Deliberative Democracy and the Resource Curse: A Nationwide Experiment in Tanzania

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Abstract

Oil and gas discoveries in developing countries are often associated with short-sighted economic policies and, in response, calls to insulate resource management from populist impulses. We report on a randomized experiment testing methods to overcome this apparent tension between sound resource governance and democratic politics. Soon after Tanzania's discovery of major natural gas reserves, we invited a nationally representative sample of voters to an intensive public deliberation of policy options featuring nationally recognized experts and small-group discussions. Democratic deliberation reinforced the public's strong preference for rapid spending of gas revenues, but also increased support for various prudential and economically orthodox measures, including independent oversight of gas revenues, limits on government borrowing, and selling gas abroad rather than subsidizing fuel at home. These effects were driven by deliberation per se, rather than a pure information treatment, and show no evidence of contamination by facilitator- or peer-effects in group deliberations.



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The data used in this paper is available here: <u>https://www.cgdev.org/sites/default/files/Sandefur-et-al-dem-gas-replication-files.zip</u>. More information on CGD's research data and code disclosure policy can be found here: <u>www.cgdev.org/page/research-data-and-code-disclosure</u>.

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1 Introduction

The concept of deliberative democracy stresses the value of informed citizens collectively and publicly weighing diverse arguments on their merits [Bessette, 1980, Fishkin, 1991, Gutmann and Thompson, 1996]. To its proponents, this process of deliberation holds both epistemic value in revealing informed public opinion [Nino, 1996] and, in some conceptions, constitutes a necessary component of democratic legitimacy [Cohen, 1997].

This study seeks to test mechanisms to enact this ideal of deliberative democracy in a particularly challenging setting, i.e., a low-income country in the midst of a resource boom. In 2010, Tanzania discovered natural gas reserves off its southern coast which, at the time of our experiment, were valued at roughly fifteen times the country's GDP [Baunsgaard, April 11, 2014], raising a host of questions about the extraction, refinement, export, management, and allocation of resource revenues.

Oil and gas discoveries are commonly associated with increased authoritarianism, deteriorating governance, and slow growth [Gelb, 1988, Van der Ploeg, 2011, Ross, 2013]. Some scholars have gone so far as to argue that electoral democracy is not just a victim but a culprit in this story, exacerbating the 'resource curse' through populism and clientelism [Collier and Hoeffler, April 2009, Gyimah-Boadi and Prempeh, 2012]. Measures promoted by the IMF and other international organizations to protect resource revenues from 'political influence' – such as sovereign wealth funds and policy rules [Poplawski Ribeiro et al., 2012, IWG, 2008] – reflect this perceived tension between sound resource governance and democratic politics.

Is this aversion to democratic participation in resource-rich developing countries warranted on economic grounds? We report on a two-day, nationally-representative deliberative process and a longitudinal survey of 2,000 voting-age adults to examine how ordinary Tanzanians wanted to use the revenue windfall generated by the country's recent natural gas discovery. This deliberative exercise is couched within an experimental design that allows us to measure its overall impact on public opinion, and to begin to disentangle the role of receiving additional information from collective deliberation *per se*.

The overriding policy failure identified in the early literature on oil and gas booms in developing countries was overly rapid and unsustainable fiscal expansion [Gelb, 1988]. On this substantive question of whether deliberation moderates public pressure toward policy choices that may contribute to profligate spending and a broader 'resource curse', our results are mixed. We find that public opinion strongly supports spending rather than saving Tanzania's resource windfall, and a preferrence for recurrent expenditures in health and education rather than physical infrastructure. These preferences appear not to stem from a lack of information or failure to consider the implications of policy choices. Information treatments and two days of intensive deliberation either leave these preferences unchanged or reinforce them.

While even informed and considered public opinion in Tanzania supports spending rather than saving resource revenues, voters are conservative or economically orthodox about most other aspects of resource governance, and this orthodox stance is reinforced through deliberation. Voters support the extraction and export of natural gas. They oppose fuel subsidies, more so than a benchmark group of Tanzanian policy elites whom we polled separately. They also support independent oversight of gas revenues and publishing gas contracts, measures that were resisted by the government at the time of this study. Information and deliberation reinforce all of these prudential tendencies.

Notably, deliberation turns citizens significantly against one specific measure proposed as a remedy to the governance challenges stemming from resource rents: cash transfers. Salai-Martin and Subramanian [2013] and Moss et al. [2015] suggest direct cash distribution of resource revenues to households, similar to Alaska's system of oil dividends, as a means to break the state's reliance on rents and heighten public awareness of the opportunity costs of profligate spending decisions. At baseline, poll respondents in Tanzania express mixed views on such proposals, but support declines dramatically in follow-up polling for respondents assigned to the deliberation treatment – bringing citizens more closely into alignment with Tanzanian elites' opposition to cash transfers.¹

Should the results of citizen deliberation – particularly with a less educated population in a developing country – be taken seriously? We test experimentally a number of longstanding concerns in the literature on democratic deliberation. First, Sanders [1997] raises the possibility that men, the rich, and more educated participants will impose their views through deliberation, a risk emphasized by more recent critiques such as Lupia and Norton [2017], who caution that "inequality is always in the room." A second and related concern is that leaders (or "facilitators" in our terminology) will inevitably drive deliberation toward

¹We focus here on the deliberation as a means to shape and elicit informed public opinion in a nationally representative sample. An additional role of deliberation in the context of new-found resource wealth, not addressed here, may be to reduce local conflict over resource rents. In a parallel study in neighboring Mozambique, which discovered natural gas around the same time as Tanzania, Armand et al. [forthcoming] find that local deliberative events led to a significant reduction in violent attacks by extremist groups.

their own preferences, as documented by Humphreys et al. [2006]. We find that these risks, while certainly real as shown in other contexts and deliberative formats, can be overcome. Exploiting our experimental design, we show that randomly assigned) groups with randomly assigned facilitators do not gravitate toward the views of the initial majority, nor toward the views held by male participants, identifiable social classes, or the group facilitator.

On the procedural question of how to enact deliberative democracy, we test a specific model known as "Deliberative Polling" previously applied on numerous topics across dozens of contexts, built on the presentation of balanced information briefs, question-and-answer sessions with panels of topic experts, and moderated, small-group discussions without any attempt to reach consensus or a collective verdict. The project is the first national "Deliberative Polling" effort in Africa, and the first national experiment testing the effect of deliberation (discussion plus information) on opinion change, as opposed to just information. Further, it is in the context of an African country where much of the literature has been skeptical about whether or not deliberation could be applied at all. We find this process yields significant shifts in public opinion across diverse levels of wealth and general knowledge. As noted, we demonstrate that these effects are driven by deliberation *per se*, and not by the information treatments in isolation.

The following section motivates our key hypotheses in more detail, first about the design and feasibility of deliberation in this context (Section 2.1) and second about its effect on the substance of public opinion related to Tanzania's resource windfall (Section 2.2). Section 3 explains the experimental design and data collection. Again, the results are divided into two parts: Section 4 presents the main effects on public opinion, while Section 5 evaluates the deliberative process itself by testing for heterogeneous effects, facilitator effects, and a small follow-up experiment on the impact of disseminating the poll results on elite policy preferences.

2 Conceptual framework and hypotheses

2.1 Implementing deliberative democracy in a low-income setting

Over the last two decades there has been an increasing movement toward participatory consultation in development policy making. As noted in the World Bank's Comprehensive Development Framework, "Development goals and strategies should be 'owned' by the country, based on citizen participation in shaping them" [World Bank and IBRD, 2003]. Many have supported this general idea. Joseph Stiglitz for example, views "development as a participatory process" and argues that "participatory processes must entail open dialogue and broadly active civic engagement, and it requires that individuals have a voice in the decisions that affect them" [Stiglitz, 2002]. Amartya Sen similarly emphasizes the importance of discussion for the meaningful formation of preferences in his case for participation: "We cannot, in general, take preferences as given independently of public discussion, that is, irrespective of whether open debates and interchanges are permitted or not" [Sen, 2000].

These considerations point in the direction of some form of consultation that combines participation with deliberation by the public as an input to policy making. But how is this to be done in the context of developing countries? One influential model that attempts to achieve this combination is "participatory budgeting" which has spread to many countries including some in Sub-Saharan Africa [Shah, 2007]. But as first developed in Porto Alegre, Brazil, the self-selected design engages unrepresentative samples of the public who are mobilized to bring home specific and often pre-determined benefits for their neighborhoods [World Bank and IBRD, 2003]. Is it possible to apply a model in developing countries that is both more representative and deliberative?

A great deal of recent work has employed the general idea of a deliberating "mini-public" chosen by random sampling [Grönlund et al., 2014]. Random sampling is meant to make the deliberators representative of the relevant population. The deliberations then take place according to a design that facilitates thoughtful and informed discussion. These models for mini-publics vary in the size of the samples and in what kind of data is collected. Some are closer to juries (citizens' juries), some seek consensus (consensus conferences). "Deliberative Polling" is a design for a mini-public that employs confidential questionnaires before and after deliberations in moderated small group discussions and plenary sessions in which the groups pose questions to competing experts. Unlike the citizens juries and consensus conferences the samples are large enough for statistically meaningful evaluation of the attitudinal and demographic representativeness of the deliberators as well as the opinion changes that might come with deliberation.² Because the opinions are solicited only in response to confidential questionnaire, the social pressure of a shared verdict, as in a jury, is avoided. Because the

²Deliberative Polling[®] is a registered trademark of James S. Fishkin. The trademark is used to support research at the Stanford Center for Deliberative Democracy.

small groups are typically recorded there is also the possibility of qualitative data in the evaluation.

Can this kind of design be applied in low-income countries in Sub-Saharan Africa, and particularly to an extremely complex policy issue such as natural gas revenue management?

First, a challenge facing the application of deliberative democracy to developing countries is the low literacy and educational levels, especially in many low-income countries in Sub-Saharan Africa. Privately, Tanzanian policymakers expressed skepticism that rural subsistence farmers could deliberate in a meaningful way about complex natural gas policy questions. Our results provide evidence that they could: after watching informational videos about the natural gas discovery and other countries' experience with extractive industries, respondents' scores on a knowledge test about natural gas policy improved significantly; participation in deliberation significantly altered respondents' preferences over gas policy in a number of dimensions; treatment effects were uniform across knowledge and wealth levels; and these effects were often in a direction we characterize as prudential or conservative.

Our study is closely related to the literature on clientelism, and specifically to experimental work on the question of whether polities in low-income democracies such as Tanzania will inevitably tend toward rapid, zero-sum distribution of public rents. In a seminal experiment on this topic, Wantchekon [April 2003] shows that candidates espousing clientelist policies in Benin reap electoral advantages. Building on this work, Fujiwara and Wantchekon [2013] show that town hall meetings with voters in Benin can significantly dull the impact of clientelism, maintaining voter turnout while reducing vote shares for candidates campaigning within their regional stronghold. Homing in on the role of deliberation per se, Wantchekon et al. [2018] randomizes congressional candidates in the Philippines to a 'one-way' campaign style involving distribution of information and campaign promises, versus a 'two-way' interactive town hall with the candidate and voters, holding policy platforms constant. The more deliberative approach generates a significant positive return in candidate vote shares, as well as movement in voters' support for policy platforms.³

³Another literature, very related in topic and geographic focus to our paper but with a different theoretical interest, explores the implications of resource discoveries for the state's capacity to tax, and the potential to break the link between taxation and political accountability. In recent work in Tanzania related to the same natural gas discovery that we study, Cappelen et al. [February 2016] show that information treatments related to gas increase expectations of corruption but do not change attitudes about taxation. This is in line with earlier survey experiments in Ghana and Uganda, e.g., de la Cuesta et al. [2019] who find no evidence that citizens are more inclined to hold politicians accountable for management of tax revenue than resource revenue. Paler [2013] finds a similar lack of difference between tax and resource revenues in citizen concern conditional on reports of misuse of funds in Indonesia, but greater willingness to take preventative action through monitoring to prevent misuse of tax revenues.

