facilities, and transportation infrastructure is a central development problem in many parts of the world. A growing body of research in comparative politics and development economics has attempted to explain why some communities are able to solve public goods problems, while others are not (Wantchekon 2003; Miguel 2004; Miguel and Gugerty 2005; Habyarimana et al. 2007; Tsai 2007). This literature has provided important insights about how formal electoral institutions and informal norms, networks, and groups can allow individuals to overcome collective action problems and provide public goods. However, even if a community or the government provides a public good, it may be destroyed or degraded, essentially restoring the status quo in which the good was not provided. This distinct type of public goods problem is frequent in both developing and developed countries; newly built schools or health clinics are rendered unusable by vandalism or the theft of supplies, rural roads are reduced to potholes and dust by careless driving and overloaded trucks, clean village centers are made dirty again by littering. **Why is motivating the provision of public goods insufficient to guarantee long-term maintenance of those goods?**

From the perspective of the political science and economics literatures on public goods problems, the inability of communities to maintain public goods that have been provided is a puzzle; in this line of research, there is an implicit assumption that if a public good is provided, it will be available indefinitely. This assumption does not square well with the empirical reality that in some localities, public goods are degraded, damaged, or destroyed shortly after they are provided, while in other cases, their integrity and viability are maintained for a much longer period of time. The frequency of such public goods maintenance problems indicates that preventing individuals from harming public goods is a social dilemma that is distinct from the type of passive free-riding that is typically associated with motivating collective action. In order to fully understand the dynamics of public goods problems, it is necessary to understand how communities solve two distinct collective action problems: inducing individuals to contribute to a public good and preventing individuals from producing public bads (Hardin 1982). **Why are some local communities able to prevent actions that harm the viability of public goods, while are others are not?**

A number of different bodies of research in comparative politics and political economy have suggested that third-party enforcement of social norms, rules, and laws can play a crucial role in preventing harmful, exploitative, or predatory behavior. Research on state authority in early modern Europe (North 1981, 1990; Tilly 1992; Spruyt 1994) and the contemporary developing world (Bates 2001) suggests that the creation of centralized law enforcement institutions by modern states is the crucial factor allowing societies to maintain the availability of public goods. However, this literature can do very little to explain why state law enforcement capacity in many parts of the world is patchy and incomplete, and why the same government might exercise different amounts and types of authority in different parts of the same territory (Jackson and Rosberg 1982, 1986; Boone 2003; Herbst 2000). **Why might the same set of third party enforcement institutions operate differently in two different communities?**

On the other hand, research on community governance of natural resources argues that norm enforcement and adjudication by localized institutions leads to better outcomes than state enforcement (Ostrom 1990; Agrawal 2001; Mearns 1996). Although this line of research indicates that third-party enforcement institutions such as councils of elders or local management committees may be may be critical for preventing public bads, these perspectives also bring a number of other unresolved questions and puzzles to the fore. **Under what circumstances are community governance institutions more effective than institutions imposed by a central government?**

The aim of my ongoing research agenda is to address this set of disparate puzzles and questions concerning the intersection of public goods problems, community governance institutions, and state law enforcement capacity (Sheely 2008). In this paper, I describe the contours of a theory that focuses on how the embeddedness of third party governance institutions in local norms and networks can explain variation in both public goods availability and law enforcement capacity. In order to both test and develop further implications of this theory, I designed and implemented a large-scale field experiment that randomly assigned villages receiving a community-based waste disposal program to different mixes of laws and institutions designed to prevent littering. The major findings from this experiment are that law enforcement does matter for public goods outcomes, but

that third party enforcement institutions must be locally embedded in order to maintain the availability of public goods over time and that in some cases, sustained collective action may be an effective substitute for third party enforcement.

A Institutional Approach to Public Goods Provision and Public Bads Prevention

In order develop a theoretical explanation for variations in the ability of communities and governments to provide and maintain local public goods, I draw a conceptual distinction between horizontal and vertical governance institutions and show how the joint operation of these two types of institution contributes to the provision and maintenance of public goods and social order. Broadly speaking, governance can be defined as the maintenance of social order through the enforcement of some combination of locally evolved and externally imposed rules (Mearns 1996). Horizontal governance refers to norm enforcement through decentralized networks of social sanctions, whereas vertical governance refers to institutions in which social rules are monitored and enforced in part by a specially designated third party, which could either be a community-based governance institution or a central government (Boone 2003). Horizontal governance institutions have been identified by a wide range of economists, sociologists, and political scientists as being vital to overcoming collective action problems and motivating the provision of public goods (Coleman 1988; Putnam 1993; Miguel and Gugerty 2005; Habyarimana et al. 2007; Janowitz 1975; Ostrom 1990). In contrast, third party enforcement of norms, rules, and laws by either community governance institutions or centralized states has primarily been associated with preventing harmful individual behavior and the production of public bads (North 1990; Bates 2001; Sweet 1999).

If it is the case that horizontal and vertical governance institutions each solve a different kind of social dilemma, it follows that different configurations of these types of institutions will lead to different patterns of public goods provision and public bads prevention. In particular, if horizontal governance primarily works to motivate public goods provision and vertical governance primarily serves to prevent public bads, we should observe high-levels of public goods availability in social settings in which both types of institution exist, are utilized, and are compatible with one another. In contrast, when only one type of institution or neither type exist or operate in a given social space,

public goods will tend to be less available, either as a result of underprovision of public goods, frequent production of public bads, or both.

	Nonexistent, Inactive, or Incompatible Vertical Governance Institutions	Existing, Active, and Compatible Vertical Governance Institutions
Nonexistent, Inactive, or Incompatible Horizontal Governance Institutions	**1.** No Provision of Public Goods, No Prevention of Public Bads	**2.** Limited Provision of Public Goods, Prevention of Public Bads
Existing, Active, and Compatible Horizontal Governance Institutions	**3.** Provision of Public Goods, Limited Prevention of Public Bads	**4.** Provision of Public Goods, Prevention of Public Bads

Figure 1. Predictions of the Effect of Horizontal and Vertical Governance Institutions on the Provision of Public Goods and Prevention of Public Bads

Comparing cells across each of the dimensions of Figure 1 reveals how this theory can generate predictions related both to the maintenance of public goods and the effectiveness of state law enforcement capacity. Comparing cells 3 and 4 explains variation in the ability of localities to maintain the integrity of public goods that have been provided. In both hypothetical cases, horizontal social sanctions motivate collective action, leading to high levels of public goods provision. However, in cases in cell 3, the absence of effective third party enforcement means that public goods will tend to be destroyed or degraded by careless or malicious action vis-à-vis cases in cell 4, in which the existence of effective third party enforcement acting in concert with social sanctions can prevent the production of public bads.

