Final report

International Growth Centre

On the mechanics of the political resource curse

Behavioral measurements of information and local elite behaviour in Mozambique

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Behavioral measurements of information and local elite behaviour in Mozambique

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Summary

Mozambique discovered substantial natural resources in recent years, drawing a considerable amount of enthusiasm from international players. The US Energy Information Administration (EIA) names Mozambique as “one of the most promising countries in Africa in terms of natural gas and coal resources”. Yet being a recent democracy with relatively weak institutions and limited media independence, Mozambique faces a considerable risk of resource and revenue mismanagement in the future.

In this context, it is crucial to understand the roots of the natural resource curse: the frequently observed decrease in income following a resource boom. The resource curse is often linked to political economy mechanisms. Two prominent channels are (1) generalized movements towards rent-seeking (decentralized) and (2) the deterioration of public policies by corrupt politicians (centralized).

We distinguish between these theories in the case of Mozambique, where a substantial discovery of natural gas recently took place in the Rovuma Basin. The area is located off the northern coast of Mozambique, in the Northern Province of Cabo Delgado. This province is characterized by a significant amount of natural resources and shares a number of demographic and political features, not only with the rest of Mozambique, but additionally with other countries that remain primarily rural, and that stand to change dramatically with newly exploited natural resources. In this sense, research in this context is extremely valuable in providing critical policy lessons that can be applied to many other countries.

Using a baseline survey collected in 2016, we observed that, despite the availability of different media for learning about the news of the province (namely radio, and family and friends), villagers in Cabo Delgado were characterized by a lack of information about natural resources and about the discovery of natural gas. Knowledge about the discovery was found to be closely related to demographic characteristics: women, younger individuals, less educated household heads, individuals living in smaller households, and lower income individuals had a lower probability of being aware of the discovery.

Following the baseline survey, we designed and implemented a large-scale randomized field experiment to follow the dissemination of information about the management of the newly-discovered resources. We designed three treatments, one with information for local leaders, one with information to both citizens and local leaders, and one that adds citizen deliberation activities to information. 206 communities were randomly chosen to receive one of these interventions or no intervention at all. The random allocation of communities to different groups guarantees that each group is statistically identical ex-ante. We performed extensive analysis to check that the randomization procedure achieves a good balance on a wide series of household and village characteristics.

For the purpose of establishing the impact of these initiatives, the project introduced an innovative set of measurements of outcomes related to both villagers’ and local elites’ behaviour. We measured a variety of outcomes through surveys, behavioural activities, and lab in the field experiments. At follow-up, we find that information given to leaders increases elite capture and rent-seeking, while information/deliberation given to citizens increase mobilization and accountability-related outcomes. We conclude that the mechanism centred on politician behaviour is most likely to be in action.

Table of Contents

ACKNOWLEDGEMENTS **2**

SUMMARY **3**

TABLE OF CONTENTS **4**

FIGURES **5**

TABLES **5**

ABBREVIATIONS AND ACRONYMS **6**

INTRODUCTION **7**

1 INTERVENTION, THEORY OF CHANGE AND RESEARCH HYPOTHESES **9**

1.1 THE INTERVENTION 9

1.2 THEORY OF CHANGE 11

1.3 HYPOTHESES 13

2 CONTEXT **14**

3 EVALUATION: DESIGN, METHODS AND IMPLEMENTATION **15**

3.1 SAMPLING AND RANDOMIZATION 15

3.2 MEASUREMENT 17

3.2.1 Surveys *17*

3.2.2 Structured community activities *17*

3.2.3 Lab in the field experiments *19*

3.3 EMPIRICAL STRATEGY 21

4 PROGRAMME OR POLICY: DESIGN, METHODS AND IMPLEMENTATION **21**

4.1 THE INFORMATION PACKAGE 21

4.2 COMMUNITY MEETINGS 24

4.3 DELIBERATION TREATMENT 25

5 TIMELINE **26**

6 IMPACT ANALYSIS AND RESULTS OF THE KEY EVALUATION QUESTIONS **26**

6.1 INFORMATION 26

6.2 ELITE CAPTURE 28

6.3 RENT-SEEKING 29

6.4 CITIZEN MOBILIZATION, TRUST, AND ACCOUNTABILITY 30

7 DISCUSSION **32**

APPENDIX. SAMPLE DESIGN **42**

APPENDIX. SURVEY INSTRUMENTS **45**

APPENDIX. PRE-ANALYSIS PLAN **47**

APPENDIX. SAMPLE SIZE AND POWER CALCULATIONS **58**

APPENDIX. DESCRIPTIVE STATISTICS **60**

REFERENCES **63**

Figures

FIGURE 1 – THEORY OF CHANGE 11
FIGURE 2 – SELECTED COMMUNITIES AND ALLOCATION TO TREATMENT GROUPS 16
FIGURE 3 – THE INFORMATION FLYER 22
FIGURE 4 – SOME MOMENTS DURING THE COMMUNITY MEETINGS 24
FIGURE 5 – TIMELINE OF ACTIVITIES 26
FIGURE 6 – SELECTED DISTRICTS WITHIN MOZAMBIQUE AND WITHIN CABO DELGADO 42
FIGURE 7 – DISTRIBUTION OF VOTERS IN SAMPLED POLLING STATIONS AND ALL STATIONS 43
FIGURE 8 – GEOGRAPHIC DISTRIBUTION OF POLLING STATIONS 44
FIGURE 9 – POWER CALCULATIONS 58

Tables

TABLE 1 – A COMPARISON BETWEEN MOZAMBIQUE AND OTHER AFRICAN COUNTRIES 15
TABLE 2 – LEADERS' AWARENESS AND KNOWLEDGE OF THE NATURAL GAS DISCOVERY 34
TABLE 3 – CITIZENS' AWARENESS AND KNOWLEDGE OF THE NATURAL GAS DISCOVERY 35
TABLE 4 – CITIZENS' AWARENESS AND KNOWLEDGE OF THE NATURAL GAS DISCOVERY 36
TABLE 5 – ELITE CAPTURE 37
TABLE 5 – RENT-SEEKING AMONG LOCAL LEADERS 38
TABLE 6 – RENT-SEEKING AMONG CITIZENS 39
TABLE 7 – CITIZEN'S MOBILIZATION 40
TABLE 8 – DISTRIBUTION OF AVAILABLE AND SAMPLED POLLING STATIONS BY STRATA 43
TABLE 9 – OUTCOMES MEASURED USING SURVEY DATA 55
TABLE 10 – OUTCOMES MEASURED USING THE SCAS 56
TABLE 11 – OUTCOMES MEASURED USING BEHAVIOURAL GAMES 56
TABLE 12 – OUTCOMES MEASURED USING ELECTORAL DATA 57
TABLE 13 – OUTCOMES MEASURED USING QUALITATIVE DATA 57
TABLE 14 – MINIMUM DETECTABLE EFFECTS 59
TABLE 15 – DESCRIPTIVE STATISTICS 61
TABLE 16 – CORRELATES OF AWARENESS AT BASELINE 62

Abbreviations and acronyms

ASPACADE	Provincial Association of Paralegals
BDM	Becker-DeGroot-Marschak
EIA	US Energy Information Administration
EITI	Extractive Industry Transparency Initiative (EITI)
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
INE	National Statistics office of Mozambique
MPCR	Marginal per-capita return
LNG	Liquefied Natural Gas
NR	Natural Resources
OLS	Ordinary Least Squares
PG	Public Good Game
RS	Rent-seeking Game
SCA	Structured Community Activity
UNDP	United Nations Development Programme
USD	United States Dollars
UPC	Provincial Farmer's Union
WTP	Willingness to pay

Introduction

Since Adam Smith's Wealth of Nations, which contains a number of unfavourable references to mining activities, economists have been wary of potential problems arising from the exploration of natural resources. Gelb (1988) and Auty (1993) were the first to propose the term resource curse: both looked at mineral windfalls and presented a series of case studies from a macroeconomic perspective, with a strong emphasis on the contraction of traded sectors, i.e., the Dutch Disease. Then, African countries such as Nigeria, Angola, and Sierra Leone, rich in oil and diamonds, became prominent cases in the 1990s. These cases contributed to the argument in the cross-country empirical literature that the resource curse was also related to political economy mechanisms involving widespread corruption (Treisman, 2000) and civil conflict (Collier and Hoeffler, 2004).

In this paper, we focus on political economy mechanisms of the resource curse. We consider effects in face of news regarding the discovery of resources, i.e., the anticipation of a major resource windfall. We distinguish between two prominent mechanisms. One predicts that a generalized movement towards rent seeking will emerge in the economy, at the expense of more productive activities (Tornell and Lane, 1999; Baland and Francois, 2000; Torvik, 2002). The other anticipates that, after news of the resource discovery, politicians will be more interested in securing political power, and as a consequence, will engage in corruption and inefficient policies such as clientelism (Robinson et al., 2006), with negative consequences for the economy. While the first mechanism does not explicitly mention politicians, the second puts them at the centre of action. We endeavour to distinguish between these political economy mechanisms of the resource curse by analysing reactions to a resource discovery at the local level. We are particularly interested in observing the behaviour of local politicians.

We employ a large-scale randomized field experiment conducted in Northern Mozambique in 206 communities, after a massive discovery of natural gas in the region (in the Rovuma basin, Cabo Delgado province). This discovery was labelled as the largest worldwide in many years. We follow the dissemination of information about the management of natural resources at the community level. These efforts were sponsored by a large coalition of governmental and non-governmental organizations, active in the international, national, and local arenas. We designed three specific interventions at the community level in this context: in the first, the information module was only delivered to local leaders; in the second, it was delivered to both local leaders and citizens; and in the third, the information module targeting both leaders and citizens was accompanied by the organization of deliberation meetings by citizens where public policy priorities for the community were discussed (in relation to the future windfall from natural gas).

In our experiment, we designed a wide range of measurement instruments including surveys, behavioural activities or structured community activities (SCAs), following Casey et al. (2012), and lab in the field experiments. We group our outcome measures in four sets. The first set is related to information/awareness outcomes on natural resources. These are based on surveys questions, administered to both local leaders and citizens, for which we typically have both baseline and end line information. The second set concerns outcomes depicting elite capture (by local leaders). These are centred on behavioural measurements, including SCAs on the use of resources meant for the community (zinc sheets for roof construction, funds for meetings), the appointment of a community taskforce, and leader behaviour in a trust game.

The third set connects to rent- seeking by leaders and citizens. This relies primarily on an SCA eliciting willingness to engage in rent-seeking, with a comparison term related to entrepreneurship, and a novel rent-seeking game. Finally, the fourth set links to mobilization, trust, and the demand for political accountability by citizens. The outcomes on mobilization are grounded on survey questions related to social capital, a matching grants SCA, behaviour related to community meetings, and a public goods game. The outcomes on trust and accountability are based on survey questions and citizen behaviour in the trust game.

We find clear positive effects of the community-level treatments on awareness and knowledge about the natural gas discovery. Citizens become optimistic regarding the future benefits of the discovery for their communities and households. Important, we identify impacts on increasing elite capture, when information is given to local leaders only. This appears in terms of leaders' attitudes in favour of corruption, misuse of funds for public purposes, and less meritocratic appointments of community members for public service. For instance, we find 29 percentage points leakage on leader funds for a community activity. We also observe increases in rent-seeking activities by citizens when information is given to leaders only. This emerges for reported contacts with influential people, but also in the bidding for meetings with district administrators. These may denote movements by those close to leaders, consistently with the effects on elite capture. Finally, we report that community-level treatments increased citizen mobilization, trust at different levels, voice/accountability at different levels, and decreased the likelihood of violence. We conclude that our patterns of effects are more consistent with a curse mechanism centred on politician mis-behaviour, possibly countered by improvements in accountability, than one based on generalized movements towards rent-seeking.

Our study relates to the vast literature on the natural resource curse, defined by Caselli and Cunningham (2009) as a decrease in income following a resource boom. The theory of the Dutch Disease was one of the first put forward to explain the resource curse. It proposed that resource booms shift inputs away from manufacturing (towards non-tradeables), and subsequently, to a curse through negative knowledge externalities in manufacturing. These ideas date back to at least Corden and Neary (1982). Our empirical knowledge of the resource curse is more recent. Sachs and Warner (1999) were the first to identify a negative relationship between GDP growth and exports of natural resources in cross-country data.

Several related models of the resource curse have been proposed which identify the resource curse with an increased propensity for rent-seeking. Tornell and Lane (1999) suggest that a windfall can increase interest group capture of fiscal redistribution; lower growth can follow through a move towards the (inefficient) informal sector. Baland and Francois (2000) propose a multiple equilibrium framework, in which a resource boom could lead to more rent-seeking (instead of entrepreneurship), depending on the initial equilibrium. Torvik (2002) introduces a simple model with rent-seeking and entrepreneurship and argues that, with a demand externality, a resource boom leads to lower welfare. This is generally the case for this family of models, and for models of Dutch Disease: an externality needs to be assumed to explain the resource curse.

More recently, Mehlum et al. (2006) showed that the negative relationship encountered by Sachs and Warner only held for countries with low-quality institutions. Building on this finding, Robinson et al. (2006) proposed a new theory of the resource curse, based on a political mechanism: in face of a resource discovery, and when institutional quality is poor, namely in

terms of political accountability, politicians are likely to enact inefficient policies that increase the likelihood that they remain in power (and benefit from resource rents). Vicente (2010) tests this assertion more specifically than Mehlum et al. by analysing patterns of change in perceived corruption after an oil discovery in the island-country of Sao Tome and Principe. He finds that vote-buying increased significantly after that discovery by using Cape Verde as a control group.

More recent empirical work has been devoted to the understanding of specific settings where natural resources are being explored. The case of oil in Brazil has inspired a number of contributions. Caselli and Michaels (2013) analyse impacts of oil on the structure of local income at the municipality level. They find no evidence of the resource curse. However, they find no significant changes in the quality of public good provision either, despite major increases in the revenues of local governments. Brollo et al. (2013) study the effect of these additional revenues on political corruption and on the quality of politicians. They show that larger transfers increase observed corruption and result in less educated mayoral candidates. In the context of Peru, Aragon and Rud (2013) examine the local impact of a large gold mine. They find evidence of a positive effect of the mining sector's demand for local inputs on real income.

Closely related to our experiment in Mozambique are three other contributions. First, our information and deliberation campaign is inspired by the model of Humphreys et al. (2006), who were the first to implement a large scale deliberative exercise related to the management of natural re- sources, with the Earth Institute at Columbia University, in the country of Sao Tome and Principe in 2004. Second, we are endowed with some knowledge about the impact of large-scale civic education campaigns in Mozambique, through the work of Aker et al. (2017) on political participation. Finally, recent work by Toews et al. (2016) shows positive impacts, namely in terms of job creation, of resource-induced FDI in Mozambique, while employing household and firm-level data.

1 Intervention, theory of change and research hypotheses

1.1 The Intervention

The intervention we are evaluating consists of a large information and deliberation campaign about the management of natural resources in the Province of Cabo Delgado, focusing on the recent natural gas discoveries. A large coalition of international, national, and local institutions, both governmental and non-governmental, sponsored the campaign. This group included the provincial government of Cabo Delgado, the Aga Khan Foundation, an international NGO with a strong presence in Cabo Delgado province, the Mozambican chapter of the Extractive Industry Transparency Initiative (EITI), two prominent national NGOs (the Christian Council and the Islamic Council of Mozambique), one university (the Catholic University of Mozambique), one newspaper (@Verdade), and two local NGOs (UPC, the provincial farmers' union, and ASPACADE, the provincial association of paralegals). In collaboration with our partners, the information and deliberation campaign was submitted at the community level. There were three types of campaigning.