Second, the results of democratic deliberation may be conflated with the simple effect of exposure to more information. Given the high cost of conducting large public gatherings with a nationwide sample, is it really necessary to meet together and discuss the issues, rather than passively absorb information? Might simple exposure to an information briefing be enough for citizens to come to considered judgments? We present results from two experimental treatments: information only, and information plus deliberation. The former group was invited to the same pre-deliberation meeting as the latter, where the documentary video about natural gas was screened. Impacts on gas knowledge are statistically indistinguishable between the two treatment arms, while opinion changes are significantly greater for the deliberation treatment group (and indistinguishable from zero across all dimensions for the information-only group).⁴

Within the large literature testing information treatments on voters, a subset of papers has explored these issues in the context of low-income democracies characterized by clientelism and ethnic voting blocks. For instance, Casey et al. [2020] find that information treatments around policy platforms in Sierra Leone can significantly reduce ethnic voting.

Third, previous research has cast doubt on the true participatory nature of group deliberations, suggesting results may be driven by group facilitators or privileged social groups. Perhaps the closest previous study to ours, Humphreys et al. [2006], found that deliberation over the use of oil revenue in São Tomé and Príncipe were primarily driven by group leaders. We attempted to both minimize and test for these effects. To minimize them, group facilitators were instructed to play a mostly passive role, encouraging participants to speak up without expressing their own opinion whatsoever; and groups were not instructed to vote or reach any type of consensus. To test for the effect of facilitators and other privileged groups, we randomly assigned participants to small groups for deliberation, including random matching with facilitators. We show no association between facilitators' initial policy views and movements in participants' opinions. Ex post, we also asked facilitators to subjectively characterize the sentiment of the group, and – by comparing these reports to participants' post-treatment poll responses – found no tendency for them to distort respondents' actual views in the direction of their own preferences.

A fourth, related concern is that deliberation may simply reinforce majority opinion, leading to group polarization, as groups on either side of an issue move further apart. Sunstein

⁴This result confirms earlier findings from [Farrar et al., 2010] who disaggregate information and deliberation effects, albeit in a rich-country context where voters access to, and ability to independently process information may differ greatly from ours.

[June 2002] predicts that deliberation will "move groups, and the individuals who compose them, toward a more extreme point in the direction indicated by their own pre deliberation judgments." Because the deliberation groups were relatively small (fifteen people), random assignment to groups resulted in some variance in majority opinion across groups at baseline. We find no evidence, however, that majority opinion affected individual's opinion changes through the process of deliberation.

2.2 Public opinion about natural resource management

In preparation for this study, we collaborated with a Tanzanian think tank, REPOA, to convene a high-level group of experts and political leaders in Dar es Salaam for several rounds of discussion to build a list of six broad policy questions related to natural gas management, based loosely on the "natural resource charter" Collier and Venables [2011] ratified by Tanzania. Those six topics became the foundation for our public opinion polling. For each topic we developed a public opinion index, combining several polling questions, which constitute the main outcome variables in the experimental analysis. For example, the question or topic area that we label "sell" (i.e., sell gas abroad, rather than subsidize cheap energy at home), is an index reflecting responses to five survey questions. The following sections describe these six topics areas, and we provide the survey questions which comprise each of the corresponding indices in the appendix.

2.2.1 Support for extracting and exporting natural gas

Our first policy index measures public support for extracting gas, processing it into LNG, and exporting it, and opposition to fuel subsidies or a focus on prioritizing domestic consumption of gas. Expert judgment by professional economists is that Tanzania would benefit economically from gas exports.⁵ However, Tanzanian politicians have emphasized the importance of exploiting the gas discovery to provide cheap fuel to Tanzanians, or to supply domestic electricity generation and stimulate power supply. Fuel and energy subsidies take up a sizable share of public expenditures in many developing countries, particularly in resource-rich economies [Ebeke and Ngouana, May 2015].

⁵This statement is based on private meetings with economists in Dar es Salaam from the IMF, World Bank, Bank of Tanzania, local universities, and think tanks.

2.2.2 Support for saving rather than spending gas revenue

The standard "IMF view" of managing natural resource revenues is to follow some form of rule inspired by the Permanent Income Hypothesis (PIH). All resources are saved (i.e., held in assets that pay a financial return) and spending is set at a level that is sustainable over an infinite time horizon [Baunsgaard, April 11, 2014].

More recently, the consensus around the PIH rule has softened. Many analysts, including some within the IMF, advocate "front loading" spending given low initial consumption levels and the potential for fast consumption growth in a resource-rich developing economy [Collier et al., 2009]. Others have pushed to broaden the definition of savings to include onshore assets, and in some cases illiquid assets that do not pay a financial return [Gelb et al., 2014]. Circa 2015, the government of Tanzania planned to create a sovereign wealth fund, but the structure of this fund had yet to be determined, and such questions as whether such a fund would be "offshore" and legislatively ring-fenced, or not, had not been widely discussed.

Case studies from other countries that illustrate previous experiences with varied fund structures were used as background information for participants in the treatment group to inform their deliberation on questions of saving versus spending.

2.2.3 Support for direct distribution of rents versus government spending

Experience from other countries has shown that discovery of natural resource wealth contributes to a number of bad governance syndromes (see Ross [2015] for a useful review), including increased corruption (e.g. Vicente [2010] for São Tomé, and Caselli and Michaels [2013] for Brazil), increased risk of civil war (e.g. Besley and Persson [2011], Dube and Vargas [2013]), and reduced democratic accountability and tax compliance (e.g. McGuirk [2013] for several African countries, and Paler [2013] for Indonesia). Many of these studies link governance failures to the existence of sovereign rents, which decouple control of the budget from the need to tax citizens.

One proposal to overcome these governance pitfalls – a variant of which was supported by both of Tanzania's major opposition parties at the time – is direct cash distribution of gas revenues to citizens. Precedents for cash distribution include the growing wave of conditional and unconditional cash transfer programs for social protection across the developing world, including the TASAF program in Tanzania [Evans et al., 2014], as well as limited experiments with distribution of resource rents, as in the case of the U.S. state of Alaska [Moss, 2012]. Initial polling data from an independent source suggested a sizable minority of Tanzanians support some form of direct distribution, though a plurality support government management of the funds in some form [Morisset et al., 2014].

2.2.4 Preference for government spending on social services versus infrastructure, transport, and industry

As noted above, the question of saving versus immediate spending of gas revenues spills over into a debate about the distinction between saving and investment, and the boundaries of investment. Few economists advocate rapid expenditure of revenues from oil and gas discoveries on "consumption", but many debate which expenditures constitute consumption versus long-term investments. An orthodox view has traditionally been that saving should be liquid, generate a financial return, and, in the case of resource-rich economies, be located offshore to combat Dutch disease. Once this constraint is relaxed – as advocated by [Collier et al., 2009], and embraced by some sovereign wealth funds which now invest onshore, and by some Tanzanian policymakers in private conversations – debate turns to whether roads and infrastructure hold a special place in the category of investment, or whether recurrent expenditures on health and education might reasonably constitute a long-term investment in human capital.⁶

The point here is simple: elite discussion of policy rules to avoid Dutch disease often goes beyond technical macroeconomic management and encroaches on broader policy priorities among health, education, infrastructure, and other uses of public expenditure. This makes it hard to justify exclusion of public participation from these debates.

2.2.5 Support for transparency and oversight of gas revenues

Transparency creates greater opportunity for the citizenry to hold elected officials accountable to a standard of responsible management of natural gas revenues. The government can increase its transparency regarding the natural gas sub-sector by publicly releasing contract agreements between natural gas companies and the government as well as permits, concession agreements, signing bonus agreements, and tax auditing reports.

⁶The textbook case is that these latter expenditures are more likely to be inflationary, since they ncrease spending on local inputs including personnel, and thus can cause Dutch disease.

There are a number of key issues to discuss. Should the government publicly release all contractual agreements, even if these may contain sensitive information? Is the media free and open to report balanced information to Tanzanian citizens? What is the best medium to share transparent information about construction, development, and revenue management associated with the natural gas sub-sector? Should this information be released on a government website, announced by village leaders, released on state television or state newspapers, or all of the above?

2.2.6 Knowledge of the natural gas discovery

Finally, deliberative democracy is premised on the participation of informed citizen deliberators. A core concern in the background of our experiment that ordinary voters have little or no information about the natural gas sector, potential revenue flows, and policy options to manage these revenues. We measure this knowledge before and after treatment in a short quiz about Tanzania's gas discovery (including when and where it occurred, and the rough magnitude of projected revenues).

Each of the above six outcomes is measured by the mean of the standardized responses to several survey questions. The components of each index are listed in Table 9 in the appendix. Full question wording and variable names from the micro data are available in the pre-analysis plan uploaded to the American Economic Association's RCT registry prior to the deliberative event and follow-up data collection.

We also test heterogeneous effects on each of these outcomes along four dimensions: general knowledge about politics, current events, and geography.; per capita household consumption ('wealth'); trust in government; and gender. The components of the first three measures of heterogeneity are also described in the appendix, Table 10. For general knowledge, the index is a weighted average of correct answers on a short quiz. For 'wealth', we use a predicted consumption measure, based on the coefficients on a regression of household consumption on survey items in Tanzania's National Panel Survey that overlap with our questionnaire, including household amenities and, notably, schooling (these items were included in the questionnaire verbatim from the government's national survey for this purpose). See Appendix III: Measuring household socio-economic status for detailed methodology of the household per capita consumption measure. For trust in government, we use a simple mean effects index of the relevant items in the questionnaire, as listed in our pre-analysis plan.

3 Experimental design and data

3.1 Interventions

The experiment includes two interventions: an information treatment administered to a random subset of individuals in a random subset of clusters immediately after baseline surveying, and a deliberation treatment to which a sub-set of the information treatment group were invited.

In the information treatment, poll respondents received detailed information about the natural gas discovery, and the pros and cons of various gas policy options. The information was provided in the form of a roughly thirty-minute video, screened in the field by survey teams after the baseline poll (i.e., in group viewings in 200 separate survey clusters). The video aims to provide a balanced view of controversial alternatives, and is based on a script written with input and approval from a panel of researchers, Tanzanian industry representatives, civil society leaders, and politicians spanning all three major political parties as well as relevant government agencies.

The deliberation treatment is considerably more intensive. A randomly drawn subset of individuals who received the information treatment were invited to a national deliberative event. The event was held over two days in April 2015, in Dar es Salaam, with travel and accommodation provided by the project. At the event, poll respondents participated in an alternating sequence of small group deliberations on specific gas policy issues, followed by question and answer sessions with experts.

3.2 Sampling and random assignment

A nationally representative baseline poll asked a target sample of 2,000 adult Tanzanians in 200 rural and urban clusters spread across twenty districts about their knowledge and policy preferences regarding Tanzania's recent natural gas discovery and the use of any future revenues.

Sampling was done in multiple stages. Twenty districts were randomly selected using probability proportional to size (PPS) sampling based on district population from the 2012 Tanzania Population and Housing Census (see Figure 1). Within each district, ten clusters were selected, also by PPS sampling. In rural areas, clusters are defined as a sub-village

Figure 1: Twenty sampled districts



The 20 districts sampled with probability-proportional to size (PPS) based on 2012 census data were Kinondoni Municipal Council, Temeke Municipal Council, Kondoa, Geita, Kasulu, Kigoma Municipal Council, Babati, Mbarali, Mbeya City, Momba, Ulanga, Nanyumbu, Ilemela Municipal Council, Misungwi, Njombe Rural, Bagamoyo, Tunduru, Shinyanga, Handeni, and Tanga City.

or hamlet (*kitongoji*). In urban areas, clusters are defined as a block or sub-ward (*mtaa*). Within each cluster, ten households were selected using a random walk method. Within households, one adult respondent was chosen from the household roster; this respondent was randomly selected electronically within the survey software on mobile computers in the field. All respondents received a free mobile phone to enable follow-up polling by phone.

In each of 100 randomly selected survey clusters, 7 of 10 respondents were invited to view a documentary video presenting pros and cons of various gas policy options (the information treatment). Of the 702 respondents who were invited to the information treatment, all complied. Of these, 401 individuals were invited to a democratic deliberation about the use of the natural gas. The experimental design is summarized in Figure 2.