Comparing cases in cells 2 and 4 explains why two localities with identical third party enforcement institutions may exhibit stark differences in the effectiveness of law enforcement and crime prevention. Both types of area are characterized by the existence of specialized institutions that are designed to detect and punish harmful social behavior. In cases in Cell 4, third party monitoring and enforcement are supported and aided by decentralized monitoring and sanctioning, increasing the overall effectiveness of law enforcement. In contrast, in cases in Cell 3, the entire burden of monitoring and enforcement falls on third party institutions. Although vertical governance institutions will have some success at deterring deleterious behavior, these institutions will rely

exclusively on coercive force and will elicit very little voluntary compliance from individuals in their jurisdiction (Barnard 1938; Blau 1963; Englebert 2000a; Levi 1988). In addition, localities in Cell 3 will experience relatively little endogenous provision of public goods. If public goods exist in these areas, it will be based primarily on the discretion of outside actors.[1] Although third party punishment will succeed at preventing many types of public bads, the integrity of externally provided public goods in cases without effective systems of horizontal governance will gradually be chipped away by low-level crime and small scale public bads, all other things being equal.

What types of social settings are necessary for the existence, operation, and compatibility of horizontal and vertical governance institutions? Horizontal governance institutions can be said to exist and function when 1) individuals are united by shared beliefs, preferences, and norms of behavior; and 2) individuals monitor the social behavior of others that they encounter and punish violations of norms. Variation in the existence and operation of horizontal governance between localities is thus driven by differences in the density and strength of social relationships (Ostrom 1990; Mearns 1996; Taylor 1982). If the individuals in a given area have very few social interactions or shared beliefs, we would expect to observe low levels of public goods provision relative to areas that characterized by high levels of social capital and social cohesion (Putnam 1993). Similarly, vertical governance institutions can be said to exist and function when 1) a specialized social role exists that grants an individual or group of individuals authority to monitor social norms, rules, and laws and to punish violations of those rules; and 2) the individuals assigned this authority actively engage in monitoring and enforcement of these rules. Thus, if a community has no designated third-party enforcement institution, or the individual(s) assigned that role don't exercise those responsibilities, we would say that vertical governance does not exist in any meaningful way and would expect high incidence of behaviors that reduce overall social welfare (Englebert 2000a; Bates 2001).

[1] The dynamics of this type of public goods provision in rural China are analyzed in recent work by Lilly Tsai (Tsai 2002, 2007).

The coexistence of functioning horizontal and vertical institutions in a given locality is not sufficient to ensure the joint production of public goods and prevention of public bads; if horizontal and vertical institutions exist in an area, but they are not compatible, public goods problems will persist. For horizontal and vertical governance institutions to be compatible, 1) the content of community-level norms should be closely aligned to the content of the rules and laws that the third-party is attempting to enforce; and 2) the boundaries of the group of individuals engaged in mutual monitoring and enforcement should be congruent with the jurisdiction of the third-party. If horizontal governance institutions exist but diverge from vertical institutions substantively or procedurally, local public goods may be provided on a sporadic and uneven basis, and third-party institutions will exhibit only limited effectiveness with respect to preventing public bads.[2]

One general observable implication of this theory is that public goods availability will be highest when third party enforcement institutions are embedded in localized norms and networks, vis-à-vis other configurations of governance institutions. In particular, areas in which horizontal and vertical governance institutions exist, function, and complement one another will have higher levels of public goods relative to localities in which 1) there are no horizontal or vertical governance institutions; 2) only one type of governance institution exists or is active; or 3) horizontal and vertical institutions exist but differ with respect to content or boundaries, all other things equal.

Embedding Third-Party Enforcement- Evidence from a Field Experiment in Laikipia, Kenya[3]

In order to estimate the causal effect of different mixes of governance institutions on public goods outcomes, I analyze data from a randomized field experiment that I designed and

[2] This set of predictions is consistent with the spirit of sociologically-grounded theories of state capacity which argue that effective public goods maintenance and law enforcement requires that state institutions be embedded in social norms and networks (Granovetter 1985; Evans 1995; Migdal 1988, 2001; Englebert 2000a, 2000b; Englebert 2000c). However, the theory developed here can explain sub-national variation in governance outcomes better than these existing theories of state-society relations. Because the explanation I develop explicitly allows for the possibility that the content and boundaries of horizontal and vertical governance institutions may vary substantially between localities within the same polity, it allows for the possibility of sub-national variation in embeddedness and corresponding variation in the availability of public goods and the effectiveness of political institutions.

[3] This section provides only a brief overview of the setup of the experiment and a snapshot of the empirical results, all of which are examined in greater detail in my dissertation. Chapter 4 has a more detailed overview of the design and implementation of the experiment. Chapter 5 sets up the basic analytic framework, and Chapter 6 focuses on extensions, robustness tests, dynamics, spillover, and treatment heterogeneity.

implemented in the rural parts of Laikipia East, West, and North Districts. The experiment was implemented and managed by the Sanitation Activities Fostering Infrastructure (SAFI) Project, a community-based waste disposal program that I co-founded during the course of my fieldwork in Kenya.[4] The SAFI Project waste management program was rolled out in 18 villages in the Laikipia Region between November 2007 and March 2008.

The community waste-management program involved mass mobilization, education, the provision of public trashcans, and the creation of village-level committees to manage the waste management program. This basic grassroots waste disposal initiative was embedded in three different institutional frameworks in order to capture the differential role of social sanctions and third-party enforcement in motivating contributions to public goods and preventing the creation of public bads. In one treatment, the waste-disposal program was implemented without any explicit mechanism for punishing littering; in two other treatments a law against littering was enforced by either government chiefs alone or a combination of government chiefs and traditional elders. In order to measure the effect of these treatments on public goods outcomes, observational data measuring the level of public waste and the frequency of littering were collected on a weekly basis in all 18 treatment villages as well as in 18 additional control villages that received no waste-disposal program.

The first treatment, the “Civil Society” group, creates a social setting in which horizontal governance institutions are activated through collective action to provide public sanitation, but in which vertical governance institutions are not explicitly activated to maintain this public good. Through the lens of the theory developed above, the mobilization, education, and capacity building components of the SAFI Project Community Waste Management Program can be understood as attempting to activate, strengthen, and forge the kinds of horizontal social linkages that have been hypothesized to motivate public goods provision through common knowledge, coordination, and credible threats of social sanctions. The other theoretically relevant component of this program is that it has no explicit linkage to systems of third party enforcement by either the Provincial

[4] For more information on the SAFI Project, see the project’s website: http://www.safiproject.org

Administration or by customary leaders. If this treatment leads to both significant reductions in the amount of public waste on the ground in villages and reduced littering by residents of that village, the implication is that social sanctions are sufficient to motivate public goods provision and public bads prevention. If the treatment is effective only at reducing public waste, then the indication is that social sanctions alone are not capable of maintaining public goods.