The first group of communities (Treatment 1 - Information to Leaders) had the information module about natural resources and its management provided to the village leaders only. In

Mozambique, these individuals are well-defined figures in each community. We targeted the higher-ranked representative of the Government within each community. In rural communities, these are known as village chiefs (*chefes de aldeia*), and in urban settlements as neighbourhood chiefs (*secretarios de bairro*). Both types of leader are typically elected by the community, even though the ruling party can strongly influence such outcome. Their competences are mainly related to conflict resolution, land allocation, and formal ceremonies. They also influence the allocation of aid, employment and public programs, such as Government funding towards small entrepreneurs ('7 *milhes*' rural development program).

The other groups of communities were as follows. The second group of communities (Treatment 2 - Information to Leaders and Citizens) had the information about natural resources and its management provided to both the leaders and the citizens. Community meetings and door-to-door contact were implemented for this purpose in each community. The third group of communities (Treatment 3 - Information to the Leaders and the Citizens plus Deliberation) had the same intervention as communities in Treatment 2 plus a deliberation module. This module started with the formation of small citizen committees of around 10 people. Each group was then invited to meet and to deliberate on priorities for the local spending of natural resource revenues.

The information being distributed started by defining natural resources and the legal rights of the population in face of its exploration (various laws related to land, mines, forests, and fishing). This was a pre-condition for understanding, as the concept of natural resources was not present in many communities. The campaign then gave details about the discovery of natural gas in Cabo Delgado, including plans for exploration, and the implications for local communities. The final content of the information package was discussed and approved by all sponsoring organizations involved in the project, in order to guarantee widespread support and maintain neutrality.[1] Importantly, the information provided underlined the expected size of the natural gas windfall, with significant positive implications for provincial government revenues and job creation.

Due to the low level of literacy in our context, treatments in this experiment focus on verbal communication methods to deliver information. They included:

(i) Explanation in local language of the information content by trained facilitators. This was done either individually targeting leaders, or in the context of community meetings (for Treatments 2 and 3);

(ii) (Live presentation of a community theatre, played by a team of three actors. The play represents a traditional family discussing the management of natural resources after hearing the news about the discovery of natural gas on the radio. The script was written by a local theatre company in collaboration with the research team, and was meant to communicate the contents of the information package in an informal manner[2];

(iii) Distribution of a three-fold pamphlet designed in collaboration with a local artist. The pamphlet is mostly visual and has the main takeaways of the information

[1] The full information manual is available upon request from the authors.
[2] The script of the theater is available upon request from the authors.

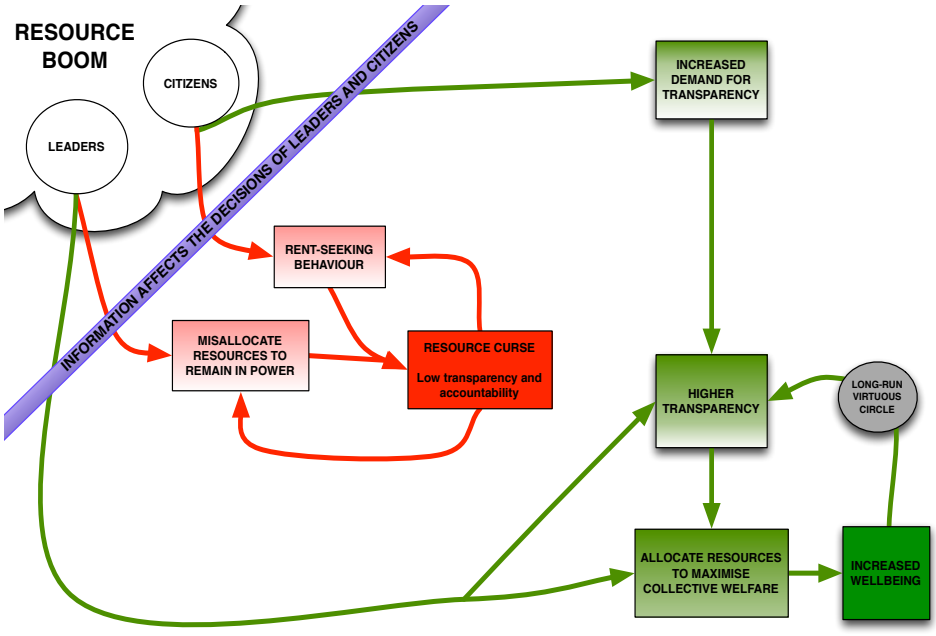
package. This leaflet was hand-delivered in each treatment community to the leader (for groups 1, 2 and 3) and to the community members (for groups 2 and 3).

1.2 Theory of Change

In this section, we discuss the theory of change behind the intervention that is subject of the study. The central assumption behind our theory of change is that if constituents were better informed about the inner workings of extractives governance, and they have ways to deliberate publicly, they would identify and communicate grievances, make claims on the relevant institutions, and demand better development and use of resources. Note that the ability to undertake public deliberation is likely to be a crucial element of the mechanism for change we plan to document in this study.

From this starting point, the proposed causal pathway begins with an intervention consisting of (1) distributing information in areas affected by resource extraction. The hypothesized primary effect of this intervention is (2) increased awareness and literacy in matters of natural resource development. Observing the current high level of opacity in the extractive sector in Mozambique, we believe that this awareness, helped by ways to deliberate publicly, will ultimately yield (3) an increased and sustained demand for accountability and transparency, such that these resources benefit communities. In our model, this demand should ultimately translate to (4) improved accountability and transparency, based on politicians' need to be re-elected or be reappointed. Lastly, transparency and accountability will (5) improve natural resource governance as elected and appointed leaders more consistently maximize the social utility of public resources. Figure 1 presents a graphic representation of this theory of change.

Figure 1 – Theory of Change



Note: we represent positive outcomes in green and negative outcomes in red.

Our interest in information campaigns presupposes two factors needed to make it viable. The most central assertion is that individuals and households have an interest in understanding

issues related to the management of natural resources. We also assume sufficient households are literate and able to process effectively the information they receive on this topic. We expect that information provided with deliberation mechanisms can increase the willingness of common citizens to contribute in public good provision, or to increase the sense of social cohesion of these communities. Just information is unlikely will lead to an improved sense of the common good. Still, we will test both possibilities by running public good games as measurement instruments for the full sample in our study.

Assuming that communities have heterogeneous and incomplete information about natural resource revenues is a reasonable assumption in a country like Mozambique, where corruption is high and the quality of governance of natural resources is low. Whether communities use benefits from natural resources properly and end up in a positive path, with investment of windfalls in activities that maximize social welfare, or in a vicious cycle, with rent-seeking activities and corruption, will depend to a great extent on the interaction between leaders and villagers within a given community.

In our theory of change the transformation of increased awareness and literacy on the issue into greater demand for transparency is founded on two hypotheses about political participation in Mozambique. The first and stronger hypothesis is that individuals receiving the treatment have established means of making claims on government institutions and officials (local leaders). The second and weaker hypothesis is that armed with the deliberation mechanism that will be provided in one of the treatment arms, they will be able to make the claims on local leaders.

The link between local communities' engagement (through information and deliberative meetings) to national policy is made through sustained bottom-up pressure of citizens and civil society groups, and through voting. Up to some extent, the national leaders and political representatives are ultimately vulnerable in face of a public engaged and interested in the issue. The information to be channelled to the population in our study will have a strong local dimension: this information will include details of the timing and sequence of the extraction of natural gas in the Rovuma basin, the plans for building new infrastructures in the region by the government and by private stakeholders, the redistribution plan for public revenues at the local level, and intended corporate social responsibility initiatives by the natural gas multinationals in the region. Even though our experimental design is not suited to analyse the national impact of the interventions we study, we will be able to assess at least qualitatively this impact.

Based on an increased demand for transparency from a more informed public, we expect that transparency and accountability increase. This result is founded on the inherent vulnerability of a politician or a bureaucrat in the face of an engaged public. An individual in such a position that wishes to maintain their office, reputation, or authority will respond, at least in part, to their constituents' demands for better resource management. This station in our theory of change may be problematic when considering some cases, as politicians in highly centralized, one-party, or autocratic governments may not derive authority from a public vote, and therefore bear little personal interest in what the public demands. In the case of Mozambique this is relevant although not critical; the multi-party voting system remains semi-democratic at worst, despite high levels of corruption.

To support our assumption no the link between demand for transparency from a more informed public is supported by the fact that the demand of information about natural resource

management in local communities is expected to be high. We do not have direct evidence on the receptivity of the local communities in Cabo Delgado to information on the extractive industry, as no specific survey is available. However, in the 2014 Gas Master Plan, the Government of Mozambique identifies the provision of information and the management of expectations within local communities as one of the pillars of the plan. The fact that the Government of Mozambique is underlying the importance of informed communities in a strategic document provides support for the potential and centrality of demand for information about revenue expenditures in affected communities, like Cabo Delgado. This demand is expected to become more salient along with the development of the sector, as socio-economic impacts are usually stronger near the area of exploitation (Aragon et al. 2015). In addition, another study in São Tomé and Príncipe provides support for the large potential of information demand following the discovery of a new natural resource exploitation possibility. Humphreys et al. (2006) report on a National Forum conducted in Sao Tome and Principe after an important oil discovery in that country. This National Forum consisted of community meetings in the whole country on the management of natural resources in the country with a strong deliberation aspect. Approximately 3,500 citizens participated in these meetings, which correspond to 2.2% of the population of country. Personnel of The Earth Institute at Columbia University, with institutional support from the government, organized these meetings. We expect the same kind of adherence to the interventions we plan to follow.

In the scenario where on top of information villagers also have deliberation power, the leader would have limited ability to misallocate resources as citizens deliberate decisions. In this case, the disincentives to rent-seeking behaviour are expected to be higher than the incentive for a more transparent management, where everybody would benefit from. We will be particularly careful of the type of information channelled to citizens and the types of deliberation process put in place. Different issues need to be taken into account. Recent research on aspiration has shown that there is a positive change in individual's aspiration when confronted with cases of success from other people in similar circumstances (Bernard et al., 2014). Moreover, deliberation processes may still be subject to elite capture, as shown by Humphreys et al. (2006) in the context of the oil boom in Sao Tome and Principe.

The last result in our model is the improvement of natural resources governance and governance overall. As a longer-term process, this is dependent on sustained bottom-up pressure of citizens and civil society groups.

1.3 Hypotheses

Following Caselli and Cunningham (2009), we distinguish between centralized and decentralized political economy theories of the natural resource curse. Centralized theories focus on politicians as the centre of action: when faced with a permanent resource boom, under low institutional quality, they will distort allocations to increase the probability of staying in power (Robinson et al., 2006). Decentralized theories relate to generalized movements towards rent-seeking activities with negative consequences for entrepreneurship and the productive sector (Torvik, 2002). Our main hypotheses are as follows:

- *Politicians distort allocations (centralized mechanism).* Where Treatment 1 is implemented, i.e., where information about a future windfall reached leaders only, and eventually flows from these individuals, we expect elite capture and rent-seeking by leaders to increase, as a way to cement local power. Rent-seeking activities by citizens

could also increase as a consequence of Treatment 1, as leaders induce movements in linked individuals. Treatments 2 and 3 are not expected to increase elite capture or rent-seeking by leaders and citizens, provided higher levels of local accountability. They are expected to induce higher levels of citizen mobilization. It is also expected that Treatment 3 leads to more citizen mobilization than Treatment 2 in face of the additional deliberation module.

- *Generalized increase in rent-seeking (decentralized mechanism).* As all treatments include information about a future windfall, all are expected to result in increased rent-seeking by leaders and citizens. Increases in elite capture could accompany this generalized increase in rent-seeking, since capture and rent-seeking by leaders overlap in most real examples. We do not expect clear effects on citizen mobilization, since politics are not explicitly important.

2 Context

The northern province of Cabo Delgado, Mozambique, is characterized by significant reserves of natural resources, particularly the natural gas at the Rovuma Basin, which remains to be extracted. The majority of the country's labour force is engaged in agriculture activities, with 81 percent of its population reporting agriculture as its main occupation. Cabo Delgado province is in line with the national average for several demographic and socio-economic characteristics. It has on average 22.15 inhabitants per km^2 and a total of 1.8 million habitants (National Statistics office – INE, 2013). In terms of poverty, it experiences a poverty rate of 37.4%, and a child mortality of 180 per 1000 births, slightly higher than the national average (UNDP 2010 Report on the Millennium Development Goals).

Mozambique shares a number of similarities with several other countries in the African continent, in terms of characteristics of the economy, quality of institutions, and recent discovery of natural resources. While Mozambique has found some of the largest natural gas deposits, Tanzania, Uganda, and Kenya have also recently discovered gas and oil reserves. Similar to Mozambique, these countries share relatively weak institutions and low political accountability. Table 1 presents a comparison with Kenya, Uganda and Tanzania on different indicators.

In terms of corruption, the Corruption index shows that these countries face similarly weak institutions. On average, Mozambique is poorer, has higher infant mortality, lower life expectancy, and a lower literacy rate. Importantly, these countries have in common a small contribution to GDP from extractives. However, they also share the expectation that this contribution will rise sharply in the coming years.

Table 1 – A comparison between Mozambique and other African countries

INDICATOR	Mozambique	Tanzania	Uganda	Kenya
Corruption index position 2015, Transparency International	119/175	119/175	142/175	145/175
GDP (PPP) per capita 2014, IMF	1174 USD	2667 USD	2023 USD	3084 USD
Population 2010, World Bank	23.4 Million	44.8 Million	33.4 Million	40.5 Million
GDP USD, 2010, World Bank	9.59 Billion	23.1 Billion	17.0 Billion	31.41 Billion
Infant Mortality rate (per 1000) 2010, World Bank	92.2	50.0	63.0	55.1
Life Expectancy 2009, World Bank	49.28 years	56.59 years	53.07 years	55.84 years
Literacy rate 2009, World Bank	55.1 %	72.9%	72.2%	87%
Total NR Rents as % of GDP World Bank, 2011	12.5%	9.6%	13.9%	3.4%

3 Evaluation: Design, methods and implementation

3.1 Sampling and randomization

We study a sample of 206 communities. These communities were randomly drawn from the list of polling locations in the province of Cabo Delgado that were present across both the 2009 and the 2014 general elections,[3] and that had more than the number of voters corresponding to the 5^{th} percentile of that distribution (corresponding to 207 voters per polling location).[4] In our final sampling frame, we had 421 polling locations, with 14 in urban areas and 39 in semi-urban areas. We stratified the sampled communities by the two urban areas (Pemba and Montepuez), semi- urban communities (i.e., the main *posto administrativo* in each district) and rural communities.[5] We then built blocks of four communities using m-distance (Mahalanobis) relative proximity. To construct m-distances, we make use of the richness of baseline information we have, including household, leader, and community characteristics.

After forming blocks of similar communities, we randomly allocated each community in a block to either one of the treatment groups or a control group, which had no information or deliberation campaigning. Each one of the four possibilities had the same probability, and we made sure each block had the four possibilities. To limit the risk of treatment contagion to other groups, at the end of this procedure, we computed the minimum distance from each community to a

[3] 54 polling locations across the two elections were dropped because they were not operating in both elections.
[4] The polling locations were located within the following 16 districts: Ancuabe, Balama, Chiure, Macomia, Mecufi, Meluco, Metuge, Mocimboa da Praia, Montepuez, Mueda, Muidumbe, Namuno, Nangade, Palma, Pemba, and Quis- sanga. These districts represent all the districts of Cabo Delgado, except one, Ibo, excluded since it is an island. We also excluded two polling stations in another island, and the 11 polling locations in Palma's 'posto administrativo'. The reason for the latter was to avoid areas that have been subject of recent violence related to the discovery of natural gas.
[5] Since we aimed for a sample of 200 communities: in urban strata, we selected 8 polling locations in Pemba and 4 polling locations in Montepuez; in semi-urban strata, we selected 2 polling stations per town (1 if only 1 was available); the remaining 165 stations were sampled from all other polling stations.