Of the 401 individuals invited to the deliberation, 370 complied and traveled to the event in Dar es Salaam. The 370 participants were divided into 25 randomly assigned small groups to discuss a sequence of gas policy options. The discussions were broken into four rounds, and groups were randomly reassigned after the second of four rounds. The random assignment of facilitators to deliberative groups is implicit in this design.

Follow-up polling measured the medium term (i.e., weeks rather than hours after treatment) impact of information and deliberation on respondents' knowledge and policy preferences. Follow-up polling was conducted by phone and broken into multiple interviews with each respondent, due to limitations on respondents' attention span on the phone. Overall, 93% of baseline respondents were re-interviewed by phone after the deliberation. Section 4.2 examines this attrition in more detail.

3.3 Baseline correlations

Before turning to the experimental results, we examine correlations between citizens' policy preferences at baseline and four covariates: gender, general knowledge, wealth, and trust in government. The results are presented in Table 1. Each column reports a separate multivariate regression, where each of our six main outcome indices is separately regressed on all four covariate indices.

Conditional on the other covariates, we find few differences in baseline responses by gender, with the exception that men are more supportive of using gas revenues for socialsector sector spending (relative to alternative uses, such as infrastructure).



Figure 2: Experimental design, compliance, and attrition

Each circle indicates the number of individuals from the baseline poll assigned to each treatment arm. All numbers to the left of the dashed vertical line report individuals assigned to the control condition. Data collection for all treatment arms occurred concurrently at both baseline (face-to-face interviews) and follow-up (phone interviews). Figures denoted with an (A) for attrition indicate individuals who could not be interviewed for the follow-up phone poll. Non-compliers are individuals who were invited to the deliberation but did not attend. Non-compliance with the information treatment did not occur.

Unsurprisingly, scores on the general knowledge quiz are highly correlated with knowledge about natural gas. Respondents who are more informed about politics, current events, etc., are also more supportive of transparency measures.

Wealthier individuals have significantly different baseline views across the board. They are less inclined to sell natural gas abroad, more supportive of saving (rather than spending) revenues if gas is sold, much less supportive of direct distribution of gas revenues through cash transfers, less supportive of transparency measures, and more knowledgeable about gas issues.

Trust in government is the only dimension positively correlated with support for commercialization of gas, and is also (positively) correlated with support for saving. Lastly, individuals who trust government more have slightly lower demand for transparency measures.

	Support	Support	Support	Support	Support	Test
	exporting	saving	cash	social	for trans-	of gas
	gas	revenues	dividends	spending	parency	knowledge
	(1)	(2)	(3)	(4)	(5)	(6)
Male	-0.047	0.013	-0.024	0.147^{*}	0.029	0.056
	(0.047)	(0.048)	(0.046)	(0.073)	(0.046)	(0.038)
Political knowledge	0.038	-0.045	-0.013	0.067	0.166^{***}	0.490^{***}
	(0.025)	(0.026)	(0.025)	(0.039)	(0.024)	(0.020)
Per capita consumption	-0.185^{***}	0.156^{***}	-0.400^{***}	0.132^{*}	-0.110^{**}	0.328^{***}
	(0.042)	(0.044)	(0.042)	(0.066)	(0.041)	(0.034)
Trust in government	0.067^{**} (0.022)	0.062^{**} (0.022)	0.035 (0.021)	-0.053 (0.034)	-0.110^{***} (0.021)	-0.004 (0.018)
Obs.	2,001	2,001	2,001	2,001	2,001	2,001

Table 1: Correlates of poll responses at baseline

Each column reports a separate regression. Dependent variables are listed in the top row. Each dependent variable is the pre-treatment value of a mean effect index combining multiple survey responses, with mean zero and standard deviation of one at baseline. Standard errors are clustered at the level of the primary sampling unit (i.e., a village or urban block).

3.4 Balance

Given the logistics of the experiment, baseline data was not available at the time of randomization.⁷ This makes it particularly important to verify that randomization did not produce any large discrepancies in outcomes between treatment groups. To test for balance, we regress the baseline values of our six main outcome indices on the various random assignment indicators.

$$Y_{ij,0} = \alpha_0 + \alpha_1 Y_{ij,0} + \alpha_2 Z_{ij}^{delib} + \alpha_3 Z_{ij}^{info} + \alpha_4 Z_{ij}^{spill} + \varepsilon_{ij}$$
(1)

In this notation j indexes clusters and i indexes individuals. The variable Z_{delib} equals one if the respondent was invited to the information treatment and the deliberation treatment; Z_{info} equals one if the respondent was invited only to the information session; and Z_{spill} equals one if the respondent was not personally assigned to any treatment, but resides in a village or urban block where other individuals were treated.

Turning to the results, there is no evidence of statistically significant imbalance on any of these six main outcomes, as reported in Table 2. In all cases, the differences between treatment arms are less than 0.1 standard deviation and insignificant at conventional levels.

⁷Cluster-level and individual-level randomization was programmed by the researchers in the office before baseline data collection commenced. Cluster-level assignment was known to the survey teams at the time of the baseline fieldwork. Individual-level randomization was not known to the surveyors at the time of interview, and was automatically revealed by the survey software at the end of each interview.

	SupportSupportSupportSupportexportingsavingcashsocialgasrevenuesdividendsspending		Support for trans- parency	Test of gas knowledge		
	(1)	(2)	(3)	(4)	(5)	(6)
Info. + deliberation	-0.017 (0.077)	0.033 (0.083)	-0.027 (0.095)	-0.149 (0.153)	-0.045 (0.077)	0.149 (0.098)
Info. only	-0.062 (0.082)	0.010 (0.085)	-0.049 (0.105)	-0.098 (0.102)	-0.002 (0.088)	0.018 (0.099)
Spillovers	-0.007 (0.083)	-0.004 (0.084)	-0.032 (0.102)	-0.223 (0.193)	-0.029 (0.087)	0.040 (0.099)
Obs.	2,001	2,001	2,001	2,001	2,001	2,001

Table 2: Balance test at baseline across six outcome indices

Each column reports a separate regression. Dependent variables are listed in the top row. Each dependent variable is the pre-treatment value of a mean effect index combining multiple survey responses, with mean zero and standard deviation of one at baseline. Standard errors are clustered at the level of the primary sampling unit (i.e., a village or urban block).

4 How does deliberation shape views on resource management?

We measure impacts on six outcome indices, listed below. In each case we regress the outcome variable in the follow-up poll on baseline responses and the set of random assignments.

$$Y_{ij,1} = \beta_0 + \beta_1 Y_{ij,0} + \beta_2 Z_{ij}^{delib} + \beta_3 Z_{ij}^{info} + \beta_4 Z_{ij}^{spill} + u_{ij}$$
(2)

Subscripts 0 and 1 refer to the pre- and post-treatment rounds of data collection, respectively. Based on these variable definitions, β_2 provides a measure of the total impact of information and deliberation combined; β_3 measures the impact of information alone; and β_4 measures spillovers within the village or urban block.

Given the length of the questionnaire, an obvious concern is that we will spuriously reject the null hypothesis of no treatment effect in some instances, i.e., multiple comparisons will generate false discovery. We deal with this multiple comparisons problem two ways, following standard practice in the social science experimental literature. First, we group outcomes into indices based on a priori judgments to reduce the total number of statistical tests. The definition of these six indices was pre-registered before the deliberation treatment and follow-up data collection. We calculate the indices following Kling et al. [2007] by (i) rescaling each indicator so that higher values indicate support for the hypothesis, (ii) computing z-scores for each indicator, (iii) averaging the indicators within an index, and (iv) creating z-scores for this composite index.

Second, because our analysis still involves at least six comparisons for each component of the experiment, we control the false discovery rate (FDR) using the procedure suggested by Anderson [2008] to calculate Benjamini et al. [2006] q-values, which we report in lieu of naive p-values where relevant.

4.1 Main effects: information, deliberation, and policy preferences

The full deliberation treatment significantly alters public opinion about natural gas use on three of five dimensions, as well as raising scores on the index of gas knowledge, as seen in Table 3. On the first dimension, selling natural gas versus subsidizing power generation or leaving it in the ground, the combination of deliberation and information increased support for extracting and selling the gas by nearly 0.3 standard deviations. Looking at the subcomponents of the index in Table 9 in the appendix, this result is driven primarily by support for selling gas abroad over using gas for energy generation, rather than explicit opposition to fuel subsidies.

Deliberation did not affect support for saving gas revenues whatsoever. Citizens began and remained strongly supportive of spending. Deliberation did reduce support, however, for direct cash distribution of gas revenues by roughly 0.3 standard deviations. This effect operated consistently across a range of question formats, though it is worth noting that support began (and remained) highest for proposals that targeted transfers to the needy, or were framed as individual savings accounts. While deliberation reduced support for cash transfers, it increased support for spending on social services rather than infrastructure by about 0.3 standard deviations. It also increased support for transparency and oversight by just 0.14 standard deviations.⁸

Notably, information alone has no significant effect on public opinion about any dimension of gas policy, as seen in in Table 3. Even on dimensions where the effect of deliberation is large and significant, such as selling gas or distributing revenues as cash transfers, the treatment effect of information alone is insignificant and point estimates are close to zero. The only outcome where we see a significant effect of information is on knowledge of the natural gas discovery, where information alone raised scores by 0.13 standard deviations and information plus deliberation raised scores by over 0.3 standard deviations.

Finally, while our design allows us to measure spillovers from either treatment, in practice we find no such effects. That is, we see no evidence that participants in the information or deliberation treatments shared information or influenced their neighbors within the village.

⁸Examining the q-values at the bottom of Table 3, the correction for multiple comparisons does not substantively affect our conclusions: effects on selling gas, cash distribution, social services, and knowledge remain significant at the 1% level, while effects on transparency remain significant at the 5% level.

Figure 3: Average poll responses for select indicators



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	Support exporting gas	Support saving revenues	Support cash dividends	Support social spending	Support for trans- parency	Test of gas knowledge
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment condition:						
Info. $+$ deliberation	0.267^{***}	-0.036	-0.288***	0.129^{***}	0.141	0.333***
	(0.066)	(0.064)	(0.062)	(0.038)	(0.078)	(0.051)
Info. only	-0.022	0.009	-0.011	0.030	0.016	0.129^{*}
	(0.072)	(0.069)	(0.058)	(0.040)	(0.074)	(0.061)
Spillovers	0.033	-0.052	-0.031	0.068	-0.031	-0.069
	(0.070)	(0.068)	(0.064)	(0.038)	(0.078)	(0.058)
Baseline outcome	0.007	0.068**	0.186***	-0.008	0.074^{**}	0.214^{***}
	(0.022)	(0.022)	(0.026)	(0.004)	(0.025)	(0.021)
For info $+$ delib.:						
BKY (2006) q-value	0.001	0.107	0.001	0.001	0.030	0.001
Horowitz-Manski-Lee						
Lower bound	0.21	-0.11	-0.34	0.09	0.08	0.31
Upper bound	0.33	0.04	-0.21	0.16	0.22	0.43
Obs.	1,857	$1,\!857$	$1,\!857$	$1,\!857$	1,857	1,857

Table 3: Intent-to-treat (ITT) effects

Each column reports a separate regression. Dependent variables are listed in the top row. Each dependent variable is the post-treatment value of a mean effect index combining multiple survey responses, with mean zero and standard deviation of one at baseline. Standard errors are clustered at the level of the primary sampling unit (i.e., a village or urban block).

4.2 Addressing attrition

The baseline survey interviewed 2,001 individuals. Post-treatment interviews for all treatment groups and the control groups were conducted by mobile phone. In total, we were able to interview 1,857 respondents during the post-treatment poll, or 93% of the baseline sample. The attrition of the remaining 7% of the sample introduces the possibility of bias in our experimental estimates. To examine this possibility, we first measure the observable correlates of attrition in our baseline data. Results in Table 6 show that we were no more likely to interview respondents in treatment villages (i.e., the "spillover" group) or respondents who received the information treatment. However, respondents who were invited to the deliberation were nearly 3 percentage points more likely to be interviewed post-treatment relative to control individuals.

Baseline covariates show some significant correlations with attrition. Individuals who are more knowledgeable, wealthier, and less trusting of government are more likely to be included in the post-treatment sample.