The second treatment creates a situation in which vertical governance institutions are activated to prevent the public bad of littering, but in which these law enforcement institutions are not fully embedded in local networks. To do this, the program coordinators added an explicit rule against littering to the structure of the SAFI Project Community Waste Management Program and recruited agents of the Kenyan state to formally create and enforce that rule. Chapter 128 of the Laws of Kenya makes this treatment possible, by giving government chiefs authority to devise and enforce working rules over issues of local public order, including sanitation and environmental management.[5] At the onset of the program rollout, none of the chiefs in the Laikipia region had exercised their authority to make rules regarding littering. This allowed the research team to create a situation where villages assigned to the "Collective Action" treatment would have a waste disposal program, but no anti-littering rules, whereas villages assigned to the "State Enforcement" treatment would have a waste-disposal program and an anti-littering rule. When introducing this treatment program to the chief in a given village, the implementation coordinator asked that chief to use his authority under the Chief's Act to create and enforce an anti-littering rule. The punishment agreed upon by the implementation team was a day of labor on community projects for the first infraction and a fine of 500 shillings (approximately $3.00) for the second infraction. In addition, chiefs agreed that individuals caught stealing a trashcan would be fined three times the cost of the bin (approximately $30).

[5] The title of chief derives from the colonial practice of indirect rule, when the British used the term designate "traditional" leaders who they authorized to rule over particular "tribes". However, the term has continued to be used to apply to the lowest levels of government administration in the post-colonial Kenyan state, and need not correspond to any kind of indigenous leadership position in the community over which the chief has jurisdiction.

The final treatment group adds third-party enforcement by customary leaders to the waste management program and the anti-littering rules created by chiefs. Villages receiving this treatment have a full waste management program, as in the other two treatment groups, and a rule against littering created by the government chief, as in the "State Enforcement" group. However, this "Elders & State Enforcement" treatment is unique in that elders (*wazee)* from the community or communities surrounding the village have authority to enforce the anti-littering rule and punishments. If this treatment leads to greater reductions in public waste and littering relative to the other treatment groups, this indicates that it is important to supplement state enforcement with governance by community leaders to prevent public bads. If the effect of this treatment is minimal, then explanations that emphasize social sanctions and state enforcement carry more weight.

Like the State Enforcement treatment, this treatment was implemented with the permission and assistance of the local chief. When introducing the Elders & State Enforcement treatment to the chief, the coordinator asked the chief to create an anti-littering rule, and to delegate some of the authority to enforce that rule to the elders in the surrounding community. The coordinator then asked the chief to introduce him to the most important elders in each of the ethnic communities living in the area around the village, and to have them nominate a representative to serve on the village waste disposal committee alongside the representatives of the civil society groups based in the village. The coordinator then interviewed a selection of individuals living in and around the village to confirm that the elders identified by the chief in fact were active in dispute resolution and the enforcement of local norms. In villages in which there was only a single ethnic community, several elders from that community were selected to serve on the village committee. In multi-ethnic villages, one elder from each community was nominated to serve on the committee. In both homogenous and heterogeneous villages, chiefs granted the elders on the trash committee authority to enforce anti-littering rules using the same structure of fines as in the State Enforcement treatment group. In addition, it was agreed that cases that could not be resolved by elders would default back to the chief.

For the purpose of implementing the SAFI Project experiment, the Laikipia region was divided into six regions of six villages each, for a total sample of 36 villages. Three of these regions were located in Laikipia East District, two were in Laikipia West District, and one was located in Laikipia North District. The 36-village sample is not a random sample of all villages in the Laikipia region; villages were included in this sample based on considerations of accessibility, security, and size.[6] From the sample of 36 villages, 6 villages were assigned to each of the three treatment groups, creating a total of 18 treatment villages and 18 control villages. Practical considerations dictated that the project be rolled out over the course of six consecutive two-week periods separated by one week of break, creating a full implementation period of 18 weeks. The practical necessity of implementing the experimental waste management in only one cluster at a time created the opportunity to randomly assign clusters to roll-out periods, while simultaneously assigning villages within clusters to treatment or control groups. Randomly assigning the timing of treatment rollout effectively partitions each treatment village into a "control period" before the implementation and a "treatment period" after the implementation. This experimental design creates the unique opportunity to estimate average treatment effects both between units and over time.

In order to analyze the effect of each of the three institutional arrangements described above on the availability of sanitation and the prevention of littering, the research team devised measures of these two concepts and developed a system to collect and manage the data. The public good of sanitation is measured using techniques originally developed in the field of community waste management (Galli and Corish 1998). The basic strategy of these techniques is to make the estimation of the amount of public waste in a large area feasible by sampling a number of smaller areas and counting all pieces of trash in those smaller areas. For the purpose of this analysis, we selected five 3 x 2 meter plots in each of the 36 villages in the sample. The research team selected plots to try to achieve variation in proximity to shops, roads, and dumping sites. In each village, the project staff trained a high school graduate to count all of the trash in each of the five plots once a

[6] Villages with fewer than three buildings in the central area were excluded, as were towns that supported a densely settled population of over 1000 individuals.

week and to record the number of pieces of plastic waste, food waste, and other kinds of waste in a notebook.

To measure littering behavior, enumerators in each village collected observational data on the waste-disposal decisions of individuals. The project staff trained an enumerator to sit in an inconspicuous but central location in each village and to record what happened each time they saw someone with a piece of trash in his or her hand. For example, if an enumerator saw an individual who had just finished eating a banana, she then watched to see what that person did with it- did he drop it on the ground, did he keep it with him when he left the area, or did he put it in a trash can or pit? The enumerator recorded the result of each "littering opportunity" on a small scrap of paper and then transferred the records to a notebook at her home. Each enumerator was instructed to sit and record observations one hour per week; across all 36 villages, the average number of "littering opportunities" recorded in a given one hour session was around 13. In order to not have the results driven by the fact that some enumerators might observe more "littering opportunities" in a given hour than others, the raw data were transformed to create a measure of the proportion of individuals observed littering, which was calculated by dividing the number of individuals observed dropping a piece of trash on the ground by the total number of littering opportunities, producing a decimal between 0 and 1.

Data collection started 9 weeks before the first set of project implementation, providing information on the baseline rates of littering in all treatment and control villages. Table 1 (below) indicates that the baseline measures of the amount of trash counted and the proportion of individuals observed littering were balanced between the three treatment groups and the control groups. There were some pre-treatment differences in the average number of pieces of trash counted at baseline between the three treatment groups; in particular villages assigned to the Elders & State Enforcement group had on average 5 fewer pieces of trash than villages assigned to the State Enforcement group. However, regressing average amounts of trash at baseline on assignment to treatment did not reveal any statistically significant effect of assignment to treatment groups on pre-

treatment levels of public waste. The same was also the case for the baseline measure of the proportion of individuals observed littering.

	Collective Action Treatment	State Enforcement Treatment	Elders & State Enforcement Treatment	Control
Trash Count- Baseline Mean	22.628	25.667	20.502	24.770
Effect of Treatment Assignment	-2.142	.897	-4.268	
t- Statistic	-0.31	0.18	-0.92	
Proportion Littering- Baseline Mean	0.8769	0.8674	0.8935	.8890
Effect of Treatment Assignment	-.0121	-.0217	.0045	
t-Statistic	-0.62	-1.20	0.12	

Table 1. Baseline Village-Level Trash Count and Littering Rates Across Treatment Groups

One way to analyze the time dimension of the experimental data while avoiding some of the pitfalls associated with the analysis of cross-sectional time-series data is to divide the each village time series into four periods, one “before- treatment” period and three “after-treatment” periods. As there are 39 weeks of post-treatment data for each of the villages in the sample, it is possible to collapse the post-treatment time-series into three 13 week period periods: “After 1” (0 to 12 weeks after treatment implementation); “After 2” (13 to 25 weeks after treatment implementation), and “After 3” (26 to 38 weeks after treatment implementation). “Before” is coded as all weeks before the implementation of the waste management program.