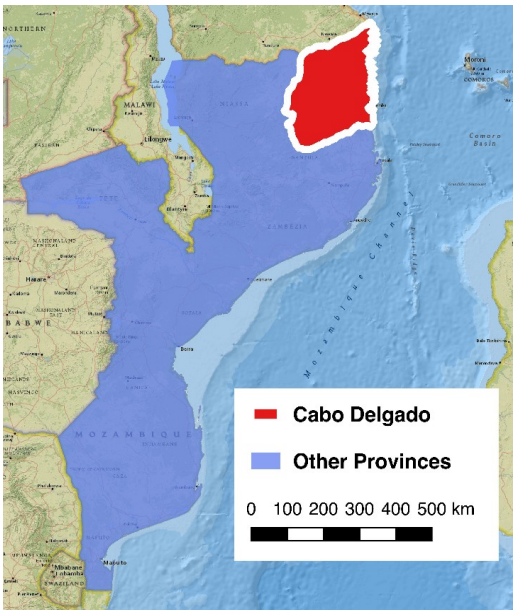
community in a different group. If two or more communities were closer than 3km, were control versus any treatment or Information to Leaders (Treatment 1) versus Information to Leaders and Citizens with and without Deliberation (Treatments 2 and 3), and were rural, then we selected at random one of these equidistant communities and re-assigned the same group to the others. We ended up with 50 communities for Treatment 1, 51 communities for treatment 2, 50 communities for treatment 3, and 55 communities for the control group. Disparities between the groups are due to the fact that we included 9 substitute communities. Results are robust to the exclusion of these substitute locations. Figure 2 presents the geographical distribution of the sample, distinguishing between comparison groups.

Sampling of citizens within communities was the product of random walks during the baseline survey. Enumerators were told to select houses by departing in different directions from the centre of the community as defined by the polling location. They were given a sampling interval for each community, which was a function of the number of registered voters in that community. The sampling interval defined the number of houses in between sampled houses. In each house, heads of households were sampled for survey interviews and behavioural activities. We interviewed 2065 heads of household in the baseline survey, approximately 10 per community. Post-treatment attrition was handled through substitutions in the same household, when possible.

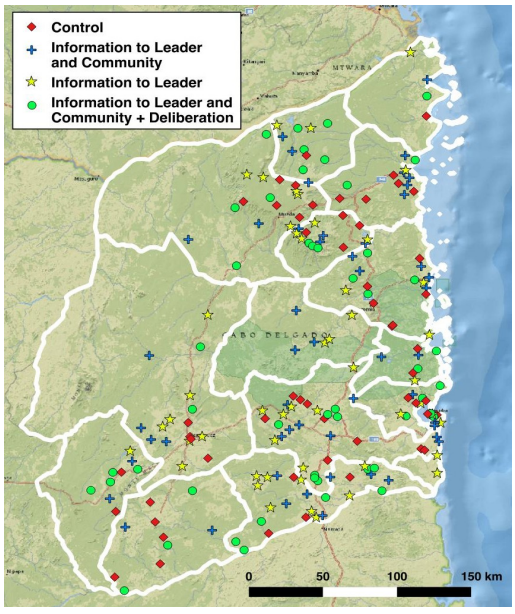
Descriptive statistics are presented in Appendix – Descriptive Statistics.

Figure 2 – Selected communities and allocation to treatment groups

Selected province



Selected districts and communities



Note: In dark blue the selected province for the project. Geo-coded coordinates were obtained from tablets' GPS sensors used for interviews. The geo-coded coordinate of each location is determined using the average of all available data points within each location (household interviews, leader interviews, and community interviews). For the locations where geo-coding is missing (10 communities), we use the closest neighbour community and the reported distance to the missing community to formulate an approximation.

3.2 Measurement

The structure of the measurement in this project included (i) baseline and end line surveys at the household, local leader, and community levels, (ii) the holding of structured community activities (SCAs) aimed at gathering behavioural data (post-treatment), and (iii) the implementation of lab in the field experiments (post-treatment). The baseline data was collected in August-September, 2016. Some SCAs were initiated immediately after the treatment activities in March 2017. The end line survey, lab experiments, and the completion of SCA activities happened in the period August-November, 2017. We now turn to the details of the design of each type of measurement in this experiment.[6]

3.2.1 Surveys

The household questionnaire was answered by the household head and included questions on the demographic traits of the respondent and his/her household, knowledge relating to natural resources, aspirations, trust, social capital and networks, and political views. The leader questionnaire had a similar structure. The community questionnaire included questions on the existence of different types of local infrastructures and natural resources, distance to markets, local associations, community meetings, and local political structures. This questionnaire was answered by small groups of (self-selected) community representatives. Most questions in all three questionnaires were present in both baseline and end line.

3.2.2 Structured community activities

We now turn to Structured Community Activities (SCAs). These follow the nomenclature of Casey et al. (2012), who consider SCAs to be 'concrete, real-world scenarios that allow unobtrusive measurement of leader and community decision-making, more objectively than lab experiments, hypothetical vignettes, or surveys.' We divide SCAs between those submitted to local leaders and those submitted to citizens. We implement versions of the three SCAs in Casey et al. (2012) as well as some new additions, as described below.

- *Leader: zinc roof tiles*. In this activity, we endeavour to measure elite capture of resources. The community leader was given eight zinc roof sheets and told that they were 'to be used in a way that benefits the community.' Each zinc sheet was worth approximately 300 Meticais, a total value of 2400 (35 USD). The leader was given the zinc sheets in private, as the person representing the community, and the activity was not announced publicly to the rest of the community. Leaders were told they had until the end of August 2017 to use the zinc sheets, otherwise they would be redistributed to other needier communities. A version of this activity was implemented in Casey et al. (2012). At the time of the end line visit to each community, we asked to see each one of the zinc sheets and recorded how it was being used. The outcome of interest of this activity involved how the zinc sheet was being used, i.e., for private or public benefit, as well as the identity/characteristics of the holder of each zinc sheet. We thus interpret the use of the zinc for private purposes as a measure of elite capture.

[6] Note that the design of this experiment and corresponding measurements was included in a pre-analysis plan registered on the AEA RCT registry (AEARCTR-0002493).

- *Leader: funds for meetings*. In this SCA we examine another form of elite capture, i.e., whether leaders appropriated funds that had been set aside to cover food items for the community members during their meetings. Community leaders were given 400 Meticais (6 USD) and were requested to use the funds in order to purchase the food items. We observed how many food items were purchased, and inquired at the nearest store the cost of each item. Our main outcome of interest is thus the difference between the 400 Meticais and the amount spent on food items, i.e., the amount appropriated by the leader.

- *Leader: appointing a taskforce***.** This SCA was intended to measure propensity for favouritism in how leaders choose individuals for specific tasks. In this case, the leader was asked to select five individuals to be submitted to a Raven's test. The Raven's test is a nonverbal test used in measuring abstract reasoning and regarded as a means of estimating intelligence, particularly in settings of low literacy. Our version was composed of 10 questions, each of which asking respondents to complete a logical sequence of images. Leaders were told that, conditional on the performance of the five selected individuals on the test, they could earn a monetary prize of 1000 Meticais (14 USD) for their community. Specifically, if all of the five individuals get at least five of the 10 questions correct, the prize would be awarded. In addition, leaders were also told that, for participating in the activity, each selected individual was given a show-up bonus of 100 Meticais. Our measurement is thus the performance on the test of the five selected individuals. Additionally, since all surveyed household representatives also took the Raven's test at end line, we have an estimate of the average score for the community. We are thus able to observe a continuous measure of how appropriate the leader's choices are, relative to the community. We also observe basic demographic characteristics of those individuals selected by the leader, as well as their relationship to the leader.

- *Leader and community: auctions*. In this SCA we wanted to have a measure of the propensity of both leaders and citizens to engage in potential rent-seeking activities. To get at this question, we conducted an auction that could be for one or two activities. The first activity was a meeting with the district administrator (the main politician at the district level, the administrative level below the province), including lunch and costs of transportation. This activity was thought to provide an environment conducive to possible rent-seeking activities, though there may be other potential benefits. This was the activity available to both local leaders and community members. The second activity was related to an activity of entrepreneurship, and was intended to provide a productive alternative to the first. This activity consisted of a training session on poultry farming (creation and management of a business in this area), including lunch and transportation. Only community members participated in this auction.[7] Each player in these auctions was endowed with 100 Meticais. When asked to bid for both activities, only one of them would later be randomly selected for implementation. Thus bidders (citizens) had an incentive to bid independently for each of the two activities. To ensure incentive compatibility of the auctions (i.e., so that individuals revealed their true willingness to pay (WTP) for each activity), the Becker-DeGroot-Marschak (BDM) mechanism was used. A set of prices was placed in a box, and after the individual

[7] The meetings with administrators and the training happened in November-December, 2017.

had stated their WTP, the actual price was drawn at random. If the WTP was greater than the price, then they were forced to purchase the activity, at the drawn price. If not, they did not pay anything, and did not purchase the activity. This was repeated for the two auctions in the case of community members, with one being chosen by the toss of a coin afterwards. All bidders in all auctions were allowed to bid more than 100 Meticais, and were truthfully told that there could be prices over 100 in the box. The primary outcomes of interest for this activity are the amounts bid in the auction to meet the district administrator, and in the case of community members, the difference in the amount bid for the meeting with the administrator and the entrepreneurial activity.

- *Community: matching grants*. The motivation for this SCA is the measurement of social cohesion and contribution to local public good provision. We gave communities the opportunity to raise funds towards a community objective. Funds were matched at a rate of 50 percent until a maximum of 2500 Meticais (35 USD), if the community raised 5000 Meticais or more. Specifically, we asked communities to form a committee that would raise and keep the individual contributions until August 2017. This committee was offered a book to keep the records of contributions. At the time of the end line visit to the communities, the amounts raised by the communities would be verified and the corresponding matching grant would be given. This activity was close to an SCA implemented in Casey et al. (2012). For this matching activity, each community had an official meeting to discuss whether to participate in the matching activity, and, if yes, which objective the community had for the funds raised under that activity. We therefore collected further behavioural outcomes related to the functioning of the meeting for the matching activity. Each meeting was observed in detail by enumerators, who recorded attendance, characteristics of participants, decisions taken, and method of decision-making. The main outcomes of interest for these meetings are participation and whether the meeting was conducted democratically.

3.2.3 Lab in the field experiments

In addition to traditional survey measurements and the SCAs, we conducted a number of lab in the field experiments, to further measure behavioural preferences in a controlled framework.

In particular we implemented four types of lab experiments in our intervention: (i) a trust game, (ii) a rent-seeking game, and (iii) a public goods game. The trust and the public goods game are fairly standard in the experimental and development literature, while the rent-seeking game is novel. All games involved the participation of all 10 community members surveyed. The trust and rent-seeking games also included the community leader as a player. The sequence of play was randomized in each community.

- *Trust Game.* The trust game involved 10 participants from the community (citizens) and the community leader. The version played corresponds to a standard trust game. Each citizen was given an endowment of 100 Meticais in the form of 10 tokens worth 10 Meticais each. They had to decide to keep this income for themselves, or send a proportion to the leader. The funds sent to the leader were tripled. The leader then had to decide how much of this tripled amount to give back to the citizen. For the leaders' decision, we used the strategy method, that is, we asked the leader for *every* possible amount sent from 1 to 10 tokens (which became 1 to 30), how much the leader would like to send back to the citizen. The game also included a punishment option at the end,

before any decisions or outcomes were revealed. Specifically, this punishment option was phrased as: 'Imagine the leader sends back less than 50 Meticais, after having received 150 Meticais. Do you want to punish the leader? Punishment costs 10 Meticais, and reduces the payoff of the leader by 30 Meticais.' All citizens were paid according to the leaders full set of decisions, while the leader's payoff was determined by being randomly matched with one individual from the community. We also elicited beliefs in this game, as citizens were paid 10 Meticais each if they correctly estimated the amount that the leader would return after having received 150 Meticais (corresponding to 50 Meticais sent). This trust game measures elite capture from leaders, as well as trust in local leaders and demand for accountability from citizens.

- *Rent-seeking game*. The rent-seeking game is a novel lab in the field experiment. It is intended to measure the willingness to engage in rent-seeking behaviour at the expense of a more productive activity. The participants are the 10 citizens and one leader. Each citizen was given an endowment of 10 tokens worth 10 Meticais each, for a total of 100 Meticais. Next, each citizen had to choose how many of the 10 tokens to send as a 'gift' to the leader (rent-seeking), with the remaining units being 'put aside' (for a productive purpose). The leader had to choose one citizen after observing the behaviour of all of them (note that the leader never observed the identity of the individuals, only the amounts sent). In the case of a citizen not chosen by the leader, the units he/she sent as a gift accrued to the leader, while the units put aside stayed with the citizen. In the case of a citizen chosen by leader, the leader received the units put aside in addition to the gift sent, while the citizen received a bonus of 300 Meticais for being chosen. In summary, the leader receives all units sent as gifts. Additionally, the leader receives the units put aside by the person he/she chose. Thus, the leader has a dominant strategy, which is to choose the person who set aside the most funds (the most ambitious entrepreneur). Knowing this, individuals' best response is to put aside all of their endowments and do no rent-seeking at all. We also collected belief data in this game, as citizens were asked how they expected the leader to choose. They were asked specifically how many tokens would be put aside by the person the leader chose. This is equal to 10 minus the number of tokens that were sent as a gift to the leader by the chosen person.

- *Public goods game.* The public goods game measures social cohesion and contribution to a common goal. The version we implemented was standard and involved 10 participants from the community, always excluding the leader. Each individual was given an endowment of 100 Meticais in 10 tokens of 10 Meticais. They had to decide whether to keep this income for themselves, or contribute towards a public account. All contributions in the public account were doubled, and divided back equally to all 10 individuals, independently of their contribution. Thus, the marginal per-capita return (MPCR) to contributing is 0.2, which is on the lower side of public goods experiments. Belief data was also elicited, as individuals were told that one person had been selected at random (not them) and that they would receive 10 Meticais extra if they guessed correctly the amount contributed by that person.

3.3 Empirical Strategy

We adopt standard specifications for the analysis of experiments. Specifically, we employ two types of specifications, depending on the existence of baseline data. We consider outcome variables defined as Y_{ij}, i.e., for location j and individual i. Individual i can be a local leader or a citizen. Outcomes defined at the community level are treated in the same way as outcomes defined at the level of the local leader.

The first specification, when baseline data are not available, is:

$$Y_{ij} = \alpha + \beta_1 T1_j + \beta_2 T2_j + \beta_3 T3_j + \gamma Z_j + \delta X_{ij} + \varepsilon_{ij} \quad (1)$$

where $T1_j$, $T2_j$ and $T3_j$ are indicator variables for living in a community in treatment groups 1, 2, and 3, Z_j is a set of location control variables including strata dummies and community characteristics[8], X_j is a set of individual characteristics, either for leaders or citizens depending on the outcome at stake[9], and ϵ_{ij} is an individual-specific error term which we cluster at the community level to account for correlated errors within the community.

The second specification, when baseline data are available, is:

$$Y_{ijt} = \alpha + \beta_1 T1_{jt} + \beta_2 T2_{jt} + \beta_3 T3_{jt} + \gamma Z_{jt} + \delta X_{ijt} + \theta Y_{ijt-1} + \varepsilon_{ijt} \quad (2)$$

where Y_{ijt-1} is the baseline value of the dependent variable. McKenzie (2012) supports that this specification maximizes statistical power in experiments, if autocorrelations of outcome variables are low. This is arguably the case for most survey outcomes, which are subjective. In our estimations below, we employ OLS in all regressions, even those with binary outcomes (i.e., linear probability models) and test for the null that the coefficients of each pair of treatments are equal.