These results cannot be definitive as to whether attrition introduces bias in our treatment effect estimates, as attriters may also differ on unobserved dimensions. To address this possibility, we estimate non-parametric bounds a la Horowitz and Manski [2000] and Lee [2009] on our main treatment effects. These bounds are reported at the bottom of Table 3. We focus on bounding the total effect of information and deliberation combined, as this is the only treatment arm where we find large and robust treatment effects across multiple outcome measures.

	(1)	(2)
Treatment condition:		
Info. $+$ deliberation	0.034^{*}	0.029
	(0.015)	(0.015)
Info. only	0.013	0.007
	(0.017)	(0.017)
Spillovers	-0.011	-0.016
	(0.017)	(0.017)
Baseline measures		
Political knowledge		0.023***
		(0.006)
Per capita consumption		0.028**
		(0.011)
Trust in government		-0.012*
		(0.006)
Constant	0.921***	0.728***
	(0.008)	(0.074)
Obs.	2,001	2,001

Table 4: Attrition

Each column reports a separate regression. The dependent is an indicator that takes a value of 1 if the respondent was successfully interviewed in the post-treatment survey round. Standard errors are clustered at the level of the primary sampling unit (i.e., a village or urban block). Variables H1 through H6 are the baseline values of the outcome variables from the main analysis; X1 through X3 are covariate indices also measured at baseline.

5 Evaluating the deliberative process

Does the fact that deliberation changes people's minds imply any normative assessment? One approach to this question is to assess whether deliberation moves citizen views in the direction of some pre-established set of "right" answers. In the previous section we noted deliberation moves opinion in the direction of economic orthodoxy about natural resource management in some, but not all cases. In Section 5.4 we test whether deliberation moves citizens in the direction of elite opinion, which may or may not reflect economic orthodoxy in Tanzania.

A second approach, which we explore in this section, is to examine the dynamics of the deliberative process itself, in hopes of gaining insights about its procedural integrity. We divide the issue of social group interactions in deliberation into two parts, looking at how different social groups affect others and how they are affected by others. In more econometric language, we use a heterogeneous treatment effects approach to examine whether deliberation has differential effects on different groups. Separately, we also test a peer effects framework where peers are divided into sub-groups to examine the question of whether deliberation promotes the views of certain social groups. Finally, we examine the role of group facilitators during deliberation in shaping participants' views.

5.1 Do social groups respond differently to deliberation? Heterogeneous treatment effects

Skeptics of deliberative democracy in developing countries question the ability of illiterate voters with limited information to grapple in meaningful ways with complex policy issues. If this is true in general, we might expect it to be particularly true for the least informed voters, or for the poorest voters in our sample. Concretely, we might expect smaller treatment effects from deliberation on these groups.

In practice, we find little evidence of differences in treatment effects across groups, as seen in the bottom rows of Table 5 which show the interaction terms between deliberation and group dummies. There are a few exceptions though. While men and women show no significant differences in opinion about saving gas revenues or support for transparency measures at baseline, deliberation moves men further in support of these measures. That effect is canceled out by a countervailing movement for women on savings, but not on transparency measures.

While deliberation reduces support for direct distribution of gas revenues overall, that effect is attenuated for richer participants – who were already less supportive of this policy at baseline.⁹ To take just one poll question as an illustration, average support for cash transfers (see full phrasing for question 4.1 in the appendix) is shown at each point of the household consumption distribution in Figure 4, for both deliberation participants and the pure control group at endline. The control group shows the same baseline (negative) correlation between wealth (proxied by our index of per capita consumption) and support for cash transfers, and as noted, deliberation has a heterogeneous effect which attenuates this correlation. But the strongest effect is the simple average treatment effect, reducing support for cash transfers.

We also investigate whether baseline trust in government is associated with differential receptivity to the information and deliberation treatment. As shown in Table 1, trust in government is associated with stronger support for selling natural gas, saving revenues, as well as opposition to transparency and governance measures. However, we find no relationship between trust in government and treatment effects in Table 5.

⁹It is debatable whether a multiple comparisons correction should be used here, in which case the p-value on this effect would fall outside normal significance levels.



Figure 4: Deliberation and support for cash transfers, by household consumption

Lines represent a local polynomial regression of support for cash transfers (question 4.1) on log household consumption, with a bandwidth of one log point. For comparison, the figure also shows a histogram of the distribution of (predicted) log household consumption. For a full description of the consumption measurement methodology, see the appendix.

	Support exporting gas	Support saving revenues	Support cash dividends	Support social spending	Support for trans- parency	Test of gas knowledge
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment condition:						
Info. $+$ deliberation	0.005	-1.103	-1.641^{*}	0.035	0.776	0.773
	(0.705)	(0.762)	(0.717)	(0.348)	(0.754)	(0.471)
Info. only	-0.016	-0.005	-0.006	0.031	0.030	0.128^{*}
	(0.072)	(0.069)	(0.057)	(0.039)	(0.073)	(0.062)
Spillovers	0.039	-0.062	-0.024	0.070	-0.019	-0.070
-	(0.071)	(0.069)	(0.063)	(0.037)	(0.077)	(0.056)
Baseline measures:						
Baseline outcome	0.012	0.076***	0.166^{***}	-0.005	0.084^{***}	0.144^{***}
	(0.022)	(0.022)	(0.025)	(0.004)	(0.025)	(0.024)
Male	0.038	-0.108	-0.053	-0.029	0.032	0.153^{***}
	(0.048)	(0.057)	(0.041)	(0.031)	(0.058)	(0.045)
Political knowledge	-0.034	0.030	-0.033	-0.024	-0.045	0.067^{*}
	(0.029)	(0.032)	(0.026)	(0.018)	(0.037)	(0.031)
Per capita consumption	0.030	-0.125**	-0.160**	-0.029	-0.026	0.091^{*}
	(0.056)	(0.047)	(0.049)	(0.029)	(0.058)	(0.040)
Trust in government	-0.012	-0.019	0.015	-0.007	0.029	-0.020
	(0.026)	(0.027)	(0.021)	(0.014)	(0.030)	(0.023)
(Info. + deliberation) $\times \ldots$						
Male	0.028	0.267^{*}	-0.225	-0.013	0.399^{**}	-0.013
	(0.094)	(0.129)	(0.116)	(0.058)	(0.120)	(0.094)
Political knowledge	0.097	0.080	-0.059	-0.010	-0.006	0.021
	(0.056)	(0.069)	(0.061)	(0.029)	(0.065)	(0.048)
Per capita consumption	0.033	0.133	0.217^{*}	0.016	-0.119	-0.064
	(0.101)	(0.109)	(0.103)	(0.049)	(0.104)	(0.067)
Trust in government	-0.085	-0.007	0.027	0.011	-0.028	-0.049
-	(0.053)	(0.057)	(0.054)	(0.029)	(0.053)	(0.040)
Obs.	1,857	1,857	1,857	1,857	1,857	1,857

Table 5: Heterogenous treatment effects

Each column reports a separate regression. Dependent variables are listed in the top row. Each dependent variable is the post-treatment value of a mean effect index combining multiple survey responses, with mean zero and standard deviation of one at baseline. Standard errors are clustered at the level of the primary sampling unit (i.e., a village or urban block).

5.2 Do social groups have disparate influence on deliberation? Peer effects and marginalized groups

Does deliberation help people form reasoned opinions or reinforce group think and marginalization? The hypothesis that information and deliberation shape citizens' policy preferences is somewhat distinct from saying that people conform to their peers' views when exposed to them through group discussion. Of particular concern is the possibility that certain social groups dominate these interactions, making the results of deliberation unrepresentative of popular opinion.

To estimate peer effects we regress the post-treatment poll responses of individual i in group g on her own baseline response, as well as the average of her G-1 peers, indexed by p.

$$Y_{ig,1} = \gamma_0 + \gamma_1 Y_{ig,0} + \gamma_2 \sum_{p \neq i} \frac{Y_{pg,0}}{G-1} + v_{ij}$$
(3)

We run equation (3) separately for each of the four topics covered in the group deliberations. Recall that the 383 deliberation participants were divided into 25 groups for each session, so average group size was about 15 people, plus a facilitator and note taker. While there were four deliberation sessions focused on the four topics listed as outcomes in Table 6, groups were randomized only twice: at the outset and between sessions two and three.

We find no evidence that peers' baseline views affect participants' preferences after deliberation. The coefficients on peers' views in the first row of Table 6 are somewhat noisily estimated, but fall on either side of zero with no clear pattern, and are never significantly different from zero.

To test whether particular social groups have an undue influence on deliberation, we repeat estimation of equation (3), restricting the group of peers to only men, only richer individuals (i.e., above the median on our consumption index), or only the educated (i.e., with some secondary education). Once again, results show no significant signs of peer influence on post-treatment poll responses. The baseline views of men, the rich, and the educated all appear to exert no disproportionate influence on their peers' preferences after spending hours together debating these topics.

	Support exporting gas	Support saving revenues	Support cash dividends	Support social spending
All				
Leave-out mean	-0.096 (0.206)	-0.193 (0.210)	$\begin{array}{c} 0.137 \ (0.221) \end{array}$	-0.021 (0.189)
Obs. BKY (2006) q-value	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$357 \\ 1.000$
Men only				
Leave-out mean	$\begin{array}{c} 0.078 \\ (0.158) \end{array}$	-0.200 (0.154)	$\begin{array}{c} 0.086 \ (0.123) \end{array}$	-0.055 (0.147)
Obs. BKY (2006) q-value	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$357 \\ 1.000$
Rich only				
Leave-out mean	$\begin{array}{c} 0.023 \\ (0.118) \end{array}$	-0.138 (0.131)	-0.003 (0.134)	$\begin{array}{c} 0.109 \\ (0.141) \end{array}$
Obs. BKY (2006) q-value	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$\begin{array}{c} 357 \\ 1.000 \end{array}$
Educated only				
Leave-out mean	-0.052 (0.116)	-0.219 (0.141)	$\begin{array}{c} 0.074 \\ (0.124) \end{array}$	-0.025 (0.137)
Obs. BKY (2006) q-value	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$\begin{array}{c} 360 \\ 1.000 \end{array}$	$357 \\ 1.000$

Table 6: Peer effects during deliberation

Each column and each panel is a separate regression. Dependent variables are measured post-treatment and are listed in the top row. Peer effects are calculated using peers' baseline responses. The leave-out mean is the average of the dependent variable for individual *i*'s group, ignoring his or her own value. Leave-out means for men, the rich, and the educated are constructed using values for those sub-sets of group members (where rich and educated are defined as being above the median for the overall sample). All regressions include controls for the individual's own baseline response and a constant (not reported).

5.3 Do facilitators drive deliberation results?

Given Humphreys et al's 2006 conclusion that deliberation about the use of oil rents in São Tomé was not truly participatory, but driven by the will of the leaders or facilitators, we designed our experiment and collected additional data to test for "facilitator effects". We hypothesize that careful training and supervision of facilitators, as well as the structure of the deliberative process used here – involving presentation of balanced briefing materials, no requirement to come to consensus, and individual "secret ballot" rather than collective reporting of post-treatment preferences – should mitigate these facilitator effects.

Humphreys et al. [2006] enumerate three mechanisms by which facilitators may skew results. In the first scenario, labeled "suasion", facilitators intervene in deliberations to sway participants' views in the direction of facilitators' own pre-treatment preferences. Random assignment of participants to groups allows us to identify these effects experimentally. To increase power, we pool responses from all four topics that were deliberated in small groups, and include indicator variables for the topic. Table 7 shows that there is no significant relationship between facilitators' baseline views on a given topic and participants post-treatment poll responses (column 1), controlling for their baseline views in an ANCOVA specification. Note that because facilitators lead only one session on each topic, we cannot isolate the role of suasion through facilitator fixed effects as in Humphreys et al. [2006]. However, it is notable that the group fixed effects in a regression of post-treatment poll responses are not jointly significant. These fixed effects should incorporate both suasion and peer effects discussed above, which may (or may not) point in the same direction.