Although splitting the after treatment period into three groups produces a slightly cluttered boxplot, it is possible to draw several tentative conclusions from this graph (Figure 1). Overall, there is relatively little discernible movement in the level of public waste over time in the control group. In contrast, both the Elders and State treatment groups exhibit very similar time-series patterns (although the state enforcement group appears to have more “very dirty” villages at baseline). In particular, in both groups, there is a large immediate effect of the waste management program,

which appears to persist across all three post-treatment periods. In addition, the variability of both of these groups decreases over time; by the third period (26 to 38 weeks after the roll-out of the program), none of the treatment villages are even close to pre-treatment levels for that group.

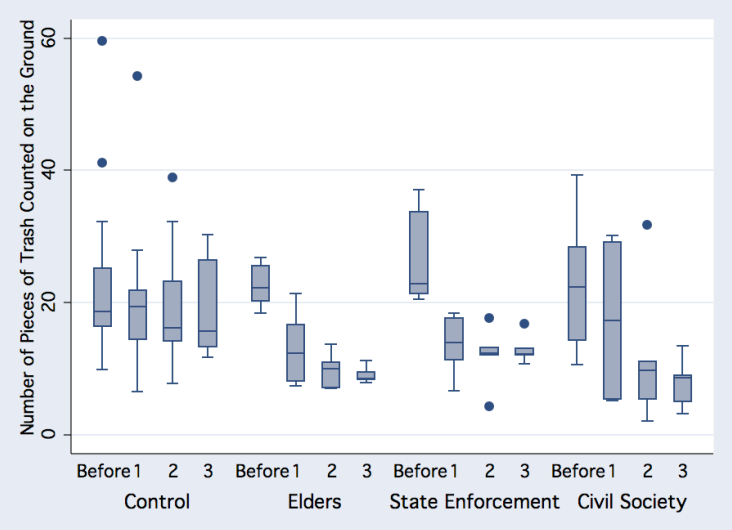

Figure 1. Average Number of Pieces of Trash Counted on Ground,
1 Before Treatment Period and 3 After Treatment Periods
Control and Three Treatment Groups

In the Civil Society treatment group, the over-time changes follow a pattern that appears to be distinct from both the control group and the two treatment groups in which littering behavior is punished. What this graph indicates is that in the villages in which there is mobilization without punishment, there is not a major change in the level of trash on the ground in the first three months following implementation, but that by the latter two periods, the amount of trash counted on the ground has decreased substantially.

The regression analysis and the associated tests of coefficients put these results in starker relief (Table 2). The model utilized here includes three different sets of dummy variables: time period dummy variables for each of the three post-treatment periods (with the pre-treatment period serving as the reference group), treatment group assignment dummies for the elders, state, and civil society groups (with the control group serving as the reference category), and the interaction of time period and treatment group (coded 1 if an observation took place in a given treatment group and period and 0 otherwise). The primary coefficients of interest are the treatment group-time period

interactions, which can be interpreted as the reduction in the amount of trash on the ground associated with having a given treatment group in a given period vis-à-vis the baseline level of trash in the control group. In this model, four treatment group-time period interactions are statistically significant: the elders treatment group in the second period (13 to 25 weeks after treatment), the state treatment group in the first and second periods (the treatment rollout week to 25 weeks after treatment), and the civil society group in the third period (26 to 38 weeks after treatment).

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Source |       SS       df       MS              Number of obs =     137
-------------+------------------------------           F( 15,   121) =    3.23
       Model |  3336.49895    15  222.433264           Prob > F      =  0.0002
    Residual |  8337.23672   121  68.9027828           R-squared     =  0.2858
-------------+------------------------------           Adj R-squared =  0.1973
       Total |  11673.7357   136  85.8362917           Root MSE      =  8.3008

------------------------------------------------------------------------------
  trashcount |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      after1 |    -2.3034   2.766923    -0.83   0.407    -7.781254    3.174455
      after2 |  -3.179489   2.807319    -1.13   0.260    -8.737316    2.378339
      after3 |  -4.132088   2.901974    -1.42   0.157     -9.87731    1.613135
      elders |    .038448   3.913021     0.01   0.992    -7.708408    7.785304
elders_aft~1 |  -7.254693   5.533847    -1.31   0.192     -18.2104    3.701016
elders_aft~2 |  -9.599956   5.554154    -1.73   0.086    -20.59587    1.395958
elders_aft~3 |  -9.337182   5.803947    -1.61   0.110    -20.82763    2.153262
       state |   3.847972   3.913021     0.98   0.327    -3.898885    11.59483
state_after1 |  -10.43199   5.533847    -1.89   0.062     -21.3877     .523717
state_after2 |  -11.24591   5.554154    -2.02   0.045    -22.24182   -.2499945
state_after3 |  -9.287364   5.803947    -1.60   0.112    -20.77781    2.203081
       civil |   .3564372   3.913021     0.09   0.928    -7.390419    8.103293
civil_after1 |  -3.173961   5.533847    -0.57   0.567    -14.12967    7.781748
civil_after2 |  -8.068659   5.554154    -1.45   0.149    -19.06457    2.927254
civil_after3 |  -10.90437   5.803947    -1.88   0.063    -22.39482    .5860697
       _cons |   22.54568    1.95651    11.52   0.000     18.67225    26.41911
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Table 2. Regression Model, Trash Count Measure, 4 Time Periods, Control and Three Treatment Groups

When considering the full post-treatment effect (the coefficient of the treatment-period interaction plus the appropriate period dummy) and the total treatment effect (the post-treatment effect plus the appropriate treatment group dummy), most of these differences between treatment groups disappear. Although none of the period effects or treatment group assignments are significant on their own, incorporating them into the estimate of the size of the treatment effect increases the number of time-period specific treatment effects that are statistically significant. When adding the coefficients of each of these other dummy variables to the interaction term, all three treatment groups have a significant effect in all three periods, with the exception of the civil society

group in the first post-treatment period. What this means is that regardless of the point of reference, the effect of the civil society treatment group in the first post-treatment period is not significantly different from zero.