4 Programme or policy: Design, methods and implementation

4.1 The Information Package

After the collection of the relevant information to share with the communities and before the project implementation, the implementing partners created a manual that served as a guide for the intervention. The information being distributed includes the type of resources

[8] Community characteristics include district and stratum (rural, semi-urban, or urban) indicator variables, an infrastructure index measuring the presence of public goods in the village, presence of natural resources in the village, presence of a market in the village, number of voters (measured by the number of tables at the polling station), and distance to the city of Palma. The infrastructure index is built by averaging 14 indicator variables for the presence in the village of a kindergarten, a primary school, a lower secondary school, a high school, an health center, a facilitator, a water pump, a market, a police station, a church, mosque or temple, an amusement area, a room for community activities, and for the access to electricity and to the sewage system. The presence of natural resources in the village is built by averaging 10 indicator variables for the presence in the community of limestone, marble, sands and rocks, forest resources, ebony and exotic woods, gold, charcoal, graphite, precious and semi-precious stones, mercury, fishing resource, salt and natural gas. When analyzing leader-level outcomes, we remove district indicators to avoid collinearity with stratum indicators

[9] Citizens characteristics include gender and age of the household head, household size, education, religion, and ethnic group indicators, indicator variable for whether the respondent is born in the village and indicator variables for ownership of radio and television. Leaders characteristics include the same variables, but measured at the level of the community leader.

discovered, plans for exploration, and the legal rights of the communities involved. The final content of the intervention is being discussed and approved by all NGOs and governmental authorities involved in the project in order to guarantee widespread support and neutrality. Although this is a very time-consuming process, we believe it to be a fundamental step for the credibility of the project and to achieve interesting and usable findings for policy makers.

Figure 3 – The Information Flyer

Note: on the left side, a picture of a village leader reading a flyer, while on the right it is a moment of the distribution of the flyer to the community members.

It was decided by the research team, in collaboration with the implementing partners, to extend the content of the information dissemination not only to natural gas, but to natural resources in general and to other resources present in the Province. The reason is that many communities in the sample are identically exposed to the exploitation of other resources, while the concept of natural resource is not present in many communities.

The information package, and consequently the community meetings where the information was provided to the community, were divided in the following sections:

1) **Presentation** – an introductory space for those who were holding the meetings in the communities to present themselves and the implementing partners and to introduce the subject of the meeting. It was also a moment for the village leader or any other influential person to explain to the community about the content and objective of the meeting.

2) **Introduction** – in this section it was explained that Mozambique is a country with many occurrences of natural resources. The industries of natural gas, coal, iron, precious stones and heavy minerals are in big expansion. The extractive industries offer potential for investment and creation of wealth. It was also introduced for the first time the importance of the natural gas reserves discovered in the Rovuma Basin as according to the IMF, during the 2020s, the natural gas industry will account for half of the country's wealth. Data shows that the future of the Mozambican economy may be heavily influenced by the revenues generated by this extraction, thus making Mozambique one of the world's potential gas producers.

3) **Natural Resources** – this section included information about the formal definition of natural resource, and the difference between renewables and non-renewables. This explanation was important for the communities to understand that many of their resources, including natural gas are non-renewables and therefore a sustainable exploration is fundamental. Later, it was explained that a sustainable resource management and exploration of the resources should benefit present generations in an equitable way, as well as the future generations. It should also provide economic and social development while taking into account the environment.

4) **Types of Natural Resources** – this section presented the types of natural resources that have a bigger presence and impact in Cabo Delgado. Specifically, Mineral Resources, Forest Resources, Fishing Resources and Natural Gas were discussed.

5) **Natural Gas** – this section presented the plans for the exploration and transformation of natural gas in the Rovuma Basin, which will happen within the next years, followed by what natural gas is and what it is used for. The teams also explained where in Cabo Delgado it was discovered and when the exploration is planned to start. At the end, it was also mentioned that another province in Mozambique, Inhambane, discovered natural gas in the past and what lessons can be learned from that experience.

6) **The importance of natural resources for citizens** – this section aimed to shed light on what local can expect from the exploitation of the resources. It was explained that it can be a source of income for the families (this is, used in regular terms for subsistence); it can also create formal and informal jobs; it is supposed to increase the level of technical expertise of both workers and students who want to have jobs in the

area; the extractive companies operating in the local communities should be aware of their social responsibility towards the citizens; finally, the governmental entities should share part of the benefits with the communities affected by the resources – this can be made in a monetary way or in a more indirect way by investing in the communities most needed areas.

7) **Practical examples** – After explaining how communities can be involved in this matter, three examples of countries that discovered natural resources were discussed, especially how they were affected by its discovery. Two of the examples were positive (*Norway* and *Botswana*), while the other one was negative (*Nigeria*). These examples served the purpose of enlightening the citizens to desirable and undesirable consequences that can arise from the discovery of natural resources.

8) **Conclusion** – In the end, it was emphasized the main lessons to take from the meeting, and it was concluded with a brief review of what had been explained before. Although the villagers were allowed to raise questions along the meeting, this is usually the time when most people wanted to express their opinion about the topic.

4.2 Community Meetings

The community meetings were held by a team of at least three members specially trained for the purpose and it followed the information package mentioned before. Figure 4 presents some moments during the Community Meetings.

Figure 4 – Some moments during the Community Meetings

At the end of the presentation, to ensure that those who attended the meetings understood the main messages, the team presented a 10-minute play. The play presented a live impersonation of a community theatre, played by a team of three actors. The play represented

a traditional family discussing the management of natural resources after hearing the news about the discovery of natural gas in the radio.

The script was written by a local theatre company in collaboration with our research team. The purpose of the play was to share the information in a colloquial way in order to enliven the atmosphere while explaining important matters. After the play, it was distributed to each person a flyer that included synthetic information on the main topics.

The illustrations were made by hand by a local artist. The flyer is mostly visual and has the main takeaways of the information campaign. It was hand-delivered in each treatment community to the leader (for groups 1, 2 and 3) and to the community members (for groups 2 and 3). The flyer is presented in Figure 3.

At the end of the meeting, the leader and the 10 baseline respondents were asked to answer a short-questionnaire to test their learning. All the community meetings were implemented without major problems and the villagers were in general very interested in the subject and eager to speak their minds. The meetings took approximately between 1 hour and 1 hour and a half. The team members supervising the organization of the deliberation meetings were fluent in the local dialects, which could differ from village to village.

On average, there were approximately 64 people per village attending the community meetings and receiving the information. When asked how they knew that a meeting was going to take place, the majority of them received a personal invitation (75.74%), while 19.3% were invited by the village leader.

4.3 Deliberation Treatment

For the villages belonging to the third treatment group, which includes the deliberation process, the attendants willing to participate would gather in groups. The following procedure was followed.

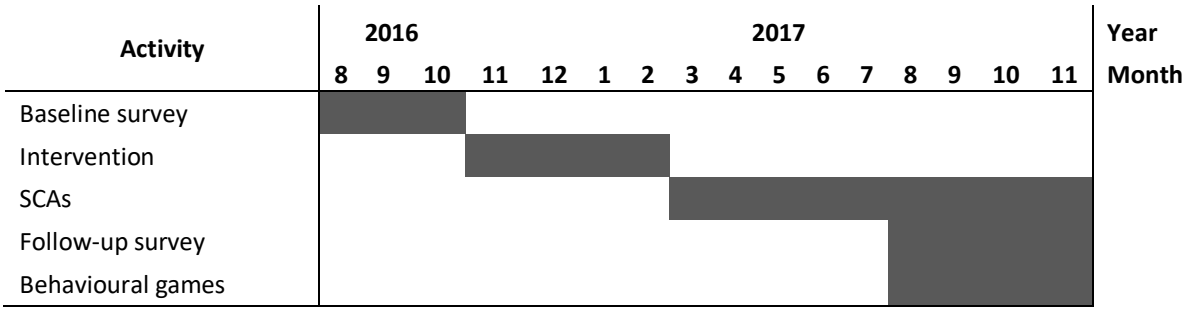
Firstly, during the community meeting, it was asked which attendants would like to participate in the deliberation. The implementing team would explain that the objective of the deliberation is to select 3 areas needing more investment in their villages in the case in the future they will start to receive rents from the exploration of natural gas. The results would then be shared with the local government. Then, at least 3 groups of 5 people were created, with the number of groups differing according to the total amount of people participating in the process. Participants would then gather in groups and chose the 3 main areas.

The voting process was randomly selected in: raising hands, where after discussing the possible areas, voters would have to vote by raising their hands for the areas they think are most in need; secret vote, where each person would secretly vote for the first, the second and the third area of interest; normal method, where no restrictions were imposed. One team member would explain the process and register their votes.

5 Timeline

Figure 5 presents the timeline of measurements and of the intervention activities.

Figure 5 – Timeline of Activities



6 Impact analysis and results of the key evaluation questions

We begin by referring to balance checks in our experiment. In the Appendix to this report (Table 16), we show descriptive statistics and differences between the control group and all treatments bundled together under a dummy variable, and between the control group and each one of the treatment groups. These differences concern a number of household, leader, and community characteristics, as collected in our baseline surveys. We also depict joint F-tests of the null that the three treatments are jointly equal to zero. Of the 63 individual significance tests relating to each treatment intervention, only four come out significant at standard levels: larger household size in Treatment 2, more secondary or higher education, as well as more years of education for citizens in Treatment 3, and less years of schooling for leaders in Treatment 3. No joint significant tests yield a rejection of the null at standard levels. We can conclude that our randomization procedure was effective at identifying comparable groups in our experiment.

Table 16 also provides us with a simple characterization of the demographic traits of our sample (control group averages): 27 percent of our baseline household representatives are female, average age is 45 years old, 11 percent have secondary education or higher, 56 percent are Muslim; local leaders are almost all men (only 4 percent are female), average age is 54 years old, and average years of schooling is 6 years; 9 percent of our sample is located in urban areas, and 11 percent in semi-urban areas.

6.1 Information

In terms of treatment effects, we begin by focusing on the effect of the interventions on the aware- ness and knowledge of the natural gas discovery among local leaders and among citizens. For both groups, we focus on a similar set of outcomes, presented in Tables 1 and 2, respectively. Note that, when baseline values of the outcome variable are available, we display regressions controlling for those values (specification 2 above) side by side the ones just employing standard control variables (specification 1 above). In columns (1) and (2), we focus on awareness of the natural gas discovery. Awareness is measured using an indicator variable equal to 1 if the respondent has ever heard about the natural gas discovery and zero otherwise. In column (3) and (4), we focus on the level of knowledge about the natural gas discovery. For both leaders and citizens, we build an index by averaging 15 indicator variables concerning

knowledge of whether the government is receiving revenues from natural gas extraction, about the firms involved, and about the location of the discovery. Each indicator variable is equal to 1 if the respondent gives a correct answer, and 0 otherwise. The index is therefore equal to 1 if the respondent has full knowledge of these elements, and zero if the respondent reports all answers wrongly or whether he has never heard about the discovery. In column (5) and (6), we measure the effect on salience, as measured by asking the respondent about the three major events in the district in the last 5 years and leaving the answer open. We then perform content analysis and we build an indicator variable equal to 1 if the respondent used the word 'gas' and zero otherwise. In columns (7) to (9), we restrict attention to respondents reporting that they are aware of the natural gas discovery. In column (7), we focus on self-reported level of knowledge, by asking the respondent how informed he feels about the natural gas discovery. The outcome is measured in a scale from 1 to 4, where 4 indicates that the respondent reports being fully informed. Finally, in columns (8) and (9), we focus on the perceived benefits from the natural gas discovery for the community and the household of the respondent. These are indicator variables equal to 1 if the respondent agrees or fully agrees that the discovery of natural gas will create a benefit for his community or his family, and zero otherwise.

We now turn to the analysis of results. We begin with the effect of the interventions on leaders' awareness and knowledge about the natural resource curse (Table 2). First, awareness is increased by roughly 4-6 percentage points across all treatment groups. This suggests that the information campaign was indeed effective in raising awareness by distributing information to the village leader, especially given the already high level of awareness among the elite. We do not observe a differential effect when information is also targeted at citizens and when deliberation is organized. Knowledge about the discovery also increased significantly across all treatment groups (4-6 percentage points), suggesting that the information campaign had impact not only in terms of awareness, but also in terms of knowledge about the details of the discovery. Relatively small effects in knowledge translated into large effects in terms of salience, but only in communities where the information was also distributed to citizens, suggesting changes in salience across leaders might be associated with the level of information among citizens. In Treatments 2 and 3, between 32-37 percent more leaders used the word 'gas' to describe one of the major events in the district in the last 5 years. When turning our attention to the perception of knowledge and to the perceived benefits from the discovery for the community and the household of the leader, we do not observe any significant effect.

We then focus on citizens' outcomes (Table 3). The intervention created a large increase in aware- ness of 24-25 percentage points, only when the information is distributed to citizens. We do not observe an effect on citizen's awareness when the information is distributed to the leader only, suggesting that leaders did not introduce any clear within-community effort for distributing the information to the citizens. Treatments 2 and 3 did not only increase awareness, but also made citizens more knowledgeable about the details of the discovery: the knowledge index increased by around 16-17 percentage points across both treatment groups. Similar to awareness, we do not observe any effect of distributing the information to the community leader on citizens' knowledge. In terms of salience, we observe a significant increase in all treatment groups, with a significantly larger effect for Treatments 2 and 3. In Treatment 1, around 5-7 percent more of citizens used the word 'gas'. This suggests that information targeted at leaders is mainly increasing salience among citizens that were already aware of the discovery at baseline, perhaps in closer connection to the leader's network. In

fact, when restricting our attention to citizens that are aware of the discovery, we observe a higher (self-reported) degree of knowledge also when the information is only targeted at the local leaders. Differently from leaders, Treatments 2 and 3 lead to a significant increase in the way citizens believe the natural gas will bring benefits to their community and their household. This is not observed when information is targeted at leaders only.

In summary, we can see clear effects of the treatments on awareness and knowledge of the natural gas discovery. This is particularly the case for Treatments 2 and 3, for both leaders and citizens. Treatment 1 also has effects on awareness and knowledge of leaders, and on salience and self- reported knowledge for citizens. Citizens also become optimistic regarding the future benefits of the discovery for the community and their corresponding households, but only when the information is targeted at the whole community.

6.2 Elite capture

Table 4 presents estimates of the effect of the three treatment interventions on measures of elite capture, namely by local leaders. In columns (1) and (2), we focus our attention on attitudes against corruption from the leader surveys. We build a measure for these attitudes by averaging two indicator variables from available questions measuring corruption. Firstly, an indicator coded as a one if the leader disagrees with the statement 'the best way to overcome problems in public services is to pay bribes'. Secondly, an indicator coded as one if the leader prefers demanding the Governor of the Province a benefit for the community rather than job for himself. The exact text of the question reads as follows: 'Imagine that you had the opportunity to have a meeting with the Governor of Cabo Delgado and that you could make a request. Please tell me what you would ask'. The measure of attitudes against corruption picks value zero if the leader is strongly in favour of corruption and one in the opposite situation. This is the only outcome variable in this table for which we have baseline values of the outcome. Column (3) is devoted to the zinc roofs SCA, namely we use a variable averaging across all zinc sheets received by a leader, with the value for each one defined as -1 if the zinc is used privately, 0 if the zinc is not used, and 1 if the zinc is used for community purposes. Columns (4) and (5) are dedicated to the funds for meetings SCA through which leaders received funds to organize meetings. Column (4) shows an outcome indicator variable defined as 1 if the leader spent all funds received for the meetings. Column (5) displays a variable defined as the amount spent in the meetings (in Meticais).[10] Columns (6) to (9) show several outcome variables related to the SCA where a taskforce was appointed by the leader. Column (6) employs the average score in the Raven's test for the selected taskforce. Columns (7) and (8) use indicator variables constructed for the first quintile and for the second to fourth (respectively) in the distribution of the difference between the average score in the taskforce and the average score among citizens in the community. The regressions in column (9) take the percent of women selected in the taskforce appointed by the leader.[11] Column (10) regards

[10] The average total spent was 291 Meticais out of the endowed amount of 400. Some leaders used their own money and spent more than 400. 34 percent of leaders spent the full amount, > 350; due to possible measurement error, we allow a margin of error of 50 out of 400 Meticais.