The second scenario in which facilitator effects may arise is self-censorship, in which participants' opinions expressed during deliberation will conform to facilitators' views. To test this hypothesis we asked independent note takers to observe each deliberative session, and report on the tone of the discussion on each of our polling topics. Note takers were asked a sub-set of the same poll questions as participants, but asked to respond on behalf of the group, relaying what they understood to be the gist of the debate in the group they observed.¹⁰ If self-censorship is at play and participants conform to facilitators' views, we would anticipate the note-takers' summary of the discussion to be at least partially explained by facilitators' views. As seen in Table 7 (column 2), we find no such relationship; being

 $^{^{10}}$ The items included in this subset are questions 1.1, 1.2, 2.1, 2.5, 2.6, 3.6, 4.1, and 4.6. See the appendix for full question phrasing.

	Suasion	Self Censorship	False Relay
	(1) Citizens (after deliberation)	(2) Facilitator's report	(3) Note-taker's report
Facilitators (before deliberation)	0.023 (0.026)	-0.182 (0.143)	-0.349^{***} (0.113)
Citizens (after deliberation)		0.929^{***} (0.069)	0.923^{***} (0.091)
Obs. R-squared	$\begin{array}{c} 1044 \\ 0.07 \end{array}$	$\begin{array}{c} 118 \\ 0.76 \end{array}$	$113 \\ 0.79$

Table 7: Do facilitators' views drive deliberation?

Each column reports a separate regression. Dependent variables are listed in the first row. All standard errors are clustered at the group level. Column (1) also includes a control for citizens' own baseline views (not reported). Column (1) is estimated on individual level data, with a separate observation for each of the four outcomes indices which were the direct focus on the four small-group deliberation sessions. Columns (2) and (3) are estimated on group-level averages. In these latter columns, variables are defined such that they have a range of one (from -0.5 to 0.5) and zero signifies indifference, while column (1) uses the mean-effects indices presented in the main analysis.

randomly assigned a facilitator who was sympathetic to a given policy position did not lead to a discussion that was more favorable to the facilitator's view.

A third possible mechanism for facilitator effects that we test is 'false relay', in which facilitators exaggerate the extent to which deliberation conformed to their own views. Note that none of our main results in earlier sections rely on facilitators' reports of what happened in the sessions; we use participants own post-treatment responses. Nevertheless, we also asked facilitators to summarize the deliberation to test whether this could, in theory, be a possible source of bias with a different deliberative setup in our context. As with the note-takers' reports, we find no relationship between facilitators' reports of the tone of the deliberation and their own baseline views (column 3 of Table 7), while citizens' own views strongly predict facilitators' reports.

5.4 Postscript: Do elites care what people think?

In private conversations with both Tanzanian policymakers and academic economists in Europe and the U.S., we found considerable skepticism that Tanzanian voters could process complex natural gas policy issues, and resistance to the notion that public opinion should directly inform these policy choices. To explore this elite resistance to public consultation on the gas issue, we designed a small survey experiment as part of our dissemination activities for the nationwide poll.¹¹

The outcomes from the nationwide poll were used as input into a survey among a sample of Tanzanian elites in Dar es Salaam. Individuals in this elite sample were selected from mailing lists and event invitation lists at CSOs, NGOs, development banks, academia, and government offices in Dar es Salaam. All individuals were invited to a dissemination event in Dar es Salaam in early September 2015. We had over 50 individuals attend the event from an invitation list of about 280 elites in Dar es Salaam. We administered an abbreviated version of the full citizen survey to 44 individuals at this event. To expand our reach, we sent a digital version of the survey via email to about 230 additional individuals who were unable to attend the event.

A total of 124 individuals completed the survey: 44 completed the survey at the dissemination event and the remaining 80 individuals completed the digital version. Individuals within the sample though they clearly self-selected when deciding to attend the event were then randomized into control and treatment groups: 67 individuals were sampled for the control group, and 56 were sampled for the treatment group.

While the citizen survey included several questions on each of the five main issue areas, the elite survey was designed to present only a select list of questions to respect participants' limited amount of time to participate in the survey. Questions which were considered to be core indicators for each of our five topical hypotheses (not including change in knowledge) were chosen for the elite survey. Questions from the elite survey are listed in Appendix VI.

Before considering any treatment effects, there are considerable differences between citizen and elite opinion. For five of eight policy questions tested, the gap between citizen and elite opinion is statistically significant, and for three of the eight, the overall balance of opinion points in the opposite direction for the two groups (Table 8).

Relative to citizens, elites are less inclined to sell Tanzania's gas and more interested in subsidizing energy generation. Elites are more fiscally cautious: they are both more inclined to save gas revenue for the future and more opposed to using the gas reserves as collateral to enable Tanzania to borrow money internationally. Elites are less enthusiastic about distributing gas revenues to individualized savings accounts – a proposal that is quite popular with citizens. Finally, elites are markedly less interested in international oversight of

¹¹We are particularly grateful to Abel Kinyondo for inputs on the design of this follow-up survey.

Tanzania's management of its gas revenue than are citizens (bear in mind, some of these elite respondents are themselves the government officials who would be subject to hypothetical oversight).

The effect of showing citizen poll results to elites is statistically significant for just three out of eight of the poll questions tested. This includes dampening elite support for saving for the future, and strengthening their existing support for spending revenues on public services rather than investments in capital infrastructure. Notably one of these three significant effects is in the 'wrong' direction, i.e., elites move further way from public opinion on international borrowing, though both groups remain opposed to borrowing on average after treatment.

On the whole, our judgment is that the combination of our citizen and elite treatments goes some way toward bridging the gap between the two samples, even though several of these results are insignificant due to our small sample size in the elite survey. For six out of eight indicators, the point estimate on the citizen-elite gap narrows due to the combination of treatments.

6 Conclusion

A key question in the literature on deliberative democracy is whether ordinary citizens, particularly among a less educated population in a developing country, can reach meaningful conclusions about complex policy topics – or, instead, whether deliberative outcomes will be determined by the interests of powerful social groups and the framing imposed by facilitators. We tested these hypotheses in the context of a nationally-representative deliberation in Tanzania, in the wake of a large natural gas discovery that poses unprecendted questions for Tanzanian policymakers about the exploitation and use of a new natural resource. Key features of this deliberation included the presentation of balanced information briefs (as adjudicated by a multi-party advisory group) to a representative cross-section of Tanzanian adults, question-and-answer sessions with panels of topic experts, and moderated, small-group discussions without any attempt to reach consensus or a collective verdict.

Results from a randomized experiment within our nationwide polling sample show that deliberation meaningfully changed public opinion, and that these changes were disproportionately not driven by the prior views of men, the educated, the rich, or group facilitators.

	Ave	erage for con	trol	Treatment effects			
	(1) Citizens	(2) Elites	$\begin{array}{c} (3) \\ \text{Gap} \end{array}$	(4) Citizens	(5) Elites	$\begin{array}{c} (6) \\ \text{Gap} \end{array}$	
Sell gas (1.1)	$\begin{array}{c} 0.198^{***} \\ (0.014) \end{array}$	0.090^{*} (0.047)	-0.109^{**} (0.055)	0.101^{***} (0.026)	$0.100 \\ (0.072)$	-0.002 (0.082)	
Save for the future (2.5)	-0.242^{***} (0.013)	$0.007 \\ (0.041)$	$\begin{array}{c} 0.249^{***} \\ (0.050) \end{array}$	$0.026 \\ (0.025)$	-0.187^{***} (0.061)	-0.213^{***} (0.078)	
Don't borrow overseas (2.6)	$\begin{array}{c} 0.081^{***} \\ (0.014) \end{array}$	$\begin{array}{c} 0.201^{***} \\ (0.034) \end{array}$	0.120^{**} (0.053)	-0.013 (0.026)	$\begin{array}{c} 0.153^{***} \\ (0.051) \end{array}$	0.166^{**} (0.080)	
Cash transfers (3.6)	-0.249^{***} (0.013)	-0.323^{***} (0.031)	-0.074 (0.051)	-0.063^{***} (0.024)	-0.044 (0.046)	$\begin{array}{c} 0.019 \\ (0.074) \end{array}$	
Personal savings accounts (3.7)	$\begin{array}{c} 0.231^{***} \\ (0.012) \end{array}$	-0.088^{*} (0.046)	-0.319^{***} (0.047)	-0.041^{*} (0.023)	-0.027 (0.068)	$\begin{array}{c} 0.014 \\ (0.072) \end{array}$	
Spend on services (not infra.) (4.6)	$\begin{array}{c} 0.119^{***} \\ (0.015) \end{array}$	$\begin{array}{c} 0.051 \\ (0.044) \end{array}$	-0.068 (0.058)	$\begin{array}{c} 0.101^{***} \\ (0.027) \end{array}$	0.115^{*} (0.066)	$\begin{array}{c} 0.014 \\ (0.086) \end{array}$	
Contract transparency (5.1)	$\begin{array}{c} 0.349^{***} \\ (0.011) \end{array}$	$\begin{array}{c} 0.409^{***} \\ (0.031) \end{array}$	$\begin{array}{c} 0.060 \\ (0.041) \end{array}$	$\begin{array}{c} 0.016 \\ (0.020) \end{array}$	-0.072 (0.048)	-0.089 (0.065)	
International oversight (5.2)	$\begin{array}{c} 0.057^{***} \\ (0.015) \end{array}$	-0.082^{*} (0.049)	-0.139^{**} (0.059)	$\begin{array}{c} 0.075^{***} \\ (0.028) \end{array}$	$0.089 \\ (0.076)$	$\begin{array}{c} 0.014 \\ (0.092) \end{array}$	

Table 8: Citizen vs. elite opinion

Outcome variables are listed in the left column, and are defined such that they have a range of one (from -0.5 to 0.5) and zero signifies indifference. Columns (1) and (2) show the mean for the control group in each sample, and the gap between the two control samples (citizen and elites) is shown in column (3). Columns (4) and (5) show the effect of deliberation and information on citizens and of the survey experiment on elites, respectively, and column (6) reports the net effect of the treatments on the gap between citizens and elites. (To see the level of disagreement between citizens and elites after treatment, sum columns (3) and (6).) Asterisks denote statistics that are significantly different from zero (i.e. from indifference, or from a null effect of treatment, depending on the column.

The combination of information and extended, structured, participatory deliberation generated (i) a measurable increase in knowledge of the gas sector; (ii) increased support for sale of natural gas and reduced support for energy subsidies; (iii) no change in support for saving versus spending gas revenues; (iv) a sharp decline in support for direct cash distribution of resource rents to citizens; (v) increased support for spending on social services as opposed to infrastructure; and (vi) a marginally significant increase in support for transparency and oversight measures.

In short, even after deliberation, Tanzanians remain impatient to spend resource revenues quickly, but deliberation otherwise leaves them more prudential about resource management. Furthermore, we find that deliberation 'works' in a procedural sense, even with an extremely low-income, low-information population like rural Tanzanian voters.

Unlike previous polls of this type conducted in low-income countries (cf Fishkin et al. [2017] and Chirawurah et al. [2017] on local or regional polls in Uganda and Ghana), our Tanzania results draw from a larger and more diverse population, and the findings are based on a controlled experiment allowing clean causal inference about the impact of deliberation, as well as allowing us to unpack the role of information and deliberation. Democratic deliberation appears to be the key to changes in policy preferences; the information treatment alone produced no significant impacts, and impacts did not spill over onto individuals in the same community who did not participate in deliberation.

An obvious limitation of our results is our inability to say whether any change in public opinion will translate into a change in policy or an improvement in natural resource governance. Multiple steps in this chain may fail that are far beyond the scope of this experiment. We only measure impacts on stated policy preferences, rather than political action. However, in a survey experiment based on the dissemination of our findings we do find modest support for the hypothesis that Tanzanian elites adapt their own policy preferences in response to public opinion data of this sort.

Future work could explore the impact of deliberation on costly political behavior, beginning with voting. Given the high cost and intensity of our deliberation treatment, it is difficult to imagine replicating this exact procedure at a much larger scale. Our method is a sample-based technique for measuring public opinion, as opposed to a mechanism for mass participation in deliberation or to shape views at the population level. Future work could explore cheaper, "lighter touch" mechanisms that adhere to similar deliberative principles and could be extended to a broader population. For the time being, we interpret our results as proof of concept for a practical mechanism for measuring the public's representative and informed views on complex issues, even those involving difficult trade-offs and even in the challenging context of a low-income country in the midst of a resource boom.