This fits with the general intuition that can be gleaned from looking at the boxplot; the civil society group only leads to significant reductions in the level of public waste gradually, whereas the two treatment groups that have some institutional mechanism for punishing littering behavior lead to immediate reduction in the level of public waste. However, this over-time difference in the effect of the civil society treatment does not hold up when comparing the size the of each period's coefficient between periods. Specifically, we cannot reject the null hypothesis that the civil society group leads to an identical reduction in public waste in the first post-treatment period as in the second and third periods. This is also the case for the other two treatment groups and the control groups- although the box plots and regression coefficients indicate that there may be movement over time in amount of trash on the ground within each group, none of these apparent time trends are statistically significant. The general conclusions that can be drawn from these regression results and post-estimation tests are thus somewhat mixed. The lack of a significant effect of the civil society group in the first period, coupled with the significance of the rest of the treatment group-period effects indicates that different causal mechanisms may drive the provision of public sanitation in this group compared with the other groups, even though many of the differences between time periods and treatment groups are not themselves statistically significant

Using the measure of littering behavior as the dependent variable in the four-period, four-group analyses allows for even stronger inferences about differences between the elders, state, and civil society treatment groups than were possible with the trash count measure. As with the trash count measure, graphing the box plot of the control group and three treatment groups disaggregated into one pre-treatment period and three post-treatment periods indicates that there may be differences between treatment groups. In particular, it is possible to discern three distinct patterns in the change of littering behavior over time. First, in the elders and civil society groups, there is a large initial drop off in littering behavior, which is maintained over time. In contrast, villages in the

state enforcement group appear to experience an initial treatment effect of a similar magnitude that is maintained for around 6 months, but by the third period (26 to 38 weeks after treatment), littering rates have increased again. Finally, the level of littering behavior in the treatment group does not remain constant over time, but rather decreases across all four periods. Thus, it appears that even in villages in the sample where there is no waste management program, littering behavior is becoming consistently less prevalent over time.

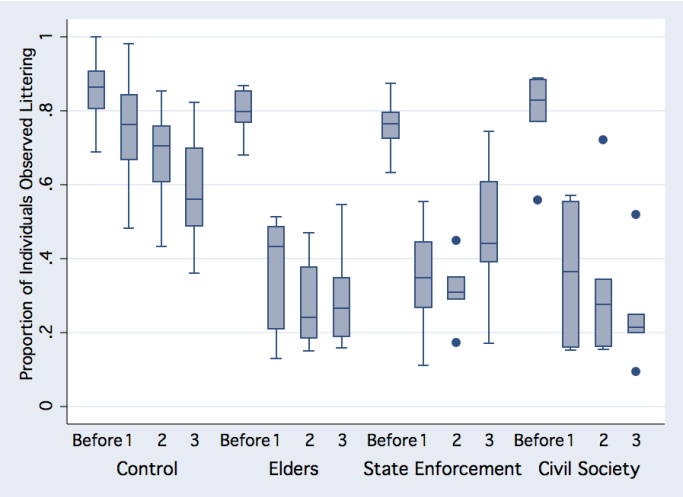

Figure 2. Proportion of Individuals Observed Littering,
1 Before Treatment Period and 3 After Treatment Periods
Control and Three Treatment Groups

In contrast to the analysis of the trash count measure, the inferences that can be drawn from the analysis of the box plot patterns are more strongly borne out by the regression analysis and the post-estimation tests of various combinations of the coefficients. As in the prior model, the littering behavior measure is regressed on dummies for time period, treatment group assignment, and treatment group implementation (the interaction of period and group assignment). In this model, all of the coefficients of the interaction term are statistically significant, save for one exception- the third period in the group in which anti-littering laws are enforced by the state (Table 3). In the first two periods after the roll-out of the waste management program, littering rates in villages that had received the state treatment group were 37 and 21 percentage points lower than the baseline rates (plus or minus 17 percentage points). In the third period, littering rates in this treatment group were

only 1.5 percentage points lower than the baseline, an effect size that is not statistically distinguishable from zero.

```
Source |       SS       df       MS              Number of obs =     138
-------------+------------------------------           F( 15,   122) =   24.09
       Model |  6.07732321    15  .405154881           Prob > F      =  0.0000
    Residual |  2.05201017   122  .016819755           R-squared     =  0.7476
-------------+------------------------------           Adj R-squared =  0.7165
       Total |  8.12933338   137    .0593382           Root MSE      =  .12969

------------------------------------------------------------------------------
proportion~2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      after1 |  -.1010709   .0432303    -2.34   0.021    -.1866497   -.0154922
      after2 |  -.1698943   .0432303    -3.93   0.000    -.2554731   -.0843156
      after3 |  -.2732418   .0453404    -6.03   0.000    -.3629976    -.183486
      elders |  -.0612223   .0611369    -1.00   0.319    -.1822489    .0598044
elders_aft~1 |  -.3258943   .0864607    -3.77   0.000    -.4970518   -.1547367
elders_aft~2 |    -.34672   .0864607    -4.01   0.000    -.5178776   -.1755625
elders_aft~3 |  -.2190413   .0906807    -2.42   0.017    -.3985529   -.0395298
       state |  -.0960469   .0611369    -1.57   0.119    -.2170735    .0249798
state_after1 |  -.3125026   .0864607    -3.61   0.000    -.4836601   -.1413451
state_after2 |  -.2762546   .0864607    -3.20   0.002    -.4474122   -.1050971
state_after3 |  -.0151398   .0906807    -0.17   0.868    -.1946513    .1643718
       civil |  -.0620764   .0611369    -1.02   0.312    -.1831031    .0589502
civil_after1 |  -.3312174   .0864607    -3.83   0.000    -.5023749   -.1600598
civil_after2 |   -.300498   .0864607    -3.48   0.001    -.4716555   -.1293404
civil_after3 |  -.2644322   .0906807    -2.92   0.004    -.4439437   -.0849207
       _cons |   .8549551   .0305685    27.97   0.000     .7944418    .9154684
```

Table 3. Regression Model, Proportion Littering Measure, 4 Time Periods, Control and Three Treatment Groups

Comparing the size of the coefficients for each of these three periods indicates that there is a statistically significant reduction in the size of the treatment effect over time. Although the increase in littering rates from the first-to second post-treatment periods is not statistically significant, the difference between the third period and both of the prior periods is significant. Comparing the third-period effect in the state enforcement group to the size of the treatment effect for the same period in the other two groups is also informative. In contrast to the negligible effect of the state enforcement group in this period, littering behavior in the elders and civil society groups are substantially lower than the baseline rates (by 21 and 26 percentage points, respectively), and the difference between the third period effects in these two groups and the state enforcement group is statistically significant. Taken together, this set of tests of the period-specific treatment effects indicate that there are significant differences between the state enforcement group and the other treatment groups in the long-term effect of treatment implementation on littering behavior. Whereas the elders

and civil society versions of the waste management program cause a large immediate treatment effect that is sustained over time, the duration of the effect of the state enforcement group is short-lived, essentially returning to zero by approximately 6 months after treatment.

In contrast to the analysis that used trash count as the dependent variable, the coefficients of all three time period dummy variables are statistically significant in the littering behavior models. The statistical significance of these three dummy variables indicates that independent of the effect of treatment group implementation; littering rates are lower for the entire post-treatment period, vis-à-vis the pretreatment period. In addition, testing the hypothesis that the size of the time period effect is the same across all three post-treatment periods indicates that although the decrease in individuals littering in the control group from the first to second periods is not statistically significant, the difference between littering rates between the second and third periods and the first and third periods is statistically significant. The joint interpretation of these results is that even independent of any effect of the implementation of the SAFI Project waste management program, littering rates dropped significantly in the first post-implementation period and continued to decrease over the following seven months.