[11] On average individuals in the household survey got 5 out of 10 correct answers, while those chosen by the leader performed on average *worse*, scoring 3.7.

leader behaviour in the Trust Game (TG), i.e., the amount (in game units) the leader returned after receiving the transfer from a citizen in the trust game.[12]

Leader attitudes in favour of corruption increase significantly with Treatment 1. When information is targeted only at leaders, attitudes against corruption are reduced by 10 to 11 percentage points. The coefficient is also negative for Treatment 2 and Treatment 3, with a marginally significant effect for Treatment 3 (7 to 8 percentage-point effects). Differences across treatments are found not to be significant. The SCA on zinc roofs does not yield any significant differences. However, we note positive point estimates, which are smallest for Treatment 1 and largest for Treatment 3. Turning to the funds for the meeting SCA, we find significant negative treatment effects for all three treatments when considering the probability of spending all assigned funds. The effects are statistically indistinguishable between treatments. Still, point estimates are largest in absolute values for Treatment 1 (29 percentage points) and lowest for Treatment 3 (18 percentage points). The only statistically significant effect for amounts spent in the meetings is for Treatment 1: -47 Meticais, slightly over 10 percent of the total budget. On the SCA that involved appointing a task- force, we also show some effects of Treatment 1 in particular. We find that Treatment 1 decreases the probability of selecting top performers (as defined by the first quintile of the distribution of the difference in Raven's scores between appointed individuals and the community) and increases the probability of selecting mid performers (in the second to fourth quintiles of the same distribution). Note that the probability of selecting top performers also decreased for Treatment 2. We also note that Treatment 1 led to a decrease in the percent of women selected for the taskforce by roughly 8 percentage points. This effect is statistically different at the 1 percent level from the one of Treatment 3, which is not distinguishable from zero. On behaviour in the Trust Game, namely in terms of amounts sent back by leaders, we do not find any significant differences between comparison groups. However, we note a negative point estimate for all treatments. We can conclude for some clear effects of Treatment 1 on increasing elite capture, in terms of more benevolent attitudes towards corruption, use of funds for other than specific public purposes, and appointments of community members for public service, i.e., less meritocratic and involving a lower number of women.

6.3 Rent-seeking

We now turn to the analysis of treatment effects on outcomes related to rent-seeking by both local leaders (Table 5) and by citizens (Table 6). We begin with survey outcomes. We analyse in columns (1) and (2) in both tables an indicator value assigned value one in case the citizen knows influential people. Columns (3) and (4) are devoted to an indicator variable taking value one if the leader called influential people in the last six months before the end line survey. Columns (5) and (6) display results for number of calls to influential people in the last six months before the end line survey. These are the only dependent variables in these tables for which we have baseline values, and so the only ones where we add specifications employing those values as a control variable. In columns (7) of Table 5 and columns (7) and (8) of Table 6 we look at the auctions for meeting the district administrator (in the case of both leaders and citizens) and for business training (in case of citizens). (7) of Table 5 is built as the log amount

[12] Regarding the trust game, the average amount sent by citizens was 4 out of 10 tokens, indicating some degree of trusting behavior. Leader's returned on average slightly more than citizens sent, taking home on average just under two-thirds of the surplus. Aggregate leader behavior was consistent for different amounts sent by citizens.

bid for meeting the administrator. (7) and (8) of Table 6 are (respectively) the difference between the log amount bid for the meeting with administrator and the log amount bid for the local training, and the share of total bids allocated to meeting the administrator. In column (8) of 4 we consider the action of leaders in the Rent-seeking Game (RSG). Namely we code the outcome variable as value 0 if the leader behaves rationally (i.e., selects the highest amount put aside by citizens for productive purposes) and 1 if the leader accepts the highest gift in the game. The final two outcomes in Table 6, in columns (9) and (10), are devoted to citizen behaviour in the rent-seeking game: the first measures the size of the gift sent to the leader; and the second is an indicator variable taking value one when the citizen sent a gift (i.e., valued more than zero).

On rent-seeking by leaders, we do not find any statistically significant difference between comparison groups, except for a negative effect of Treatment 1 on number of calls to influential people (which disappears once controlling for baseline values of the dependent variable). All treatment effects except those on number of calls are clearly below the size of the corresponding standard error, which may be a sign of relatively low statistical power to detect effects. On rent-seeking by citizens, we find several clear treatment effects. When employing our survey measures of rent- seeking, we find significant positive effects on rent-seeking of Treatment 1 on all three dependent variables. We also find significant positive effects of Treatment 3 on the probabilities of knowing and calling influential people. In these two variables, treatment effects from Treatments 1 and 3 are indistinguishable, but significantly different from Treatment 2 in the case of knowing influential people. The magnitudes of the effects of Treatment 1 are 6 percentage points for knowing influential people, 3 percentage points for calling influential people, and 12.5 percentage points for number of calls to influential people. Turning to the auctions, we also find significant positive impacts on the log of the difference between the bid for meeting and the bid for training, with magnitude 15 percent. These effects are statistically different from the effects of Treatment 2 and 3, for the share of the bid for meeting. Finally, in the rent-seeking game, we find a statistically significant treatment effect (at the 10 percent level) for the size of gifts sent to the leader only for Treatment 2, while we note positive point estimates across the other two treatments.

We conclude that despite no movements in rent-seeking by leaders, we observe clear and consistent increases in rent-seeking by citizens when faced with information targeting the local leaders (Treatment 1). This emerges for reported contacts with influential people, but also in the bidding for meetings with the district administrator. We also identify some scattered positive effects on rent-seeking of Treatments 2 and 3, even though most do not appear in behavioural outcomes. Effects of Treatment 1 on rent-seeking may denote movements by those close to leaders, consistent with the effects found on elite capture.

6.4 Citizen mobilization, trust, and accountability

Our final set of results relates to citizen's mobilization, social cohesion, trust and the demand for political accountability. Table 7 presents estimates of treatment effects on measures of citizen mobilization and social cohesion. Table 8 presents estimates of treatment effects on citizen's trust and demand for accountability. Beginning with Table 7, columns (1) to (4) concern standard social capital measures based on survey questions, namely on membership of professional organizations or local committees, and participation in community meetings. We have baseline values for these outcome variables and so employ them as controls in

columns (2) and (4). In columns (5) to (9), we explore the outcomes of the matching grants SCA. The first dependent variable is an indicator for awareness, i.e. whether or not the individual knew about the matching activity. The next variable in column (6) is an indicator for whether the individual reported contributing a positive amount of money toward the matching activity. The continuous version of this variable is found in column (7), in logarithms. Columns (8) and (9) are measured at the community level - the first dependent variable is attendance of the meeting, taken as the share of adults who participated from the community; the dependent variable in column (9) is an indicator for whether the com- munity decided the outcome through voting. The regression in columns (10) examines behaviour in the Public Goods Game (PGG). The outcome is defined as the contribution to the public account in the public goods game. Average contributions in the public goods game were 4.5 out of 10 tokens, with only 6 percent contributing zero.

We find that social capital measures of membership of professional organizations and local committees increased with information plus deliberation (Treatment 3). Effects on membership of professional or local organizations are 5-7 percentage points. Regarding participation in community meetings, the results are similar. There is a significant increase in Treatment 3, and additionally the effects are significant for Treatment 2 as well. Both for membership and active participation, we can reject that the effect size is the same for Treatment 1 and 3 at the 5 percent level, indicating that citizens are more effectively mobilized in treatments where they are targeted to receive information, with the strongest effects coming from when this is bundled with deliberation. Interestingly, we find a positive effect of information to the community in both Treatments 2 and 3, on both awareness and participation in the matching grants SCA: this is a 9-11 percentage-point effect. In the case of awareness, we are able to reject that the treatment effects of 2 and 3 are equal to the treatment effect of 1. However, regarding participation, we can no longer reject equality of the coefficients across all treatments. On average, 76 percent of individuals report being aware of the contribution activity, while 38 percent of individuals report contributing positive amounts. The log contribution amounts in the matching grants follow a similar pattern with higher point estimates for Treatments 2 and 3 than for treatment 1. Next, we also find a statistically significant effect of Treatment 3 when considering the log number of participants in the meetings. However, once again, we are unable to distinguish this impact from the one of each of the other interventions.[13] In the last regression involving the meetings SCA, column (9), we examine a dummy for whether the outcome was determined democratically, by voting. Here there is a significant positive impact only for Treatment 3. The effect corresponds to slightly over a 6-percentage point increase in the likelihood that the outcome was determined by voting. Finally, column (10) presents the outcomes of contributions to public goods. We find no significant effects, despite the fact that point estimates are highest for Treatment 3.

Turning to Table 8, in columns (1) to (9), we employ survey outcomes on trust, voice and account- ability, and violence. Columns (1) and (2) display the average of all self-reported measures of trust, i.e., trust concerning family, neighbours, local leaders, local people, the district government, the provincial government, Mozambicans, and national leaders. We use baseline values of the dependent variable in column (2). In columns (3) to (5) we analyse self-reported trust in the com- munity leaders personally known by the respondent, in the provincial

[13] The average meeting size was 43 individuals, ranging from 9 to one community which reported 600. We account for village population in the dependent variable.

government, and in national leaders (respectively). The scale employed in all self-reported questions on trust ranges from 1 (do not trust at all) to 4 (trust a lot). In columns (6) and (7) we explore the self-reported levels of voice citizens have with provincial and national leaders (respectively), with scale ranging from 1 (no voice at all) to 4 (full voice). The regressions in columns (8) and (9) concern violence: the first dependent variable is defined as an indicator variable equal to one if the citizen believes violence is justified to defend a cause; the second variable is defined as an indicator variable equal to one if the respondent witnessed any verbal violence in the three months before the end line survey. The final two columns of Table 8 are related to behaviour by citizens in the Trust Game (TG). The outcome variable in column (10) is the average amount (at the community level) sent by the citizens in the trust game, and the one in column (11) is the average (at the community level) of indicator variables, one for each citizen, taking value one if the corresponding citizen has the desire to punish the leader in the trust game.

We observe clear effects on average trust, namely negative effects of Treatment 1, with magnitude of 2 percentage points, and positive effects of treatment 2, with magnitude between 2-3 percent- age points. These treatment effects are statistically different from each other, as is the treatment effect of information to the community (Treatment 2) from the one of information plus deliberation (Treatment 3). We find positive effects of Treatments 2 and 3 on trusting known community leaders: these are both close to 2 percent of the subjective scale. Trust in the provincial government behaves similarly to average trust, with a significantly higher effect for Treatment 2 than for the other treatments. We observe a significant positive effect of Treatment 3 on trusting national leaders - this is, however, indistinguishable from the other treatment effects. Turning to voice questions, we identify a larger treatment effect for Treatment 2 than for Treatment 1 when considering voice at the provincial level. Treatment 2 becomes statistically significant when employing voice at the national level: its magnitude is 4 percent of the subjective scale. When analysing the questions on violence, we find a higher point estimate for Treatment 1 (relative to the other treatment effects) in the regression considering as outcome positive attitudes towards violence, even if no statistical significance is achieved. We observe a significant negative effect of Treatment 3 on the likelihood of witnessing verbal violence: this is a 5 percentage-point effect. This is statistically distinct from the effect of Treatment 2. Finally, on outcomes related to the trust game, we find no statistically significant effects on average amounts sent or on the desire to punish.

In summary, we find some evidence that the full treatment (Treatment 3) increased membership of local organizations, awareness and participation/contribution in the matching grants activity, participation in meetings, and the likelihood of voting being employed in decision-making at the meetings. Information to the community (Treatment 2) increased awareness and participation in the matching grants activity and participation in the meetings. We also observe clear effects of Treatments 2 and/or 3 on increasing trust at different levels, voice/accountability at different levels, and decreasing the likelihood of violence.

7 Discussion

We find evidence that a community-targeted information campaign in Northern Mozambique, relating to the recent discovery of natural gas in the region, was effective in raising awareness and knowledge of citizens. When information is given to local leaders only, we observe an increase in elite capture as well as in rent-seeking by citizens. These effects do not emerge

when information is given to citizens. Moreover, we document increases in citizen mobilization, trust, voice, and a decrease in violence, when information/deliberation are targeted at the general population. This pattern of results is consistent with a known mechanism of the resource curse that is centred on mis-governance by politicians.

Our study is relevant for policy-makers for two main reasons. First, we show that a large-scale information campaign can be effective at raising levels of awareness in the population about a resource discovery and its related management debates. Second, we report clear effects on trust in government at different levels, as well as on decreasing violence. These findings are of crucial importance in face of the known association of the resource curse with localized conflict in resource-producing areas. The appropriate management of expectations of the local population and the implementation of inclusive deliberation processes as resource exploration unfolds may be key to escape the emergence of localized conflict. Information campaigns like the one we study in this study can be seen as a central piece of those efforts.

Table 2 – Leaders' awareness and knowledge of the natural gas discovery

Dep. Var.:	Awareness		Knowledge		Salience		Knowledge (self-reported)	Perceived benefit to Community	Household
Sample:	All	All	All	All	All	All	Respondents aware of the discovery		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(T1) Information to Leader	0.042**	0.042**	0.039**	0.042**	0.072	0.086	0.134	0.036	0.031
	(0.020)	(0.020)	(0.018)	(0.017)	(0.088)	(0.089)	(0.125)	(0.065)	(0.081)
(T2) Information to Leader and Citizens	0.049**	0.050**	0.062***	0.061***	0.317***	0.317***	0.068	0.009	-0.025
	(0.021)	(0.021)	(0.018)	(0.018)	(0.092)	(0.093)	(0.131)	(0.068)	(0.085)
(T3) Information plus Deliberation	0.056***	0.060***	0.048**	0.051***	0.336***	0.348***	0.168	-0.035	-0.063
	(0.021)	(0.021)	(0.019)	(0.018)	(0.092)	(0.093)	(0.131)	(0.068)	(0.085)
Observations	206	203	206	203	206	203	204	204	204
R^2	0.143	0.175	0.231	0.288	0.336	0.341	0.527	0.198	0.129
Mean (control group)	0.964	0.964	0.629	0.629	0.291	0.291	2.585	0.868	0.830
T1 = T2 (p-value)	0.703	0.704	0.214	0.295	0.009	0.014	0.609	0.684	0.505
T1 = T3 (p-value)	0.500	0.381	0.632	0.631	0.005	0.006	0.796	0.297	0.271
T2 = T3 (p-value)	0.762	0.615	0.449	0.581	0.843	0.744	0.439	0.514	0.651
Lagged Dependent Variable	No	Yes	No	Yes	No	Yes	No	No	No

Note: estimates based on OLS regression (see equations 1 and 2). *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parenthesis and clustered at community level. Columns (1), (3), (5) and (7)-(9) present estimates using equation (1). Columns (2), (4), (6) present estimates using equation (2), including the lagged value of the dependent variable. Depending on the column, the dependent variables are defined by the following: (1)-(2) Awareness: indicator variable equal to 1 if the respondent reports having heard about the natural gas discovery; (3)-(4) Knowledge: index built averaging 12 indicator variables concerning knowledge of whether the government is receiving revenues from natural gas extraction, about the firms involved, and about the location of the discovery; (5)-(6) Salience: indicator variable equal to 1 whether the respondent use the word 'gas' when asked about the three major events in the district in the last 5 years; (7) Knowledge (self-reported): self-reported level of information about the natural gas discovery (1 = not at all - 4 = fully informed); (8) Perceived benefit to Community: indicator variable equal to 1 if the respondent agree or fully agree that the community will benefit from natural gas; (9) Perceived benefit to Household: indicator variable equal to 1 if the respondent agree or fully agree that his household will benefit from natural gas. In columns (4)-(6), the sample is restricted to respondents aware of the natural gas discovery. All specifications include village- and leader-level controls.