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Appendix I: Full text of poll questions, by index

The following pages list the wording of each question as read to respondents, after translation from Kiswahili to English. Each question employs a five, seven, or eleven-point response scale, always with an option of perfect indifference or ambivalence. Below, each question bears one, two, or three asterisks next to its identification number. One asterisk indicates the question has a five-point scale; two indicates it has a seven-point scale, and three indicates that it has an eleven-point scale. The five and eleven-point scale responses offer the respondent degrees of agreement or disagreement, while the seven-point scale is used for questions that pose a choice between two policy alternatives, as follows.

• Five-point scale (*):

Yes, strongly agree
 Neutral
 No, strongly disagree
 Refused No opinion

• Seven-point scale (**):

(1) Strongly agree with proposal A
 (2)
 (3)
 (4) Exactly in the middle
 (5)
 (6)
 (7) Strongly agree with proposal B
 (98) Refused
 (99) No opinion

Eleven-point scale (***):
(0) Extremely unimportant
(1)
(2)
(3)

(4)
(5) Exactly in the middle
(6)
(7)
(8)
(9)
(10) Extremely important
(98) Refused

(99) No opinion

Index 1: Support for extracting and exporting the gas

H1_1***

Use the gas to reduce the price of fuel.

$H1_2**$

Some people think that Tanzania should use the gas for fuel for Tanzanians. Suppose these people are at 1 on the scale. Other people think Tanzania should sell the gas to earn money. Suppose these people are at 7 on the scale. Those who are exactly in the middle are at 4. Where would you place yourself?

$H1_{-}3^{**}$

Some people think that Tanzania should leave the natural gas in the ground, to save for the future and avoid trouble. Suppose these people are at 1 on the scale. Other people think the gas should be extracted to provide fuel and make money. Suppose these people are at 7 on the scale. Those who are exactly in the middle are at 4. Where would you place yourself?

$H1_4**$

Some people think that Tanzanians should pay the full price for energy so that the earnings from selling natural gas can be used for roads, schools, clinics, and electricity lines. Suppose these people are at 1 on the scale. Other people think the gas should be used mostly to produce electricity so that electricity would be very cheap for all Tanzanians. Suppose these people are at 7 on the scale. Those who are exactly in the middle are at 4. Where would you place yourself?

$H1_{5}**$

Some people think that all of the gas should be sold at the highest possible price to get the most money for Tanzania. Suppose these people are 1 on the scale. Other people think that some of the gas should be discounted to help local industry grow, even if this means that Tanzania receives less money from the sale of gas. Suppose these people are at 7 on the scale. Those who are exactly in the middle are at 4. Where would you place yourself?

Index 2: Support for saving rather than spending gas revenue

$H2_{-}1^{**}$

Some countries, such as Norway, place strict limits on the amount of money that can be spent each year from oil and gas revenues so that the money can be used over a longer period of time. Suppose these countries are at 1 on the scale. Other countries, such as Ghana, have very loose limits on how much money is spent from oil and gas revenues so that more money can be spent immediately to help Ghana's economy. Suppose these countries are at 7 on the scale. Those who are exactly in the middle are at 4. What do you think is the right solution for Tanzania? Strict limits on spending like Norway or loose limits like Ghana or somewhere in between? Please choose a number between 1 and 7 if 1 is for very strict limits and 7 is for very loose limits.

$H2_{2}***$

Spend some money on building things for the people, such as roads and the electricity system

H2_3***

Spend some of the money on public services, such as health care and education

$H2_4***$

Save some of the money for future generations

$H2_{5}**$

Some people think the money should be saved mostly for the future even if that means there is not much of an increase in spending now. Suppose these people are at point 1 on the scale. Other people think that the money should be spent now even if that means that in the future there will be nothing left. Suppose these people are at point 7 on the scale. Those who are exactly in the middle are at 4. Where would you place yourself?

$H2_{-}6^{**}$

Rather than waiting for the money from oil and gas to begin flowing, Tanzania should use the expected money from gas to borrow money from overseas and start spending sooner, even though the government will need to repay more than the original amount borrowed.

$H2_{-}7^{**}$

Some people think the money should be spent by the government on building things the people need, such as roads or the electricity system even if that means there will be no extra money for public services. Suppose these people are at point 1 on the scale. Other people think the money should be spent on improving public services such as health care and education even if that means there will be no extra money for building things such as roads or the electricity system. Suppose these people are at 7. Those who are exactly in the middle are at 4. Where would you place yourself?

Index 3: Support for government spending versus direct distribution

H3_1***

Give some money directly to households to spend for their own needs however they want

H3_2***

Give some money directly to those households with children or the elderly

H3_3***

Giving most of the money directly to households will fight poverty and hunger

H3_4***

Giving most of the money directly to the people will help children in poor families have better nutrition and a greater chance of doing well in school

H3_5***

Giving most of the money directly to households will make the government more accountable for the amount people expect each year

H3_6**

Some people think that the money should be given directly to households even if that means there will be no increased money for the government to spend on what the public needs. Suppose these people are at 1 on a scale from 1 to 7. Other people think that the money should be spent by the government for what the public needs even if that means there will be no extra money to give directly to the people. Suppose these people are at 7 on the scale. Those who are exactly in the middle are at 4. Where would you place yourself?

$H3_7*$

What if some money is put into a savings account for every child at birth with each child having access to the resulting money at age 18?

$H3_8*$

What if some money is put into a savings account for every adult starting at age 40 with each adult having access to the resulting money at age 60?

Index 4: Support for government spending on social services versus

infrastructure, transport, and industry

$H4_{-}1^{***}$

Using most of the money to build things such as roads and the electricity system will create jobs

$H4_2***$

Using most of the money to build things such as roads and the electricity system will help the economy grow much faster

H4_3***

Spending most of the money on services such as health care and education will help poor people

H4_4***

Spending most of the money on services such as health care and education will help the economy grow much faster

$H4_5*$

Some people say that when the government increases spending on roads and schools a lot of money is wasted during these projects.

H4_6**

Some people think the money should be spent by the government on building things the people need, such as roads or the electricity system even if that means there will be no extra money for public services. Suppose these people are at point 1 on the scale. Other people think the money should be spent on improving public services such as health care and education even if that means there will be no extra money for building things such as roads or the electricity system. Suppose these people are at 7. Those who are exactly in the middle are at 4. Where would you place yourself?

Index 5: Support for transparency and oversight of gas revenues, or additional restrictions on their use

$H5_{-1}**$

Some people think that the government should be able to keep the oil and gas contracts with companies private and not allow citizens access to them so that sensitive information between companies and the government is kept private. Suppose these people are at 1 on the scale. Other people think that all oil and gas contracts should be published for citizens to access them so that citizens know how much money the government is receiving from oil and gas companies. Suppose these people are at 7 on the scale. Those who are exactly in the middle are at 4. Where would you place yourself?

$H5_{-2}^{**}$

Some people think the government should decide how to spend most of the money from natural gas over the years since the government is elected by the people. Suppose these people are at 1 on the scale. Other people think most of the money should be managed by an independent and international group of experts appointed by government, to help ensure the money is not wasted or stolen over the years. Suppose these people are at 7. Those who are exactly in the middle are at 4. Where would you place yourself?

H5_3***

Entrusting most of the money to the national government will ensure it is spent where it is most needed

$H5_4$

What, if anything, have you heard about Tanzania's recent natural gas discoveries? Tanzania has...

Answer choices:

(1) Not begun extracting or exporting the gas, (2) Begun extracting the gas but not exporting it, (3) Begun extracting and exporting the gas, (4) I haven't heard anything about the natural gas, (99) DON'T KNOW

$H5_{-}5$

Where was the natural gas discovered?

Answer choices:

(1) Near Arusha, (2) Under Lake Victoria, (3) Offshore near Mtwara, (4) Morogoro,
(-96) OTHER, (SPECIFY), (-99) DON'T KNOW

Index 6: Knowledge of the natural gas discovery

$H6_{-1}$

During whose presidency were recent offshore natural gas discoveries made?

Answer choices:

(1) During Nyerere's presidency, (2) During Mwinyi's presidency, (3) During Mkapa's presidency, (4) During Kikwete's presidency, (-96) OTHER (SPECIFY), (-99) DON'T KNOW

$H6_2$

Do you think that the government has started receiving revenues from the recent discoveries of natural gas?

Answer choices:

(1) Yes, they have begun receiving a small portion of revenues, (2) Yes, they have begun receiving a large portion of revenues, (3) No, they have not begun receiving any revenues, (-99) DON'T KNOW

$H6_{-}3$

The cost of building a new regional hospital?

Answer choices: (1) More, (2) Less, (-99) DON'T KNOW

$H6_{-}4$

The cost of building 10 new regional hospitals?

Answer choices: (1) More, (2) Less, (-99) DON'T KNOW

$H6_{-}5$

The size of the entire national government budget?

Answer choices: (1) More, (2) Less, (-99) DON'T KNOW

$H6_{-}6$

The size of the whole national economy

Answer choices: (1) More, (2) Less, (-99) DON'T KNOW

$H6_{-}7$

If it was divided evenly among all Tanzanians, how much natural gas revenue do you think there will be each year for each person? (TSh)

Answer choices:

- (1) Less than 1,000 shillings, (2) 1,000 to 10,000 shillings, (3) 10,000 to 100,000 shillings,
- (4) 100,000 to 1m shillings, (5) Over TSh 1m, (-99) DON'T KNOW

		Control			Information	1	Info	. + Deliber	ation	Bal	ance	Diff-	-in-Diff
	t = 0	t=1	Δ	t= 0	t=1	Δ	t= 0	t=1	Δ	(4)-(1)	(7)-(1)	(6)-(3)	(9)-(3)
	(1)	(2)	(3)	(4)) (5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
H1: Sell													
Sell gas (vs use for energy)	0.10^{***} (0.02)	0.20^{***} (0.02)	0.09^{***} (0.03)	0.08^{***} (0.03)	0.22^{***} (0.03)	0.15^{***} (0.04)	0.09^{***} (0.03)	0.30^{***} (0.02)	0.21^{***} (0.03)	-0.02 (0.04)	-0.01 (0.04)	0.05 (0.05)	0.12^{***} (0.04)
Do not subsidize energy	-0.22^{***} (0.02)	-0.27^{***} (0.02)	-0.05 (0.03)	-0.24^{***} (0.03)	-0.30^{***} (0.03)	-0.05 (0.04)	-0.22^{***} (0.02)	-0.20^{***} (0.02)	0.02 (0.04)	-0.02 (0.03)	-0.00 (0.03)	-0.00 (0.05)	0.07 (0.05)
Extract vs leave in ground		0.49^{***} (0.00)	0.49^{***} (0.00)		0.49^{***} (0.00)	0.49^{***} (0.00)		0.48^{***} (0.00)	0.48^{***} (0.00)			-0.01 (0.00)	-0.01 (0.00)
Sell gas vs fuel (2)		0.47^{***} (0.00)	0.47^{***} (0.00)		0.47^{***} (0.00)	0.47^{***} (0.00)		0.47^{***} (0.00)	0.47^{***} (0.00)			-0.00 (0.00)	0.00 (0.00)
Don't subsidize energy (2)		-0.24^{***} (0.01)	-0.24^{***} (0.01)		-0.25^{***} (0.02)	-0.25^{***} (0.02)		-0.21^{***} (0.02)	-0.21^{***} (0.02)			-0.01 (0.02)	0.03 (0.02)
H2: Save													
Strict limits on spending	0.11^{***} (0.02)	0.08^{***} (0.02)	-0.04 (0.03)	0.13^{***} (0.03)	0.13^{***} (0.03)	-0.01 (0.04)	0.09^{***} (0.03)	0.12^{***} (0.02)	0.02 (0.03)	0.02 (0.04)	-0.02 (0.03)	0.02 (0.05)	$0.05 \\ (0.04)$
Against infrastructure	-0.37^{***} (0.01)	-0.32^{***} (0.01)	0.05^{***} (0.02)	-0.37^{***} (0.02)	-0.33^{***} (0.02)	0.05^{**} (0.02)	-0.35^{***} (0.02)	-0.33^{***} (0.01)	0.02 (0.02)	0.00 (0.02)	0.02 (0.02)	-0.00 (0.03)	-0.03 (0.03)
Against health & educ.	-0.40^{***} (0.01)	-0.34*** (0.01)	0.07^{***} (0.01)	-0.38^{***} (0.02)	-0.34^{***} (0.01)	0.05^{**} (0.02)	-0.36^{***} (0.02)	-0.34^{***} (0.01)	0.02 (0.02)	0.03 (0.02)	0.04^{**} (0.02)	-0.03 (0.02)	-0.05^{*} (0.03)
Save for future generations	0.23^{***} (0.02)	0.22^{***} (0.01)	-0.01 (0.02)	0.19^{***} (0.02)	0.19^{***} (0.02)	-0.01 (0.03)	0.18^{***} (0.02)	0.18^{***} (0.02)	-0.01 (0.03)	-0.04 (0.03)	-0.05^{*} (0.03)	-0.00 (0.04)	0.01 (0.04)
Save vs spend now	-0.10^{***} (0.02)	-0.24^{***} (0.02)	-0.14^{***} (0.03)	-0.08^{**} (0.03)	-0.22^{***} (0.03)	-0.15^{***} (0.04)	-0.07^{**} (0.03)	-0.22^{***} (0.02)	-0.15^{***} (0.04)	0.02 (0.04)	0.03 (0.03)	-0.01 (0.05)	-0.01 (0.05)
Don't use gas as collateral	0.07***	0.08***	0.01	0.04*	0.08***	0.03	0.03	0.07***	0.03	-0.03	-0.04	0.03	0.02