The significance of the effects of the time period dummies and the increasing size of these effects over time raises the concern that it may be impossible to disentangle the effect of period-specific treatment effects from the general trend of decreased littering behavior over the period of time in this study. Testing the differences between the size of the time-period effects and the period-specific treatment effects indicates that although the size of the first period treatment effect in all three groups is significantly larger than the time-period effect, it is impossible to reject the hypothesis that the time period effects are equal to the second period effects for all three groups and the third period effects for the elders and civil society groups. Although this test indicates that it is impossible to distinguish the difference between the period effects and the treatment effects in the third period, the same test actually indicates that the size of the third-period treatment effect in the state enforcement group is less than the size of the same effect in the control group. In this interpretation, any tendency for villages in the state group to have lower than baseline littering rates is due more to

large scale changes in littering behavior in the study area over time rather than in the implementation of the state enforcement program.

The results of the four-period four-group analysis of the proportion littering measure are the most clear, consistent, and statistically significant difference between the three randomly assigned variations of the waste management program. From a methodological point of view, this finding clearly demonstrates the analytic leverage provided by partitioning the post-treatment observations into three periods. Although a simple before-after analysis reveals the existence of large and statistically significant effects across all three groups, the difference in average littering rates between the state enforcement group and the other two groups is not statistically distinguishable from zero when the littering behavior data for each village is only partitioned into to periods. In contrast, the results of the four-period regression analysis indicate that although the differences in average post-treatment littering frequency are not statistically significant, there are differences in the ability of each of the three treatment groups to induce long-term behavioral change. In particular, the bulk of the statistical evidence supports the conclusion that while all three of the treatment groups lead to a reduction in littering behavior in the short-term, this effect is only sustained over the long term in the elders and civil society treatment groups. By 38 weeks after the implementation of the waste management program, any discernable effect of treatment on littering behavior has disappeared in villages that received the state-enforcement version of the treatment group.

Discussion

At first glance, the insignificance of the long-term effect of the state enforcement group on littering behavior supports the central theoretical intuition of the theory of embedded enforcement developed above, that the prevention of public bads requires that third party enforcement be embedded in local norms and networks. However, this theory also predicted that the elders enforcement group would outperform the civil society group over time. This prediction was not borne out-- the effect of the civil society group is statistically significant in all three periods and is identical to the size of the effect of the elders group in all three periods.

Not only does this finding not fit with the implications of the locally embedded enforcement theory; the fact that both and only the elders and civil society groups significantly reduce littering behavior is logically puzzling. That is, given the way that the treatment groups were designed, it is unclear exactly what type of social scientific theory would be consistent with these findings. As detailed above, the structure of the treatment groups was that each group added one component to the general program. That is, the State Enforcement group added enforcement of a local anti-littering law to the set of mobilization, education, infrastructure, and capacity-building activities in the civil society group, and the elders treatment group took the full set-up of the state enforcement group and added the participation of traditional community leaders in the operation of the waste management program and the punishment of littering behavior.

If the analysis had shown that the Elders and State enforcement groups had an enduring, significant effect on the prevention of littering behavior, while the effect of the Civil Society group dissipated in a short period of time, the implication would be that some kind of third party enforcement is necessary to prevent social behavior that produces negative externalities. Similarly, if only the Civil Society group had been significant, we would be led to believe that only collective action and mass mobilization are sufficient to ensure the reduction of harmful social behavior and that any kind of more formalized legislation and enforcement of rules regarding this kind of small-scale “public bad” is actually counterproductive. Given the incremental nature of differences between the treatment groups, the starkly discontinuous nature of the differences between the effect of each treatment on littering behavior over time is puzzling.

One way to explain this puzzling set of results is by looking more closely at effect of the civil society group on littering behavior alongside the changes over time in the trash count measure in that that treatment group. In the first period following implementation, implementation of the civil society group leads to a statistically significant reduction in littering behavior, but not in the amount of trash on the ground. What this indicates is that although the simple set of implementation activities appears to be sufficient to cause a large number of individuals to coordinate on a new waste disposal equilibrium, this type of civil-society led implementation is actually less effective than the

groups that incorporate government chiefs or local elders at motivating a successful initial clean-up. However, over the medium and long-term, the level of public waste in civil society villages is ratcheted down to a level comparable to the other two treatment groups. What appears to be the case is that although the initial mobilization in these villages was lackluster, the civil society groups that were tapped to manage the waste management program actually took ownership over the project, continuing to stage regular clean-ups and empty the public trash cans. This localized provision of sanitation services by community groups appears to have had a positive feedback effect on littering behavior- effective public goods provision over time appears to have led actually lead to the creation of an informal social norm against littering, which in turn helped to maintain public sanitation over time.

If this explanation for the long-term effectiveness of the civil society treatment is correct, it also helps to explain why the civil society group was more effective than the state enforcement group in preventing littering behavior. Because the distinctive element of the state enforcement group is simply the punishment of littering behavior by agents of the central government, it is possible that common knowledge that the government is punishing littering in a given community may lead to less active engagement by civil society groups, as they start to see waste management as the government's role rather than their own responsibility. Thus in the state enforcement group, the existence of state punishment essentially crowds out the endogenous "ratcheting down" of littering behavior and the associated creation of anti-litter norms that is induced by civil society mobilization without punishment. At the same time, the increase in littering rates in the long run in this group indicates that punishment alone is insufficient to motivate behavior change over the long run- perhaps the structure of punishment is not sufficiently deterrent, or individuals discover that enforcement is uneven, meaning that they can get away with littering, leading to an increase in the behavior over the long-run.

In contrast to the state enforcement group, the system of monitoring and enforcement in the elders treatment group is linked to traditional networks of exchange and governance in local communities. Whereas the state enforcement group undermined the endogenous creation of anti-

littering norms without offering an alternative focal point for making the anti-littering law locally legitimate, villages in the elders group were able to avoid this negative outcome by linking the system of littering punishment to an existing system of local governance. Viewed in this light, the theoretical underpinnings of both the civil society and elders groups are actually more similar than they were originally conceptualized in that they predict that the maintenance of public goods relies on some kind of social engagement, either in terms of collective action or systems of monitoring enforcement that are embedded in local norms and networks. Moreover, this set of analyses of the effect of treatment on littering behavior indicates that the operative element driving sustainable behavior change over time is not punishment, but rather is the relationship between the set of institutions designed to provide maintain a public good and the social organization of the community that benefits from that public good.

The differences between the results of the trash count and littering behavior analyses are a second puzzling aspect of these findings. Even though the four-period analysis of the effect of treatment group implementation on littering behavior provides strong evidence that enforcement of an anti-littering law by government agents alone is not effective in preventing littering in the long-run, this finding does not necessarily sit easily with the findings of the trash-count analysis. In particular, the four-period analysis of the littering behavior measure indicates that littering rates are significantly higher in the third period of the state enforcement group, but there is no similar significant change in the trash count measure in that period. Similarly, villages in the civil society treatment group experienced a statistically significant reduction in littering behavior in the first period after treatment, but the concurrent reduction in public waste was not statistically distinguishable from zero.