Table 3 – Citizens' awareness and knowledge of the natural gas discovery

Dep. Var.:	Awareness		Knowledge		Salience		Knowledge (self-reported)	Perceived benefit to Community Household	
Sample:	All	All	All	All	All	All	Respondents aware of the discovery		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(T1) Information to Leader	0.010	0.013	0.009	0.011	0.055**	0.072**	0.120**	-0.001	0.025
	(0.028)	(0.030)	(0.018)	(0.019)	(0.026)	(0.030)	(0.053)	(0.030)	(0.029)
(T2) Information to Leader and Citizens	0.249***	0.250***	0.171***	0.170***	0.218***	0.219***	0.234***	0.043*	0.065**
	(0.027)	(0.028)	(0.017)	(0.018)	(0.026)	(0.028)	(0.046)	(0.023)	(0.027)
(T3) Information plus Deliberation	0.240***	0.238***	0.169***	0.163***	0.233***	0.242***	0.273***	0.044**	0.067***
	(0.026)	(0.026)	(0.017)	(0.017)	(0.030)	(0.032)	(0.044)	(0.020)	(0.025)
Observations	2067	1875	2067	1875	2072	1879	1622	1589	1570
R^2	0.273	0.285	0.387	0.406	0.175	0.173	0.117	0.149	0.123
Mean (control group)	0.681	0.671	0.461	0.452	0.190	0.183	1.977	0.779	0.694
T1 = T2 (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.024	0.111	0.175
T1 = T3 (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.113	0.148
T2 = T3 (p-value)	0.725	0.648	0.903	0.694	0.621	0.449	0.337	0.981	0.941
Lagged Dependent Variable	No	Yes	No	Yes	No	Yes	No	No	No

Note: estimates based on OLS regression (see equations 1 and 2). *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parenthesis and clustered at community level. Columns (1), (3), (5) and (7)-(9) present estimates using equation (1). Columns (2), (4), (6) present estimates using equation (2), including the lagged value of the dependent variable. Depending on the column, the dependent variables are defined by the following: (1)-(2) Awareness: indicator variable equal to 1 if the respondent reports having heard about the natural gas discovery; (3)-(4) Knowledge: index built averaging 12 indicator variables concerning knowledge of whether the government is receiving revenues from natural gas extraction, about the firms involved, and about the location of the discovery; (5)-(6) Salience: indicator variable equal to 1 whether the respondent use the word 'gas' when asked about the three major events in the district in the last 5 years; (7) Knowledge (self-reported): self-reported level of information about the natural gas discovery (1 = not at all - 4 = fully informed); (8) Perceived benefit to Community: indicator variable equal to 1 if the respondent agree or fully agree that the community will benefit from natural gas; (9) Perceived benefit to Household: indicator variable equal to 1 if the respondent agree or fully agree that his household will benefit from natural gas. In columns (4)-(6), the sample is restricted to respondents aware of the natural gas discovery. All specifications include village- and household-level controls.

Table 4 – Citizens' awareness and knowledge of the natural gas discovery

Dep. Var.:	Awareness		Knowledge		Salience		Knowledge (self-reported)	Perceived benefit to Community Household	
Sample:	All	All	All	All	All	All	Respondents aware of the discovery		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(T1) Information to Leader	0.01	0.013	0.009	0.011	0.055**	0.072**	0.120**	-0.001	0.025
	-0.028	-0.03	-0.018	-0.019	-0.026	-0.03	-0.053	-0.03	-0.029
(T2) Information to Leader and Citizens	0.249***	0.250***	0.171***	0.170***	0.218***	0.219***	0.234***	0.043*	0.065**
	-0.027	-0.028	-0.017	-0.018	-0.026	-0.028	-0.046	-0.023	-0.027
(T3) Information plus Deliberation	0.240***	0.238***	0.169***	0.163***	0.233***	0.242***	0.273***	0.044**	0.067***
	-0.026	-0.026	-0.017	-0.017	-0.03	-0.032	-0.044	-0.02	-0.025
Observations	2067	1875	2067	1875	2072	1879	1622	1589	1570
R2	0.273	0.285	0.387	0.406	0.175	0.173	0.117	0.149	0.123
Mean (control group)	0.681	0.671	0.461	0.452	0.19	0.183	1.977	0.779	0.694
T1 = T2 (p-value)	0	0	0	0	0	0	0.024	0.111	0.175
T1 = T3 (p-value)	0	0	0	0	0	0	0.003	0.113	0.148
T2 = T3 (p-value)	0.725	0.648	0.903	0.694	0.621	0.449	0.337	0.981	0.941
Lagged Dependent Variable	No	Yes	No	Yes	No	Yes	No	No	No

Note: estimates based on OLS regression (see equations 1 and 2). *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parenthesis and clustered at community level. Columns (1), (3), (5) and (7)-(9) present estimates using equation (1). Columns (2), (4), (6) present estimates using equation (2), including the lagged value of the dependent variable. Depending on the column, the dependent variables are defined by the following: (1)-(2) Awareness: indicator variable equal to 1 if the respondent reports having heard about the natural gas discovery; (3)-(4) Knowledge: index built averaging 12 indicator variables concerning knowledge of whether the government is receiving revenues from natural gas extraction, about the firms involved, and about the location of the discovery; (5)-(6) Salience: indicator variable equal to 1 whether the respondent use the word 'gas' when asked about the three major events in the district in the last 5 years; (7) Knowledge (self-reported): self-reported level of information about the natural gas discovery (1 = not at all - 4 = fully informed); (8) Perceived benefit to Community: indicator variable equal to 1 if the respondent agree or fully agree that the community will benefit from natural gas; (9) Perceived benefit to Household: indicator variable equal to 1 if the respondent agree or fully agree that his household will benefit from natural gas. In columns (4)-(6), the sample is restricted to respondents aware of the natural gas discovery. All specifications include village- and household-level controls.

Table 5 – Elite capture

Dep.Var.	Attitudes against Corruption		Zinc Roof Usage	Funds for Meetings		Taskforce Activity				Trust Game
				Spent all budget	Expenses	Average Raven's Score	Top performers selected	Mid-performers selected	Women Selected	Leader Returns
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(T1) Information to Leader	-0.106***	-0.101**	0.03	-0.291***	-51.903**	0.320	-0.206***	0.219**	-0.079*	-0.598
	(0.040)	(0.041)	(0.083)	(0.093)	(23.814)	(0.319)	(0.077)	(0.096)	(0.040)	(0.578)
(T2) Information to Leader and Citizens	-0.050	-0.063	0.072	-0.205**	-24.374	0.333	-0.136*	0.135	-0.016	-0.639
	(0.042)	(0.044)	(0.086)	(0.097)	(24.929)	(0.333)	(0.080)	(0.100)	(0.042)	(0.604)
(T3) Information plus Deliberation	-0.076*	-0.082*	0.107	-0.185*	-19.102	0.264	-0.094	0.124	0.043	-0.860
	(0.042)	(0.044)	(0.086)	(0.097)	(24.971)	(0.333)	(0.081)	(0.100)	(0.042)	(0.596)
Observations	204	192	206	205	205	206	206	206	206	202
R2	0.202	0.205	0.306	0.194	0.277	0.181	0.241	0.196	0.277	0.166
Mean (control group)	0.927	0.927	-0.2	0.481	310.463	3.516	0.291	0.491	0.218	6.019
T1 = T2 (p-value)	0.181	0.391	0.626	0.375	0.269	0.969	0.385	0.403	0.134	0.946
T1 = T3 (p-value)	0.481	0.663	0.38	0.28	0.195	0.868	0.171	0.348	0.005	0.664
T2 = T3 (p-value)	0.543	0.688	0.686	0.834	0.832	0.836	0.601	0.908	0.169	0.711
Lagged Dependent Variable	No	Yes	No	No	No	No	No	No	No	No

Note: estimates based on OLS regression (see equations 1 and 2). *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parenthesis and clustered at community level. Columns (1), (3)-(10) present estimates using equation (1). Column (2) presents estimates using equation (2), including the lagged value of the dependent variable. Depending on the column, the dependent variables are defined by the following: (1)-(2) Attitudes against Corruption: average between an indicator variable equal to 1 if the leader disagree with the statement "the best way to overcome problems is to pay bribes" and an indicator variable equal to 1 if the leader would not demand a job for himself when asked "Imagine that you had the opportunity to have a meeting with the Governor of Cabo Delgado and that you could make a request. Please tell me what you would ask"; (3) Zinc Roof Usage: index for community use of zinc roof tiles; (-1) leader's personal use, (0) unused, (1) community use. For Funds for Meetings, (4) Spent all budget: indicator for whether leader used all (> 350 of 400 Meticais) funds for meeting; (5) Expenses: expenses during the meeting (in Meticais). For the Taskforce Activity, (6) Average score on Raven's test of individuals chosen by leader; (7) Top performers selected: indicator variable for 1st quintile in the sample distribution of difference between average test score of persons chosen by leader and individuals' scores; (8) Mid-performers selected: indicator variable for 2nd-4th quintiles in the sample distribution of difference between average test score of persons chosen by leader and individuals' scores; (9) Women Selected: percent of women chosen by leader for the Raven's test. For the Trust Game, (10) Leader Returns: amount Leader Returned (out of 15 tokens) in Trust Game. All specifications include village- and leader-level controls.

Table 6 – Rent-seeking among local leaders

Dep. Var.	Relationship with Influential People						Auction	Rent-seeking Game
	Knows any person		Called		Number of calls		Bid for Meeting	Degree of RS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(T1) Information to Leader	-0.037	-0.035	-0.046	-0.002	-0.648*	-0.576	0.103	0.025
	(0.059)	(0.062)	(0.077)	(0.079)	(0.364)	(0.363)	(0.119)	(0.064)
(T2) Information to Leader and Citizens	-0.038	-0.038	-0.006	0.019	-0.542	-0.503	0.100	-0.030
	(0.062)	(0.063)	(0.081)	(0.081)	(0.380)	(0.382)	(0.125)	(0.067)
(T3) Information plus Deliberation	-0.054	-0.045	-0.034	-0.014	-0.368	-0.354	-0.012	0.018
	(0.062)	(0.064)	(0.081)	(0.081)	(0.380)	(0.383)	(0.125)	(0.066)
Observations	204	198	206	203	206	203	206	200
R2	0.206	0.217	0.275	0.299	0.221	0.241	0.238	0.124
Mean (control group)	0.926	0.926	0.800	0.800	3.189	3.189	4.217	0.186
T1 = T2 (p-value)	0.986	0.969	0.618	0.795	0.781	0.849	0.979	0.405
T1 = T3 (p-value)	0.787	0.877	0.883	0.887	0.469	0.566	0.365	0.917
T2 = T3 (p-value)	0.797	0.907	0.727	0.690	0.649	0.700	0.373	0.469
Lagged Dependent Variable	No	Yes	No	Yes	No	Yes	No	No

Note: estimates based on OLS regression. *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parenthesis and clustered at community level. Columns (1), (3), (5), (7) and (8) present estimates using equation (1). Columns (2), (4) and (6) present estimates using equation (2), including the lagged value of the dependent variable. Depending on the column, the dependent variables are defined by the following: for the Relationship with Influential People, (1)-(2) Knows any person: indicator variable equal to 1 if the citizen knows influential people; (3)-(4) Called: indicator variable equal to 1 if the citizen called influential people; (5)-(6) Number of calls: number of calls (in logs) to influential people in the last 6 months. For the Auction activity, (7) Bid for Meeting: log amount bid for the meeting with administrator. For the Rent-seeking Game, (8) Degree of Rent Seeking: amount of rent seeking as proportion of total possible: Varies continuously from 0 (lowest rent seeking), to 1 (full rent seeking).

Table 7 – Rent-seeking among citizens

Dep. Var.	Relationship with Influential People						Meeting − Training Auction		Rent-seeking Game	
	Knows any person		Called		Number of calls		Bid Difference	Share Bid to Meeting	Gifts Sent	Any Gift Sent
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(T1) Information to Leader	0.062**	0.062**	0.033**	0.024	0.125**	0.106*	0.155**	0.028**	0.143	0.039
	(0.029)	(0.031)	(0.016)	(0.016)	(0.056)	(0.057)	(0.076)	(0.013)	(0.214)	(0.025)
(T2) Information to Leader and Citizens	-0.014	-0.014	0.013	0.011	0.059	0.061	0.063	0.006	0.341	0.049*
	(0.032)	(0.032)	(0.015)	(0.015)	(0.049)	(0.050)	(0.066)	(0.011)	(0.208)	(0.025)
(T3) Information plus Deliberation	0.048*	0.042	0.042**	0.044**	0.059	0.070	0.082	0.007	0.055	0.033
	(0.027)	(0.028)	(0.018)	(0.019)	(0.052)	(0.054)	(0.072)	(0.013)	(0.216)	(0.027)
Observations	2065	1861	2072	1879	2072	1879	2072	2072	2023	2023
R2	0.107	0.117	0.069	0.082	0.065	0.077	0.020	0.023	0.117	0.043
Mean (control group)	0.613	0.609	0.064	0.063	0.182	0.177	-0.029	0.499	4.079	0.880
T1 = T2 (p-value)	0.026	0.027	0.286	0.458	0.290	0.460	0.134	0.031	0.288	0.594
T1 = T3 (p-value)	0.666	0.548	0.646	0.314	0.301	0.577	0.279	0.055	0.648	0.779
T2 = T3 (p-value)	0.064	0.093	0.106	0.071	0.999	0.865	0.764	0.929	0.143	0.463
Lagged Dependent Variable	No	Yes	No	Yes	No	Yes	No	No	No	No

Note: estimates based on OLS regression (see equations 1 and 2). *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parenthesis and clustered at community level. Columns (1), (3), (5) and (7)-(10) present estimates using equation (1). Columns (2), (4) and (6) present estimates using equation (2), including the lagged value of the dependent variable. Depending on the column, the dependent variables are defined by the following: for the Relationship with Influential People, (1)-(2) Knows any person: indicator variable equal to 1 if the citizen knows influential people; (3)-(4) Called: indicator variable equal to 1 if the citizen called influential people; (5)-(6) Number of calls: number of calls (in logs) to influential people in the last 6 months. For the Meeting − Training Auction activity, (7) Bid Difference: difference between the log amount bid for the meeting with administrator and the log amount bid for the local training; (8) Share Bid for Meeting: share of total bids allocated to meeting the administrator. For the Rent-seeking Game, (9) Gifts Sent: number of gift tokens (out of 10) sent to leader; (10) Any Gift Sent: indicator variable for whether the participant sent any tokens as gift to leader. All specifications include village- and household-level controls.