Appendix II: Average poll responses by question and treatment group

Table 9: Levels and changes by indicator and treatment group

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		Control			Information	1	Info	. + Deliber	ation	Bal	ance	Diff-	in-Diff
	t = 0	t=1	Δ	t = 0	t=1	Δ	t=0	t=1	Δ	(4)-(1)	(7)-(1)	(6)-(3)	(9)-(3)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
H3: Direct distribution													
Give money to all	0.09^{***} (0.02)	0.14^{***} (0.01)	0.05^{**} (0.02)	0.05^{*} (0.03)	0.10^{***} (0.02)	0.04 (0.03)	0.06^{**} (0.03)	0.03 (0.02)	-0.04 (0.03)	-0.04 (0.04)	-0.03 (0.04)	-0.01 (0.04)	-0.09^{**} (0.04)
Give money to needy	0.24^{***} (0.02)	0.20^{***} (0.01)	-0.04^{*} (0.02)	0.19^{***} (0.02)	0.21^{***} (0.02)	0.01 (0.03)	0.24^{***} (0.02)	0.11^{***} (0.02)	-0.13^{***} (0.02)	-0.04 (0.03)	0.00 (0.03)	0.05 (0.04)	-0.09^{***} (0.03)
Cash transfers fight poverty	0.20^{***} (0.02)	0.22^{***} (0.01)	0.02 (0.02)	0.18^{***} (0.02)	0.20^{***} (0.02)	0.02 (0.03)	0.16^{***} (0.02)	0.15^{***} (0.02)	-0.01 (0.03)	-0.02 (0.03)	-0.04 (0.03)	-0.00 (0.04)	-0.03 (0.03)
Transfers $=$ nutrition	0.25^{***} (0.02)	0.22^{***} (0.01)	-0.03 (0.02)	0.24^{***} (0.03)	0.21^{***} (0.02)	-0.03 (0.03)	0.23^{***} (0.02)	0.17^{***} (0.02)	-0.07^{**} (0.03)	-0.01 (0.03)	-0.02 (0.03)	0.00 (0.04)	-0.04 (0.04)
Transfers = accountability	0.12^{***} (0.02)	0.17^{***} (0.01)	0.05^{**} (0.02)	0.14^{***} (0.03)	0.16^{***} (0.02)	0.03 (0.03)	0.14^{***} (0.02)	0.11^{***} (0.02)	-0.03 (0.03)	0.01 (0.03)	0.01 (0.03)	-0.02 (0.04)	-0.08^{**} (0.04)
Cash vs public services	-0.18^{***} (0.02)	-0.25^{***} (0.02)	-0.07^{***} (0.03)	-0.18^{***} (0.03)	-0.27^{***} (0.03)	-0.09^{**} (0.04)	-0.22^{***} (0.02)	-0.31^{***} (0.02)	-0.09^{***} (0.03)	-0.00 (0.04)	-0.04 (0.03)	-0.02 (0.05)	-0.02 (0.04)
Cash to child savings accts	0.22^{***} (0.02)	0.23^{***} (0.01)	0.01 (0.02)	0.21^{***} (0.02)	0.28^{***} (0.02)	0.07^{**} (0.03)	0.24^{***} (0.02)	0.19^{***} (0.02)	-0.05^{*} (0.03)	-0.02 (0.03)	0.01 (0.03)	0.06^{*} (0.03)	-0.06 (0.03)
Cash to retirement accts	0.16^{***} (0.02)	0.19^{***} (0.01)	0.03 (0.02)	0.19^{***} (0.02)	0.19^{***} (0.02)	-0.00 (0.03)	0.20^{***} (0.02)	0.15^{***} (0.02)	-0.05 (0.03)	0.03 (0.03)	0.04^{*} (0.03)	-0.03 (0.04)	-0.07^{**} (0.03)
H4: Spend on social services													
Roads not important	-0.38^{***} (0.01)	-0.34^{***} (0.01)	0.05^{***} (0.02)	-0.37^{***} (0.02)	-0.32^{***} (0.02)	0.06^{**} (0.03)	-0.34^{***} (0.02)	-0.32^{***} (0.01)	0.02 (0.02)	0.01 (0.02)	0.04^{*} (0.02)	0.01 (0.03)	-0.02 (0.03)
Infrastr. not important	-0.37^{***} (0.01)	-0.34^{***} (0.01)	0.04^{**} (0.02)	-0.38^{***} (0.02)	-0.32^{***} (0.02)	0.06^{***} (0.02)	-0.34^{***} (0.02)	-0.31^{***} (0.02)	0.04 (0.02)	-0.00 (0.02)	0.03 (0.02)	0.03 (0.03)	0.00 (0.03)
Health & educ. important	0.48^{***} (0.00)	0.48^{***} (0.00)	-0.00 (0.00)	0.47^{***} (0.01)	0.48^{***} (0.00)	0.01 (0.01)	0.47^{***} (0.01)	0.48^{***} (0.00)	0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.01 (0.01)	0.01 (0.01)

Table 9: Levels and changes by indicator and treatment group (continued)

		Control			Information	l	Info	. + Deliber	ation	Bal	ance	Diff-in-Diff	
	t = 0	t=1	Δ	t = 0	t=1	Δ	t = 0	t=1	Δ	(4)-(1)	(7)-(1)	(6)-(3)	(9)-(3)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Social services $=$ growth	0.48^{***} (0.00)	0.48^{***} (0.00)	-0.00 (0.00)	0.47^{***} (0.01)	0.48^{***} (0.00)	0.01 (0.01)	0.47^{***} (0.01)	0.48^{***} (0.00)	0.01 (0.01)	-0.01^{*} (0.01)	-0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Infrast. $=$ corruption	-0.07^{***} (0.02)	-0.07^{***} (0.02)	0.00 (0.03)	-0.04 (0.02)	-0.11^{***} (0.03)	-0.07^{*} (0.03)	-0.06^{**} (0.03)	-0.00 (0.03)	0.07^{*} (0.04)	0.03 (0.03)	0.00 (0.03)	-0.07 (0.04)	0.07 (0.05)
Social services vs infrastr.	0.17^{***} (0.02)	0.12^{***} (0.02)	-0.05^{*} (0.03)	0.21^{***} (0.03)	0.13^{***} (0.03)	-0.08^{**} (0.04)	0.13^{***} (0.03)	0.22^{***} (0.02)	0.10^{***} (0.03)	0.04 (0.04)	-0.04 (0.03)	-0.03 (0.05)	0.14^{***} (0.04)
H5: Transparency													
Publish contracts	0.33^{***} (0.01)	0.35^{***} (0.01)	0.02 (0.02)	0.31^{***} (0.02)	0.38^{***} (0.02)	0.06^{**} (0.03)	0.29^{***} (0.02)	0.37^{***} (0.02)	0.08^{***} (0.03)	-0.02 (0.03)	-0.03 (0.02)	0.05 (0.03)	0.06^{**} (0.03)
International oversight	-0.07^{***} (0.02)	0.06^{***} (0.02)	0.13^{***} (0.03)	-0.06^{**} (0.03)	-0.00 (0.03)	$0.05 \\ (0.04)$	-0.06^{**} (0.03)	0.13^{***} (0.02)	0.20^{***} (0.03)	0.01 (0.04)	0.01 (0.03)	-0.08^{*} (0.05)	0.07^{*} (0.04)
Don't entrust money to govt	-0.23^{***} (0.02)	-0.18^{***} (0.02)	0.06^{**} (0.03)	-0.23^{***} (0.02)	-0.15^{***} (0.02)	0.07^{*} (0.04)	-0.24^{***} (0.02)	-0.17^{***} (0.02)	0.07^{**} (0.03)	0.01 (0.03)	-0.00 (0.03)	0.01 (0.04)	0.01 (0.04)
H6: Knowledge													
Heard about gas?	0.40^{***} (0.01)	0.48^{***} (0.00)	0.07^{***} (0.01)	0.40^{***} (0.02)	0.49^{***} (0.00)	0.08^{***} (0.02)	0.41^{***} (0.02)	0.48^{***} (0.01)	0.07^{***} (0.02)	0.00 (0.02)	0.01 (0.02)	0.00 (0.02)	-0.01 (0.02)
Where is the gas?	-0.02 (0.03)	0.17^{***} (0.03)	0.17^{***} (0.02)	-0.01 (0.04)	0.23^{***} (0.03)	0.22^{***} (0.04)	0.04 (0.04)	0.35^{***} (0.02)	0.29^{***} (0.03)	0.00 (0.05)	0.05 (0.05)	0.05 (0.04)	0.13^{***} (0.04)
When was it found?	-0.07^{**} (0.03)	-0.02 (0.02)	0.04 (0.03)	-0.04 (0.04)	$0.03 \\ (0.03)$	0.07 (0.05)	-0.01 (0.03)	0.11^{***} (0.03)	0.11^{***} (0.04)	0.02 (0.05)	0.05 (0.04)	0.03 (0.05)	0.07 (0.05)
Is money already flowing?	-0.24^{***} (0.02)	-0.10^{***} (0.02)	0.14^{***} (0.03)	-0.24^{***} (0.03)	-0.03 (0.03)	0.21^{***} (0.05)	-0.18^{***} (0.03)	0.13^{***} (0.03)	0.31^{***} (0.04)	-0.00 (0.04)	0.06 (0.04)	0.07 (0.06)	0.17^{***} (0.05)
Is gas worth $>$ a hospital?	-0.04 (0.03)	0.18^{***} (0.02)	0.21^{***} (0.04)	-0.03 (0.04)	0.20^{***} (0.03)	0.23^{***} (0.05)	0.02 (0.04)	0.27^{***} (0.02)	0.23^{***} (0.04)	0.01 (0.05)	0.06 (0.05)	0.03 (0.06)	0.03 (0.06)
ten hospitals?	0.21***	0.36***	0.11***	0.30***	0.40***	0.11***	0.27***	0.36***	0.13***	0.08*	0.06	0.01	0.02

Table 9: Levels and changes by indicator and treatment group (continued)

		Control			Information	1	Info	+ Delibera	ation	Bal	ance	Diff-	in-Diff
	t = 0	t=1	Δ	t = 0	t=1	Δ	t = 0	t=1	Δ	(4)-(1)	(7)-(1)	(6)-(3)	(9)-(3)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	(0.04)	(0.01)	(0.03)	(0.03)	(0.02)	(0.04)	(0.04)	(0.02)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
the entire gov't budget?	-0.32^{***} (0.03)	-0.30^{***} (0.02)	-0.00 (0.04)	-0.30^{***} (0.04)	-0.30^{***} (0.03)	0.04 (0.06)	-0.34^{***} (0.03)	-0.31^{***} (0.02)	0.02 (0.05)	0.02 (0.05)	-0.02 (0.04)	0.04 (0.07)	0.02 (0.06)
the entire nat'l economy?	-0.31^{***} (0.04)	-0.32^{***} (0.02)	-0.07 (0.06)	-0.38^{***} (0.04)	-0.36^{***} (0.03)	0.05 (0.08)	-0.35^{***} (0.03)	-0.34^{***} (0.03)	-0.03 (0.06)	-0.07 (0.05)	-0.04 (0.05)	0.12 (0.10)	0.04 (0.08)
How much if divided equally?	-0.41^{***} (0.01)	-0.34^{***} (0.01)	0.08^{***} (0.02)	-0.42^{***} (0.02)	-0.32^{***} (0.02)	0.11^{***} (0.03)	-0.40^{***} (0.02)	-0.30^{***} (0.02)	0.10^{***} (0.03)	-0.01 (0.02)	0.02 (0.02)	0.03 (0.03)	0.02 (0.03)

Table 9: Levels and changes by indicator and treatment group (continued)

All variables are rescaled so that the midpoint, representing indifference, is zero. The range of each variable is one, extending from -0.5 to 0.5. Column 1 shows the average value for the control group of each indicator in the baseline survey, and column 2 for the follow-up survey. Column 3 shows the change between periods. Columns 4 to 6 repeat this for the information only treatment group, and columns 7 to 9 for the group assigned to information plus deliberation. Columns 10 and 11 report balance tests at baseline. Columns 12 and 13 report difference-in-differences, comparing changes over time in each treatment group to changes in the control group. Standard errors, clustered at the village level, are reported in parentheses.