There are two possible ways to interpret the differences between the findings for the trash count measure and the proportion littering behavior. One explanation is that because the measurement of littering behavior measure is much less variable than the trash count measure, the estimates of the effect of each of the three treatments on littering behavior are more precise. As a result, the differences in public waste levels across periods and treatment groups follow the same patterns as the littering behavior measure, but simply have larger standard errors. If this is the case,

then the slight increase in the amount of trash on the ground in the state enforcement group in the third period may be a result of the same causal process, but the measure is simply too noisy to have confidence in this finding.

The alternative explanation is that the difference in the over-time treatment effects between the two outcome measures actually reveals that these two indicators capture two distinct types of processes-- the provision of a public public good and the prevention of a public bad—and that the different institutional arrangements embedded in the three treatment groups actually effect each of these types of outcomes in different ways. Comparing the R^2 statistics between the regression models for these two different variables supports this interpretation-it appears to be the case that although treatment group implementation and time period effects explain most of the variation in littering behavior over space and time, the same set of independent variables does a much poorer job of explaining sanitation outcomes. There are two interpretations of this difference (which are not mutually exclusive)- on one hand, punishment regimes have a strong and direct effect on the likelihood that individuals will litter, but littering behavior may only weakly drive public waste outcomes; on the other hand, the specific institutional backbone of a community-based public waste program may only have a weak direct effect on how dirty a village is.

Although the differences in treatment programs do have some effect on public waste outcomes, these results indicate that the dynamics of waste accumulation and dispersion is in fact a complex process, and institutional rules governing littering behavior are just one piece of the puzzle. If this is the case, the relationship between public waste and littering behavior is not as straightforward as was originally assumed in the design of the experiment. The initial linkage of the experiment to the broader research program on institutions and the maintenance of public goods was premised on the assumption that it is necessary to prevent the production public bads, such as litter, in order to maintain the availability a public good over time, and also that the reduction of harmful behavior is sufficient to ensure the maintenance of a public good over time.

What the disjuncture between the results of the two dependent variables may indicate is that this assumption is off base on both accounts. In the first period, villages in the civil society group

experienced a large and significant decline in littering behavior, but no noticeable reduction in the amount of trash on the ground, indicating that at least in some circumstances, reductions in littering behavior do not necessarily lead to reductions in public waste. Conversely, in the state enforcement group, the upswing in littering rates in the third period does not lead to a equally large and statistically significant increase in the amount of trash on the ground. If this is not due to the lack of precision of the regression estimator, it means that increased littering behavior apparently actually has a weak direct effect on how dirty a village center actually is.

One way to get more leverage over these possibly contradictory sets of results is to monitor the movement of the trash count measure over the next several post-treatment periods. If adding observations from the next 13 weeks of data collection to the analysis shows that levels of public waste increase significantly in the period following the initial uptick in littering behavior, this both supports the initial intuition and helps to highlight the precise causal pathway through which institutions have an effect on sanitation outcomes—effective interventions reduce littering behavior, which in turn reduce public waste, thus when institutions stop working <become less credible> and increase in littering leads to an increase in public waste. However, if levels of public waste remain low in spite of a return to pre-treatment levels of littering, then are grounds to start rethinking the nature of the causal relationship between littering and public waste.

Conclusion

To summarize, there are three sets of empirical findings from this analysis of data from the SAFI Project field experiment that can be linked back to the theoretical framework developed in this paper. First, the empirical results provide strong evidence that mobilizing collective action is indeed one of the major hurdles facing the provision of public goods such as sanitation in rural regions of Africa, such as Laikipia. The level of cleanliness in villages that received any version of the SAFI Project vis-à-vis control villages demonstrates that grassroots efforts have an important role to play in overcoming public goods problems. Moreover, the durability of the effect of the civil society group on public waste and littering behavior indicates that it may be possible to provide and maintain public goods without any formal system of enforcement or punishment. Second, the results suggest that

active vertical governance institutions may play an unexpected role in motivating the provision of local public goods. In particular, the statistical results indicate that enforcement by either state officials or customary leaders causes a rapid movement to a "clean equilibrium," whereas civil society mobilization without third party enforcement leads to a more gradual reduction in levels of public waste. Third, there is tentative evidence that the incorporation of local elders enhances the effectiveness of state law enforcement efforts; villages in which elders help to enforce the anti-littering rules created by chiefs experienced larger and more durable reductions in the proportion of individuals observed littering than in villages in which the anti-littering law was enforced by government chiefs alone.

These three sets of findings fit with a number of larger research programs within the social sciences. Although the empirical analysis presented here focuses on two particular types of third-party enforcers, the central theoretical underpinnings of this argument can apply to governance by any number of different types of actors and organizations. Existing research and anecdotal evidence from a diverse array of empirical settings indicates the broad applicability of this theoretical framework. Ethnographic work on the organizational structure of urban drug gangs and other types of criminal organizations indicates that these organizations act as third-party governance institutions, but that they are able to do so in large part due to their intimate relationship with local networks of exchange (Gambetta 1993; Venkatesh 2006, 2008). Similarly, research from civil war settings indicates that armed groups frequently act as replacements to the state, and that their long-term military success may in some circumstances depend on their ability to embed themselves in local communities better than the central government (Wood 2003; Weinstein 2007; Kalyvas 2006). The analytic and theoretical perspective developed in this dissertation thus provides a framework for explaining patterns of public goods availability and law enforcement outcomes within and between contexts as different as nomadic pastoralist communities in Africa, urban housing projects in developed countries, and irregular civil wars and failed states around the world.

Viewing the results of this public sanitation experiment in the context of broader research on social and political institutions reveals that while third party enforcement is indeed important

for preventing public bads and maintaining public goods, it is even more important that public goods projects are embedded to some extent in locally relevant governance institutions. The implication of this finding is that even where governments expand law enforcement institutions into peripheral areas, they must either invest in legitimating their presence in those communities or must work closely with grassroots organizations and local systems of third party enforcement.

Working Bibliography

Agrawal, A. 2001. "State formation in community spaces? Decentralization of control over forests in the Kumaon Himalaya, India." *Journal of Asian Studies* 60 (1):9-40.

Barnard, Chester Irving. 1938. *The functions of the executive*. Cambridge, Mass.,: Harvard University Press.

Bates, Robert H. 2001. *Prosperity and violence : the political economy of development*. 1st ed. New York: Norton.

Beck, N., and J. N. Katz. 1995. "What to do (and not to do) with time-series cross-section data." *American Political Science Review* 89 (3):634-47.

Bertrand, M., E. Duflo, and S. Mullainathan. 2004. "How Much Should We Trust Differences-in-Differences Estimates?." *Quarterly Journal of Economics* 119 (1):249-75.

Blau, P. M. 1963. "Critical Remarks on Weber's Theory of Authority." *American Political Science Review* 57 (2):305-16.

Boone, Catherine. 2003. *Political topographies of the African state : territorial authority and institutional choice*. Cambridge, U.K. ; New York: Cambridge University Press.