Table 8 – Citizen's mobilization

Dep. Var.	Group Membership		Community Meetings Participation		Matching Grant Activity					Public Good Game
					Awareness	Participation	Contributions	Attendance	Voting	Contribution
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(T1) Information to Leader	-0.008	-0.031	0.003	0.002	0.018	0.043	0.137	0.024	-0.029	-0.134
	-0.022	-0.025	-0.019	-0.02	-0.035	-0.047	-0.178	-0.015	-0.031	-0.187
(T2) Information to Leader and Citizens	0.023	0.005	0.033*	0.034*	0.093***	0.089*	0.253	-0.003	-0.022	-0.132
	-0.022	-0.025	-0.018	-0.019	-0.035	-0.051	-0.192	-0.016	-0.032	-0.209
(T3) Information plus Deliberation	0.067**	0.052*	0.041**	0.041**	0.108***	0.107**	0.386*	0.032**	0.061*	0.03
	-0.027	-0.03	-0.017	-0.018	-0.033	-0.049	-0.197	-0.016	-0.032	-0.206
Observations	2051	1776	2014	1792	2067	2072	2008	203	206	2023
*R*2	0.106	0.129	0.074	0.089	0.102	0.091	0.085	0.227	0.156	0.071
Mean (control group)	0.232	0.225	0.899	0.892	0.705	0.34	1.219	0.044	0.018	4.479
T1 = T2 (p-value)	0.194	0.14	0.11	0.082	0.027	0.382	0.557	0.084	0.836	0.988
T1 = T3 (p-value)	0.006	0.004	0.05	0.049	0.006	0.217	0.237	0.65	0.007	0.334
T2 = T3 (p-value)	0.116	0.109	0.636	0.682	0.658	0.747	0.556	0.028	0.011	0.379
Lagged Dependent Variable	No	Yes	No	Yes	No	No	No	No	No	No

Note: estimates based on OLS regression. *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parenthesis and clustered at community level. Columns (1), (3), (5)-(11) present estimates using equation (1). Columns (2) and (4) present estimates using equation (2), including the lagged value of the dependent variable. Depending on the column, the dependent variables are defined by the following: (1)-(2) Group Membership: indicator variable equal to 1 if the citizen is an active member or leader in a professional or local organization or in a local committee; (3)-(4) Community Meetings Participation: indicator variable equal to 1 if the citizen participated in at least one community meeting in the last 12 months. For Matching Grants Activity: (5) Awareness: indicator variable equal to 1 if the citizen heard about the activity; (6) Participation: indicator variable equal to 1 if the citizen reported contributing a positive amount; (7) Contributions: log of self-reported contribution in matching activity; (8) Attendance: (observed) share of adults in the community who attended the matching activity; (9) Voting: indicator variable equal to 1 if the decision in the matching activity was determined by voting. For Public Goods Game: (10) Contribution: contribution (out of 10 tokens) in public goods game. Specifications in columns (1)-(7) and (10) include village- and household-level controls. Specifications in columns (8)-(9) include village- and leader-level controls.

Table 7: Trust and Accountability

Dep. Var.	Trust (self-reported)					Voice at		Violence		Trust Game	
	Average Trust		Community Leaders known	Provincial Government	National Leaders	Provincial level	National level	Attitudes towards	Verbal violence	Amount sent	Desire to punish
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(T1) Information to Leader	-0.022*	-0.024**	0.004	-0.056	0.020	-0.034	0.017	0.029	0.000	0.135	0.043
	(0.012)	(0.012)	(0.034)	(0.039)	(0.040)	(0.046)	(0.046)	(0.030)	(0.029)	(0.168)	(0.037)
(T2) Information to Leader and Citizens	0.024**	0.025**	0.056*	0.057	0.057	0.081*	0.107**	-0.011	-0.004	0.015	0.047
	(0.011)	(0.011)	(0.032)	(0.037)	(0.038)	(0.049)	(0.042)	(0.027)	(0.026)	(0.171)	(0.039)
(T3) Information plus Deliberation	-0.005	-0.003	0.057**	-0.014	0.059*	0.049	0.050	0.004	-0.045*	0.124	-0.021
	(0.012)	(0.011)	(0.023)	(0.042)	(0.035)	(0.048)	(0.046)	(0.032)	(0.026)	(0.182)	(0.038)
Observations	2030	1744	1627	2058	2065	1998	2001	1881	2065	2023	2003
R2	0.104	0.133	0.127	0.080	0.085	0.062	0.067	0.059	0.049	0.150	0.047
Mean (control group)	0.766	0.769	2.827	2.439	2.445	2.503	2.489	0.298	0.349	4.053	0.398
T1 = T2 (p-value)	0.000	0.000	0.217	0.002	0.338	0.035	0.071	0.132	0.871	0.511	0.931
T1 = T3 (p-value)	0.179	0.091	0.112	0.357	0.301	0.110	0.499	0.393	0.112	0.958	0.106
T2 = T3 (p-value)	0.014	0.016	0.989	0.087	0.966	0.563	0.230	0.619	0.096	0.567	0.115
Lagged Dependent Variable	No	Yes	No	No	No	No	No	No	No	No	No

Note: estimates based on OLS regression (see equations 1 and 2). *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parenthesis and clustered at community level. Depending on the column, the dependent variables are defined by the following: for Trust outcomes, (1)-(2) Average Trust: average of all self-reported measures of trust (family, neighbours, local leaders, local people, district government, province government, Mozambicans, and national leaders) (0 = no trust / 1 = highest trust); (3) Community Leaders Known: self-reported trust for community leaders that are personally known by the respondent (1 = not at all / 4 = trust a lot); (4) Provincial government: self-reported trust for provincial government (1 = not at all / 4 = trust a lot); (5) National Leaders: self-reported trust for national leaders (1 = not at all / 4 = trust a lot). For Voice at, (6) Provincial level: self-reported level in which citizens have voice with provincial administrators (1 = not at all / 4 = totally); (7) National level: self-reported level in which citizens have voice with national administrators (1 = not at all / 4 = totally). For Violence, (8) Attitudes towards violence: indicator variable equal to 1 if the citizen believes violence is justified to defend a cause; (9) Verbal violence: indicator variable equal to 1 if the respondent witnessed any verbal violence in the last 3 months. For the Trust Game, (10) Amount sent: amount sent (out of 10 tokens) by the participant in the trust game; (11) Desire to punish: indicator variable equal to 1 if the respondent has desire to punish selfish leader in the trust game. Specifications in columns (1)-(9) include village- and household-level controls. Specifications in columns (10)-(11) include village- and leader-level controls.

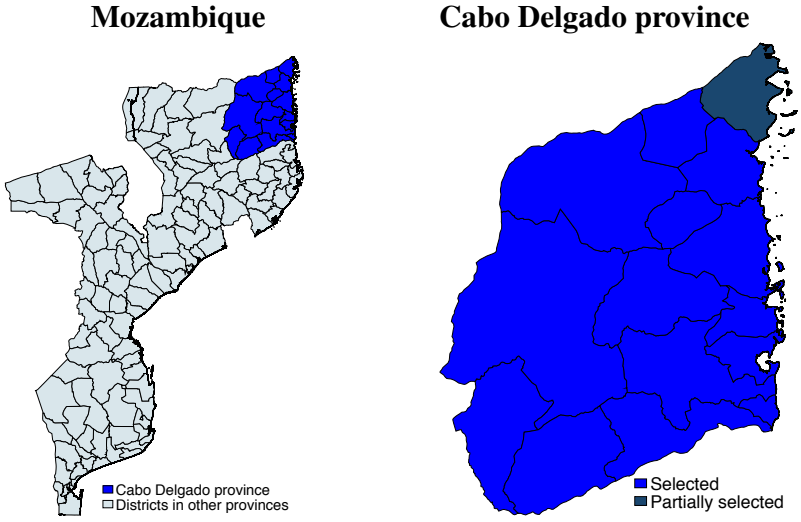
Appendix. Sample design

Villages were selected from all districts except one in the province of Cabo Delgado. The sampling frame was the electoral one, which yields data on registered voters per polling station. There are 474 polling stations in the province, as of the last national election in 2014. Since one of the objectives of the study is to understand the relationship between natural resources and political outcomes and we cannot observe voting outcomes at village level, we selected polling stations as our geographical unit of interest.

The selection process excluded islands (2 polling stations, and all 4 polling stations of the excluded Ibo district), as well as polling stations in Palma administrative seat (11 polling stations). The former stations were excluded due to their unrepresentative isolation. The latter stations were instead excluded to avoid communities that will be relocated due to the construction of a LNG plant. Figure 6 presents the geographical distribution of the selected areas, both for the whole country and within the Cabo Delgado district. Further exclusions involve polling stations that moved from 2009 to 2014 electoral frames (54 polling stations) and polling stations that were smaller than or equal to the 5th percentile by number of registered voters (corresponding to approximately 200 voters per polling station). The former polling stations were excluded to focus on more stable polling stations and that can therefore be compared over time, while the latter were excluded due to non-representativeness and anticipation of difficulties in household recruitment.

For the random sampling among remaining polling stations, polling stations were stratified into three groups: polling stations in urban areas (Pemba and Montepuez), polling stations in semi-urban areas (administrative seats of each district), and finally all other stations. In this sampling frame, there are 421 polling stations: 14 in urban areas and 39 in semi-urban areas.

Figure 6 – Selected districts within Mozambique and within Cabo Delgado



Note: in dark blue, the provinces selected for the project.

We selected a total number of 200 polling stations at random using the following rules for selection within each stratum. In urban strata, we selected 8 polling stations in Pemba and 4 polling stations

in Montepuez. In semi-urban strata, we selected 2 polling stations per town, except when only 1 was available (in which case only one was selected). The remaining 165 stations are sampled from all other polling stations. Additionally, 7 polling stations were added to the sample (following the same sampling rules as before). These additional areas are to be use as a safeguard in case any of the 200 villages have to be excluded over the duration of the study. Hence, the baseline was conducted in a total of 207 polling stations. Table 9 shows the list of strata and the number of available and sampled polling stations for the 200 polling stations.

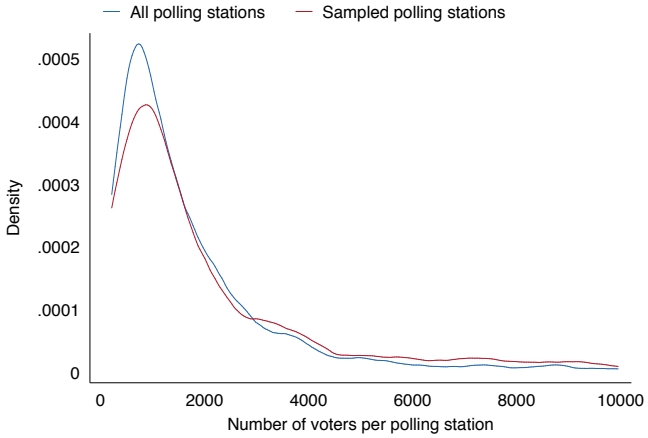
Table 9 – Distribution of available and sampled polling stations by strata

Stratum	Name	Polling Stations		
		Available	Sampled	% Sampled
URBAN	Pemba	9	8	0.040
URBAN	Montepuez	5	4	0.020
SEMI-URBAN	Ancuabe	5	2	0.010
SEMI-URBAN	Balama	1	1	0.005
SEMI-URBAN	Chiure	1	1	0.005
SEMI-URBAN	Mocimboa da Praia	4	2	0.010
SEMI-URBAN	Macomia	8	2	0.010
SEMI-URBAN	Mecufe	3	2	0.010
SEMI-URBAN	Meluco	3	2	0.010
SEMI-URBAN	Metuge	2	2	0.010
SEMI-URBAN	Mueda	4	2	0.010
SEMI-URBAN	Muidumbe	2	2	0.010
SEMI-URBAN	Namuno	3	2	0.010
SEMI-URBAN	Nangade	1	1	0.005
SEMI-URBAN	Palma	1	1	0.005
SEMI-URBAN	Quissanga	1	1	0.005
OTHER STATIONS	-	421	165	0.825
TOTAL	**-**	**474**	**200**	**1.000**

The sampling design presents an oversampling of urban and semi-urban polling station in order to have a more representative sample of the few urban settlements in the province. Figure 7 shows a comparison of the distribution of registered voters in the sampling frame and the sampled polling stations. Each distribution is estimated using a non-parametric kernel density of the number of voters per polling station. The blue line presents the distribution of the number of registered voters per polling station in the sampling frame, while the red line presents the same distribution in the sampled polling stations.

The distribution of registered voters in sampled polling stations is more representative of larger polling stations compared to the sampling frame, due to the oversampling. For larger polling stations, the distribution is comparable between sampled stations and its population.

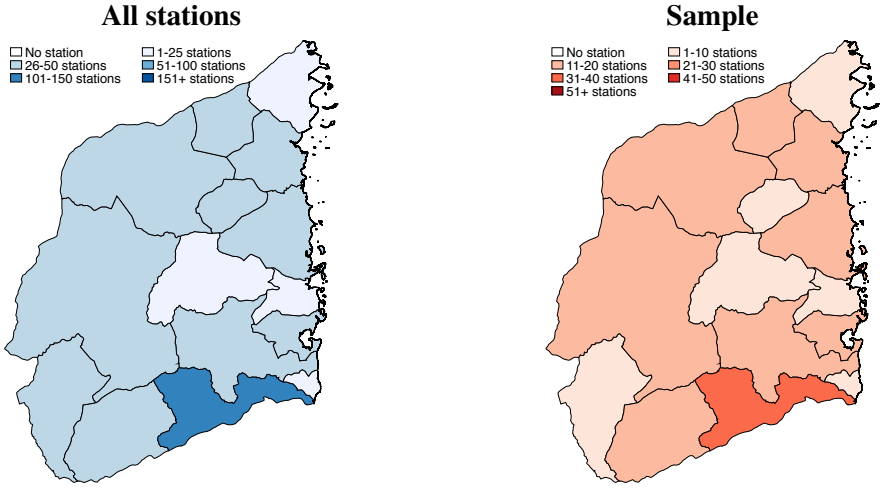
Figure 7 – Distribution of voters in sampled polling stations and all stations



Note: The blue line presents the distribution of the number of registered voters per polling station in the sampling frame, while the red line presents the same distribution in the sampled polling stations.

In order to obtain a geographical representation of sampled polling stations, we present the distribution among different districts of the number of polling stations and the number of sampled polling stations. Figure 8 presents the geographical distribution of polling stations in both the population and the sample. The left panel presents the geographic distribution of the number of polling station, while the right panel shows the same information but restricted to sampled polling stations. We can observe that stratified random sampling tend to replicate the distribution of polling stations in the sampling frame. While the number of polling stations is comparable across districts, the number of stations is slightly higher in Chiure district, in the southern part of Cabo Delgado. Overall, the sample is covering the whole province.

Figure 8 – Geographic distribution of polling stations



Note: left panel presents the geographic distribution of the number of polling station, while the right panel shows the same information but restricted to sampled polling stations. Metuge is included in Pemba district and Ibo is included in Quissanga district.

Appendix. Survey instruments

The survey instruments used during the baseline data collection are composed by three questionnaires: *Household, Leader,* and *Community* questionnaires. In this section, we describe the main characteristics of these instruments.

Household

The household questionnaire was designed for the purpose of collecting data from ten citizens of each village. The questionnaire is composed of several modules:

- *Identification and Selection* – This section includes the identification and location of the house and of the respondent, and questions that identify if the individual meets the requirements to take part in the project.
- *Demographics* – This section contains detailed questions on the demographic characteristics of the respondent and the household, including gender, age, marital status, number of household members, education, languages spoken, occupation, income, and expenditures.
- *Agriculture* – This section presents questions on the total land owned by the household, amount of land used for agriculture, and the assets of the household.
- *Household characteristics* – Information about the materials used to build the house and basic conditions as water and electricity.
- *Information about natural resources* – Includes questions about sources and frequency of information about political issues and knowledge of natural gas. Elicits opinions about the benefits of the natural gas, and questions to examine existing knowledge about natural gas.
- *Discount and risk* – This section measures time and risk preferences of respondents.
- *Aspirations* – Includes questions about the current situation of the province, the country, and the household's economic situation, as well as future expectations and desires. Furthermore, questions about expected and desired occupation, as well as, expected and desired children's education, and level of inclusion in village activities. The section ends with questions related to the expected future investment of the government in the village.
- *Trust* – Collects information about the level of trust individuals have in their family, neighbours, local leaders, members of the community or tribe, members from other communities or tribes, leaders of the district and of the province, and national leaders.
- *Social capital* – This section asks about level of participation in social groups, community meetings, rallies, and political campaigns, and about his/her household's contribution to community improvements, as well as detailed information about any influential people the respondent knows. We also ask the respondent extensive information about its relationship with all leaders in the village, including influential people, high-level officials, community and religious leaders.