Appendix III: Measuring household socio-economic status

Household consumption is the basis for official poverty and inequality estimates in Tanzania. To measure the socio-economic status of our poll respondents, we rely on a predicted measure of household consumption expenditure, using sixty-four consumption predictors in our poll data. These sixty-four predictors are based on questions borrowed from the questionnaire for Tanzania's National Panel Survey (NPS round 2, 2010/11), a nationally representative household survey conducted by Tanzania's National Bureau of Statistics to produce poverty estimates.

We constructed our consumption prediction as follows:

- 1. As preparation for the poll, we used the existing NPS data to perform a stepwise regression of consumption on dozens of candidate predictors. Our consumption measure is the natural logarithm of total household consumption per annum per adult equivalent, measured in 2011 PPP dollars (henceforth C). Questions were selected for inclusion in the poll based on their predictive power in the stepwise regression and the ease of administering them in the field.
- 2. We use the final set of sixty-four indicators that overlap between the NPS and the poll to fit a simple regression model of C in the NPS data. The regression is performed at the level of the individual household member, with a sample size of 9,015 individuals, and predictors are a combination of household and individual characteristics. Results are shown in Table 10. The R-squared of the model is fairly high, at 0.64. Inevitably, the variance of the predicted values (0.61) is somewhat lower than the actual consumption data (0.73), but as seen in Figure 4a, the distributions correspond fairly closely.
- 3. Finally, we apply the regression parameters from the model of C in the NPS data to the individuals in the polling data, generating our measure of predicted consumption, \hat{C} . As seen in Figure 4b, the distribution of \hat{C} in the polling data corresponds quite closely to the distribution of \hat{C} in the NPS sample, suggesting the poll achieved a relatively representative national sample and that questions were administered and understood consistently across the two samples. The mean and standard deviation of \hat{C} are 6.9 and 0.61 in the NPS sample and 6.8 and 0.57 in the poll data.

In the main text we refer to this measure of \hat{C} simply as 'consumption.'

	Sample (Standard e	mean deviation)	Regression coefficient (Standard error) NPS sample (3)	
	NPS sample (1)	Poll sample (2)		
	(1)	(2)	(3)	
	Consumption	poll	chat	
Adult equivalents in household	5.151	4.791	-0.0867	
	(3.148)	(2.342)	(0.00833)	
Total household members	6.264	5.802	-0.0114	
	(3.890)	(2.792)	(0.00666)	
Occupation: Paid employee	0.110	0.0562	-0.110	
	(0.313)	(0.230)	(0.0403)	
Occupation: Self-employed, employees	0.0144 (0.119)	0.0544 (0.227)	0 (.)	
Occupation: Self-employed, no employees	0.0837 (0.277)	$0.235 \\ (0.424)$	-0.150 (0.0409)	
Occupation: Unpaid family helper (non-ag)	0.0539	0.0392	-0.158	
	(0.226)	(0.194)	(0.0428)	
Occupation: Unpaid family helper (ag)	0.151	0.120	-0.269	
	(0.358)	(0.325)	(0.0403)	
Occupation: Own farm or shamba	0.204	0.265	-0.264	
	(0.403)	(0.442)	(0.0399)	
Occupation: None	0.383	0.231	-0.278	
	(0.486)	(0.421)	(0.0389)	
Able to read/write	0.782	0.822	0.00449	
	(0.413)	(0.382)	(0.0224)	
Education: None	0.178	0.110	-0.746	
	(0.383)	(0.314)	(0.0573)	
Education: Less than a year	0.00568	0.00720	-0.750	
	(0.0752)	(0.0846)	(0.0815)	
Education: Std I	0.0169	0.0163	-0.776	
	(0.129)	(0.127)	(0.0641)	

Table 10: Consumption predictors

	Sample (Standard	Regression coefficient (Standard error)		
	NPS sample (1)	Poll sample (2)	NPS sample (3)	
Education: Std II	0.0199	0.0271	-0.744	
	(0.140)	(0.162)	(0.0621)	
Education: Std III	0.0447	0.0403	-0.734	
	(0.207)	(0.197)	(0.0565)	
Education: Std IV	0.0201	0.0154	-0.728	
	(0.140)	(0.123)	(0.0612)	
Education: Std V	0.0227	0.0127	-0.782	
	(0.149)	(0.112)	(0.0603)	
Education: Std VI	0.476	0.587	-0.718	
	(0.499)	(0.492)	(0.0524)	
Education: Std VII	0.00311	0.00256	-0.647	
	(0.0557)	(0.0506)	(0.0962)	
Education: Std VIII	0.0123	0.00986	-0.607	
	(0.110)	(0.0988)	(0.0656)	
Education: Primary + Course	0.0113	0.0109	-0.687	
	(0.105)	(0.104)	(0.0669)	
Education: Form I	0.0314 (0.174)	0.0279 (0.165)	-0.656 (0.0576)	
Education: Form II	0.0289 (0.168)	0.00799 (0.0890)	-0.664 (0.0581)	
Education: Form III	0.0766	0.0807	-0.587	
	(0.266)	(0.273)	(0.0539)	
Education: Form IV	0.0197	0.0214	-0.515	
	(0.139)	(0.145)	(0.0604)	
Education: Form IV + Course	0.00495 (0.0702)	0.00355 (0.0595)	-0.505 (0.0823)	
Education: Form V	0.00630	0.00128	-0.475	
	(0.0791)	(0.0358)	(0.0766)	

	Sample (Standard	Sample mean (Standard deviation)		
	NPS sample (1)	Poll sample (2)	NPS sample (3)	
Education: Form VI	0.00253	0.00197	-0.406	
	(0.0502)	(0.0444)	(0.104)	
Education: Form VI + Course	(0.00566) (0.0750)	(0.0711) (0.00700 (0.0834)	-0.318 (0.0789)	
Education: Ordinary diploma	0.00274	0.00246	-0.267	
	(0.0523)	(0.0496)	(0.103)	
Education: University	0.00234	0	-0.252	
	(0.0484)	(0)	(0.110)	
Resides: Dodoma region	0.0445	0.0489	-0.103	
	(0.206)	(0.216)	(0.0249)	
Resides: Tanga region	0.0425	0.0988	-0.0467	
	(0.202)	(0.298)	(0.0238)	
Resides: Morogoro region	0.0494	0.0499	0.129	
	(0.217)	(0.218)	(0.0222)	
Resides: Pwani region	0.0250 (0.156)	0.0493 (0.217)	0.231 (0.0303)	
Resides: Dar region	(0.200) 0.0967 (0.296)	(0.297)	0.479	
Resides: Mtwara region	(0.135) 0.0315 (0.175)	(0.218) (0.218)	0.0120 (0.0271)	
Resides: Ruvuma region	0.0324	0.0502	-0.0673	
	(0.177)	(0.218)	(0.0271)	
Resides: Mbeya region	0.0630	0.149	0.0657	
	(0.243)	(0.357)	(0.0202)	
Resides: Kigoma region	0.0381	0.0994	-0.0880	
	(0.192)	(0.299)	(0.0254)	
Resides: Shinyanga region	0.0891	0.0491	-0.0184	
	(0.285)	(0.216)	(0.0180)	

	$\operatorname{Sample}(\operatorname{Standard})$	Sample mean (Standard deviation)		
	NPS sample (1)	Poll sample (2)		
Resides: Mwanza region	0.0829	0.0984	0.0666	
	(0.276)	(0.298)	(0.0183)	
Resides: Manyara region	0.0300	0.0493	-0.0822	
	(0.171)	(0.217)	(0.0276)	
Owns: mobile phone	1.261	1.617	0.109	
	(1.448)	(1.416)	(0.00449)	
Owns: hoes	2.874	2.739	0.0330	
	(2.600)	(2.357)	(0.00251)	
Owns: plough	0.127	0.170	0.121	
	(0.546)	(0.560)	(0.0123)	
Owns: livestock	6.912	7.432	0.00192	
	(25.37)	(16.68)	(0.000262)	
Cook with electricity	0.00194	0.000739	0.347	
	(0.0440)	(0.0272)	(0.103)	
Cook with charcoal	0.242	0.310	0.144	
	(0.428)	(0.463)	(0.0144)	
Shelter roof: mud/grass	0.0474	0.00370	0.0615	
	(0.212)	(0.0607)	(0.0245)	
Shelter roof: metal	0.657	0.734	0.133	
	(0.475)	(0.442)	(0.0117)	
Shelter roof: asbestos	0.00163	0.000493	0.109	
	(0.0404)	(0.0222)	(0.111)	
Toilet: None	0.119	0.0223	-0.0333	
	(0.324)	(0.148)	(0.0152)	
Toilet: VIP	0.0290	0.0152	0.142	
	(0.168)	(0.122)	(0.0286)	
Toilet: Flush	0.114	0.186	0.117	
	(0.317)	(0.389)	(0.0171)	

	${ m Sample}$	Sample mean (Standard deviation)		
	NPS sample (1)	Poll sample (2)	NPS sample (3)	
Lighting: gas	0.000534	0.00153	-0.470	
Lighting: lamp oil	0.687	0.274	-0.136	
Lighting: candle	(0.464) 0.00607	(0.446) 0.00696	(0.0117) -0.0553	
Lighting: firewood	(0.0777) 0.0138	(0.0831) 0.00651	(0.0594) -0.177	
Consumed: meat and fish	(0.117) 2.891	(0.0805) 1.902	(0.0431) 0.0371	
	(2.281)	(2.105)	(0.00219)	
Consumed: milk products	(2.697)	(2.307)	(0.0237) (0.00188)	
Consumed: sugars	4.740 (3.021)	3.910 (3.090)	0.0351 (0.00183)	
Consumed: fruits	2.013 (2.572)	2.321 (2.667)	0.0230 (0.00191)	
Hunger during a week	1.656 (0.475)	0.395 (0.489)	0.0657 (0.0101)	
Constant	()	()	7.405 (0.0728)	
R-squared			0.64	

Column 1 reports the mean of each variable in the NPS sample, with standard deviations in parentheses. Column 2 reports the same statistics for the poll sample. Column 3 reports coefficients on these same variables from a regression of log household consumption per adult equivalent per annum (in 2011 PPP dollars) using the NPS data. The set of independent variables consists of demographic and other indicators that were measured in both the NPS and the polling data at baseline.





(a) Actual vs. predicted consumption in the NPS data

(b) Predicted consumption in the NPS data vs. polling sample