Coleman, J. S. 1988. "Social Capital in the Creation of Human Capital." *American Journal of Sociology* 94 (S1):95.

Cronk, L. 2004. *From Mukogodo To Maasai: Ethnicity And Cultural Change In Kenya*: Westview Press.

Duflo, E., R. Glennerster, and M. Kremer. 2006. "Using Ramdomization in Development Economics Research: A Tool Kit." *NBER Working Paper*.

Ekeh, P. 1975. "Colonialism and the Two Publics in Africa." *Comparative Studies in Society and History* 17 (1):91-112.

Englebert, P. 2000a. "Pre-Colonial Institutions, Post-Colonial States, and Economic Development in Tropical Africa." *Political Research Quarterly* 53 (1):7.

———. 2000b. "Solving the Mystery of the AFRICA Dummy." *World Development* 28 (10):1821-35.

Englebert, Pierre. 2000c. *State legitimacy and development in Africa*. Boulder, CO: Lynne Rienner Publishers.

Evans, P. 1995. *Embedded Autonomy: States & Industrial Transformation*: Princeton University Press Princeton, NJ, USA.

Galli, John, and Kathy Corish. 1998. "Anacostia Stream Trash Surveying Methodology and Indexing System." ed. M. W. C. o. G. Department of Environmental Programs. Washington, DC.

Gambetta, Diego. 1993. *The Sicilian Mafia : the business of private protection*. Cambridge, Mass.: Harvard University Press.

Granovetter, M. 1985. "Economic Action and Social Structure: The Problem of Embeddedness." *American Journal of Sociology* 91 (3):481.

Green, D. P., S. Y. H. Kim, and D. Yoon. 2003. "Dirty Pool." *International Organization* 55 (02):441-68.

Habyarimana, J., M. Humphreys, D. N. Posner, and J. M. Weinstein. 2007. "Why Does Ethnic Diversity Undermine Public Goods Provision?" *American Political Science Review* 101 (04):709-25.

Hardin, Russell. 1982. *Collective action*. Baltimore: Published for Resources for the Future by the Johns Hopkins University Press.

Herbst, Jeffrey Ira. 2000. *States and power in Africa : comparative lessons in authority and control*. Princeton, N.J.: Princeton University Press.

Hodgson, Dorothy Louise. 2001. *Once intrepid warriors : gender, ethnicity, and the cultural politics of Maasai development*. Bloomington: Indiana University Press.

Jackson, R. H., and C. G. Rosberg. 1982. "Why Africa's Weak States Persist: The Empirical and the Juridical in Statehood." *World Politics* 35 (1):1-24.

———. 1986. "Sovereignty and Underdevelopment: Juridical Statehood in the African Crisis." *Journal of Modern African Studies* 24 (1):1-31.

Janowitz, M. 1975. "Sociological Theory and Social Control." *American Journal of Sociology* 81 (1):82.

Kalyvas, Stathis N. 2006. *The logic of violence in civil war*. 1 vols. Cambridge ; New York: Cambridge University Press.

Lesorogol, C. K. 2003. "Transforming Institutions among Pastoralists: Inequality and Land Privatization." *American Anthropologist* 105 (3):531-41.

———. 2005. "Experiments and Ethnography: Combining Methods for Better Understanding of Behavior and Change 1." *Current Anthropology* 46 (1):129-36.

Levi, Margaret. 1988. *Of rule and revenue*. Berkeley: University of California Press.

Mamdani, Mahmood. 1996. *Citizen and subject: contemporary Africa and the legacy of late colonialism*. KampalaCape TownLondon: Fountain Publishers ;David Philip ;James Currey.

Mearns, R. 1996. "Community, collective action and common grazing: The case of post-socialist Mongolia." *Journal of Development Studies* 32 (3):297-339.

Migdal, Joel S. 1988. *Strong societies and weak states : state-society relations and state capabilities in the Third world*. Princeton (N.J.): Princeton university press.

———. 2001. *State in society: studying how states and societies transform and constitute one another*. Cambridge ; New York: Cambridge University Press.

Miguel, E. 2004. "Tribe or Nation? Nation Building and Public Goods in Kenya versus Tanzania." *WORLD POLITICS* 56 (3):327-62.

Miguel, E., and M. K. Gugerty. 2005. "Ethnic diversity, social sanctions, and public goods in Kenya." *Journal of Public Economics* 89 (11-12):2325-68.

North, Douglass Cecil. 1981. *Structure and change in economic history*. 1st ed. New York: Norton.

———. 1990. *Institutions, institutional change, and economic performance*. Cambridge ; New York: Cambridge University Press.

Ostrom, Elinor. 1990. *Governing the commons: the evolution of institutions for collective action*. Cambridge [England] ; New York: Cambridge University Press.

Putnam, Robert D. 1993. *Making democracy work: civic traditions in modern Italy*. Princeton, N.J: Princeton University Press.

Sheely, Ryan. 2008. State Authority, Community Governance, and Public Goods in Rural Africa, Department of Political Science, Yale University, New Haven, CT.

Spruyt, Hendrik. 1994. *The sovereign State and its competitors : an analysis of systems change*. Princeton (N.J.): Princeton university press.

Sweet, A. S. 1999. "Judicialization and the Construction of Governance." *Comparative Political Studies* 32 (2):147.

Taylor, Michael. 1982. *Community, anarchy, and liberty*. Cambridge [Cambridgeshire] ; New York: Cambridge University Press.

Tilly, Charles. 1992. *Coercion, capital, and European states, AD 990-1992*. Cambridge, MA: Blackwell.

Tsai, L. L. 2002. "Cadres, Temple and Lineage Institutions, and Governance in Rural China." *The China Journal* 48 (2):1-27.

———. 2007. "Solidary Groups, Informal Accountability, and Local Public Goods Provision in Rural China." *American Political Science Review* 101 (02):355-72.

Venkatesh, Sudhir Alladi. 2006. *Off the books : the underground economy of the urban poor*. Cambridge, Mass.: Harvard University Press.

———. 2008. *Gang leader for a day : a rogue sociologist takes to the streets*. New York: Penguin Press.

Wantchekon, L. 2003. "Clientelism and Voting Behavior." *World Politics* 55:399-422.

Weinstein, Jeremy M. 2007. *Inside rebellion : the politics of insurgent violence*. Cambridge ; New York: Cambridge University Press.

Wilson, S. E., and D. M. Butler. 2007. "A Lot More to Do: The Sensitivity of Time-Series Cross-Section Analyses to Simple Alternative Specifications." *Political Analysis*.

Wood, Elisabeth Jean. 2003. *Insurgent collective action and civil war in El Salvador*. New York: Cambridge University Press.

Wooldridge, Jeffrey M. 2002. *Econometric analysis of cross section and panel data*. Cambridge, Mass.: MIT Press.

World Bank, The. 2007. *Kenya Poverty Statistics by Division* [cited March 1 2007]. Available from siteresources.worldbank.org/INTPOVRES/Resources/477227-1103229847256/ch5.4.6.pdf.