- *Political accountability* – Includes questions on political accountability, such as how decisions are made in the community, the involvement of the respondent in the community, agreement with statements about politics, and knowledge about local leaders. The section ends with questions about violence in the community.
- *Political preferences and rent-seeking* – This final section includes information on which political parties the respondent supports, and attitudes towards rent-seeking behaviour.

Leader

In line with the household survey, a survey was addressed to the leader of each village. To maintain consistency, a person is considered a leader when selected by the community through a community meeting and subsequently approved by the district government. A leader's main role is to act as a liaison between the government and the community. Religious leaders or other influential villagers were not part of the study. While we focus on a specific leader for this measurement instrument, in the household questionnaire, we collect extensive information about the relationship between the household head and all leaders.

The survey is similar to the previous one but includes additional questions related to the position of the respondent as a leader, such as, how long he/she is in the office, role in social groups, and questions relating to decision-making.

Community

The community survey was collected from up to 7 community members from each village who answered the questionnaire together (typically those who are influential in the community and/or are members of community groups). It includes a comprehensive set of questions about village characteristics. It comprises the following sections:

- *Identification of the village* - Basic information about the identity of the village, respondents, number of households, number of households working in natural resources, migration, and ethnic/linguistic composition.
- *Infrastructure* – This section is dedicated to the infrastructure available in the village.
- *Natural resources* – Includes information about any natural resources that may exist in the village surroundings.
- *Markets* – This section asks details about markets that villagers attend.
- *Improvements* – This module includes questions on any improvements made to the community during the last 12 months.
- *Social groups* – Information about the existence and characteristics of any social groups in the village.
- *Community meetings* – This section contains questions about frequency, attendance, and content of meetings in the village.

- *Social capital* – This section includes the identification of leaders and influential individuals in the community.

Appendix. Pre-analysis plan

This pre-analysis plan describes the methodology that will be used to evaluate the impact of an intervention that aims to promote transparency and accountability in the management of natural gas revenues in Mozambique[14]. This intervention will occur during the second half of 2016 in the province of Cabo Delgado.

Mozambique discovered substantial natural resources in recent years. Known gas reserves in the Rovuma basin have the potential to transform Mozambique into a global player in Liquefied Natural Gas exports. Being a recent democracy, and with relatively weak institutions, Mozambique also faces considerable risks of resource and revenue mismanagement in the future, particularly since media independence and penetration are low and the level of political accountability is not improving.

The intervention we will evaluate consists on the distribution of information about the management of the newly discovered natural gas in the Rovuma basin, and the holding of citizen meetings to deliberate on the main priorities for spending the revenues from these resources. These activities will be sponsored and implemented by a consortium of NGOs led by free-distribution newspaper @Verdade. These implementing agencies strongly believe that the resource curse can be counteracted through the widespread provision of information about the management of natural resources in the country. Behind this belief is the hypothesis that information will make politicians accountable through the electoral system.

We propose to evaluate three different treatments at the level of the community. The first is the dissemination of information about natural resources and its management to the local elite only (group 1). The second is the dissemination of information about natural resources and its management to both the population through community meetings and door-to-door contact, and to the local elite (group 2). Within this treatment, we will evaluate different types of information leading subjects to potentially different aspirations: control and information on success cases for well-governed resource booms (aspirations module). The third is deliberation in small citizen committees about priorities for the spending of natural resource revenues, in addition to information to citizens and elite (group 3). Within this treatment, we will evaluate different methods of deliberation at the citizen group level: default, majority elections (secret), and open deliberation (deliberation module).

Randomization procedure and Sample

Randomization design and sample

The study main research questions are the following:

[14] In the event that the structure of the data or other unforeseen factors necessitate adjustments in the methodology and specifications to be employed in the analysis, such adjustments will be documented with reference to the original specifications in this note and accompanied by a justification of why such adjustments were necessary.

1. What is the effect of information about natural resources on the political elite's behaviour, when local elites are the only ones being informed, when everyone is informed, and when citizens deliberate on ways to spend resource revenues?
2. What is the effect of information about natural resources on citizens' behaviour, when everyone is informed and when citizens deliberate on ways to spend resource revenues?
3. What is the impact of different types of information channelled to citizens, namely on aspirations and other citizen outcomes?
4. What is the impact of different types of deliberation, i.e., default, majority elections (secret), and open deliberation, on elite behaviour/deliberation outcomes?
5. How are the above-referred impacts different for subjects living closer to the centre of action for the natural gas boom?

In order to answer these research questions, we will implement a randomized controlled trial in partnership with the implementing agency, @Verdade. Randomization will be conducted at the community level. A community will be identified as a polling station. This will allow us to use actual political behaviour as an outcome variable.

We will select 200 communities (including villages and urban neighbourhoods) in Cabo Delgado province. These will be selected randomly from the communities identified by the corresponding polling locations of that province. We will structure the 200 communities in clusters of four communities matched on geographical traits including proximity and randomly allocate each to one of the groups, described in Section 1:

- Group 0. Control Group
- Group 1. Information to the elite
- Group 2. Information to the elite + Information to the community
- Group 3. Information to the elite + Information to the community + Deliberation

In terms of measurement within the 200 communities, we will select subjects randomly from the pool of subjects accepting to participate in our games: within each community, 20 individuals will be selected for participation in the dictator and trust games, and 10 individuals will be selected for participation in the public game. We will place door-to-door invitations for the purpose of participation in the lab games. Surveys will be submitted to 10 random adults in each community, by stratifying on households (one adult per household), and following standard door-to-door sampling procedures.

In Group 2, we will also have the aspirations module. For this group, citizens will be randomly assigned to two groups, one providing information about success cases in the management of natural resources, the other assigned to control.

Within each of the communities in Group 3, we will randomly allocate citizens to the three deliberation treatments: secret voting, open deliberation, and default. Initially, @Verdade implementers will collect a list of citizens interested in deliberating about the priorities for resource

revenue spending. When all participating subjects are identified, they will be assigned randomly to three groups. When they are formed, sealed envelopes with the type of deliberation (fieldworkers will not know the specific contents) will be given to the three groups. This procedure guarantees random assignment of treatments to deliberation citizen groups.

Unit of Analysis

Depending on the outcome of interest, the unit of analysis is at the individual level, at the household level, or at the community level. For behavioural data sources, we will distinguish individual data between elite and citizens. We indicate as “local elites” the village leaders. In Mozambique, these individuals are well-defined figures in each community. At the level of the community ("localidade"), a local chief is the person in charge for the community. At a smaller level, there are chiefs for villages (*chefes de aldeia*) or neighbourhoods (*secretários de bairro*), and for blocks (*chefes de quarteirão* or *chefes de bloco*). They are typically elected by the community (informally) even though the ruling party can strongly influence the outcome, through higher levels of the government structure (at the level of the *localidade* or *posto administrativo* – note that the chiefs at these levels are nominated by the provincial governor). In addition to these figures, the "*régulos*" are the traditional village leaders. These leaders follow a hereditary system, passing from parents to sons. The competencies at the lower levels (village, neighbourhood, block) are mainly related to conflict resolution, land allocation, and formal ceremonies. These leaders also influence the allocation of aid and employment programs.

Attrition

In order to minimize attrition, we will collect cell phone numbers of respondents and other members of the household, from the participants in the games and in the modules activities. Additionally, we will collect social network data and GPS coordinates.

Data sources

We plan to collect data from several sources:

i. Survey data – this will consist on a baseline conducted in 2016 and an end-line in 2017;

ii. Structured Community Activities –to be designed and tested during the first phase of project. Different SCAs will be conducted to measure elite and citizens behaviour;

iii. Lab Games – dictator game played with the elite, and a trust game and a public good game with the citizens;

iv. Official electoral data – aggregated at the poll level, from the municipal elections in 2018 and the national general elections in 2019;

v. Qualitative data – to be collected at the pilot stage, during the intervention (particular focus on the deliberation groups) and at end line.

Hypotheses

With this impact evaluation, we will be able to test the following hypothesis:

A. Information

1. Information on natural resources will affect elite's provision of public goods and investment in political connections.
2. Citizens' information on natural resources will affect the levels of social cohesion, trust, and political accountability in the community.
3. Citizens' information on natural resources will affect rent-seeking behaviour by citizens.
4. Citizens' information on natural resources will affect citizens' political participation.
5. Elite information on natural resources will affect citizens' behaviour in A3-A5.

B. Aspirations

1. Having citizens who are exposed to testimonies from other citizens will affect elite's provision of public goods and investment in political connections.
2. Being exposed to testimonies from other citizens will affect the levels of social cohesion, trust, and political accountability in the community.
3. Being exposed to testimonies from other citizens will affect the rent-seeking behaviour of citizens.
4. Being exposed to testimonies from other citizens will affect citizens' political participation.
5. Being exposed to testimonies from other citizens will affect citizens' economic and social outcomes.

C. Deliberation

1. Giving deliberation power to the citizens will affect elite's provision of public goods and investment in political connections.
2. Giving deliberation power to the citizens will affect the levels of social cohesion, trust, and political accountability in the community.
3. Giving deliberation power to the citizens will affect rent-seeking behaviour by citizens.
4. Giving deliberation power to the citizens will affect citizens' political participation.
5. The type of deliberation system will affect elite's behaviour in C1 and C2.
6. The type of deliberation system will affect citizens' behaviour in C2-C4.

Methods

In this section, we present the methodology used to evaluate the effect of the different treatments explained in Section 2. The evaluation design for the comparison of different interventions examines differences in outcomes across individuals and households living in communities assigned to different treatment groups. Since the communities were allocated at random to

different treatment groups, they are expected to be identical on average on all their other characteristics, observed or unobserved. A simple comparison across communities will give us the impact on outcomes of implementing one versus another intervention. Similarly, a comparison of communities assigned to different treatment groups will identify the effect for community-level outcomes.

Identifying the effect of Information

We start by focusing on the general effect of providing information to either the elite or the community. For individual and household outcomes, let T_{im} be an indicator variable that takes value 1 if respondent (or household) i lives in a community m assigned to groups 1, 2 or 3, and equal to 0 if respondent i lives in a community m that is part of group 0. In order to estimate the effect of providing information on the outcome Y_{im}, we estimate the following model:

$$Y_{im} = \alpha + \beta T_{im} + X'_{im}\gamma + \varepsilon_{im} \qquad (3)$$

where X_{im} be a vector of controls, including household and individual characteristics and geographical controls, and ε_{im} is a residual idiosyncratic error term picking up unobserved determinants of the outcome of interest. The impact on outcome Y_{im} of providing information as opposed of not providing any information is given by β.

Similarly, for community-level outcomes, we can estimate the effect of providing information comparing outcomes among communities allocated to different treatment groups. We plan to estimate the effect of information using the following equation:

$$Y_{m} = \alpha + \beta T_{m} + X'_{m}\gamma + \varepsilon_{m} \qquad (4)$$

where X_m is a vector of community characteristics and ε_m is an error term idiosyncratic to the community. The interpretation of coefficients is similar to the one presented for the individual and household outcomes.

Another version of these models also controls for potential imbalances in the outcomes of interest at baseline, by including $Y_{im,t-1}$ in the model. Denoting t as the follow-up period and t-1 as the baseline period (as in equation 1) the model is:

$$Y_{im,t} = \alpha + \beta T_{im,t} + X'_{im,t}\gamma + \delta Y_{im,t-1} + \varepsilon_{im,t} \qquad (5)$$

We will be especially confident of the robustness of our results for equations (1) and (3) are similar across these two specifications. Large differences across the results may indicate occasional imbalances in community characteristics at baseline, in spite of the randomization of interventions to communities.

Identifying the effect of elite information versus community information

In this section, we are interested at identifying the effect of providing information to the elite versus providing information to the community. For individual and household outcomes, similarly to the previous section, let $T1_{im}$ be an indicator variable that takes value 1 if individual (or household) i lives in community m assigned to group 1, and equal to 0 otherwise. Similarly, $T23_{im}$ is an indicator

variable that takes value 1 if individual (or household) i lives in community m assigned to group 2 or 3, and equal to 0 otherwise. In this case, we can identify the effect of different interventions by estimating the following equation:

$$Y_{im} = \alpha + \beta_1 T1_{im} + \beta_{23} T23_{im} + X'_{im}\gamma + \varepsilon_{im} \qquad (6)$$

where X_{im} be a vector of controls and ε_{im} is a residual idiosyncratic error term picking up unobserved determinants of the outcome of interest. The effect of providing information to the elite compared to not providing it is identified by β_1, while the effect of providing information to the community compared to not providing it is identified by β_{23}. The object of interest is not only to test whether β_1 or β_{12} are different than zero, but we are also aiming at testing whether β_1 is different than β_{12}.

Similarly, for community-level outcomes, we can estimate the effect of providing information to the elite versus the community by estimating the following equation:

$$Y_m = \alpha + \beta_1 T1_m + \beta_2 T2_m + \beta_3 T3_m + X'_m\gamma + \varepsilon_m \qquad (7)$$

where X_m is a vector of community characteristics and ε_m is an error term idiosyncratic to the community. The interpretation of coefficients is similar to the one presented for the individual and household outcomes.

Identifying the effect of elite information versus community information with aspirations versus community information with deliberation

In this section, we are interested at identifying the effect of each specific intervention. Similarly, to the previous section, let $T1_{im}$ be an indicator variable that takes value 1 if individual (or household) i lives in community m assigned to group 1 (Information to the elite), and equal to 0 otherwise. Let $T2_{im}$ be an indicator variable that takes value 1 if individual (or household) i lives in community m assigned to group 2 (Information to the elite + Information to the community), and equal to 0 otherwise. Let $T3_{im}$ be an indicator variable that takes value 1 if individual (or household) i lives in community m assigned to group 3 (Information to the elite + Information to the community + deliberation), and equal to 0 otherwise. In this case, we can identify the effect of different interventions by estimating the following equation:

$$Y_{im} = \alpha + \beta_1 T1_{im} + \beta_2 T2_{im} + \beta_3 T3_{im} + X'_{im}\gamma + \varepsilon_{im} \qquad (8)$$

where X_{im} be a vector of controls and ε_{im} is a residual idiosyncratic error term picking up unobserved determinants of the outcome of interest. Similar to the previous section, the effect of providing information to the elite compared to not providing it is identified by β_1. The effect of providing treatment for group 2 is identified by β_2, while the effect of providing treatment for group 3 is identified by β_3. The object of interest is not only to test whether β_1 or β_2 or β_3 are different than zero, but also to test whether β_1 is different than β_2, whether β_1 is different than β_3 and whether β_2 is different than β_3. Similarly, for community-level outcomes, we can estimate the effect of providing different interventions using the following equation

$$Y_{im} = \alpha + \beta_1 T1_{im} + \beta_2 T2_{im} + \beta_3 T3_{im} + X'_{im}\gamma + \varepsilon_{im} \qquad (9)$$

where X_m is a vector of community characteristics and ε_m is an error term idiosyncratic to the community. The interpretation of coefficients is similar to the one presented for the individual and household outcomes.

Heterogeneous Effects of Alternative Interventions

In addition, we plan to control for heterogeneous treatment effects. To this purpose, for each sub-group k in the variable for which we want to control for heterogeneity in the effect, we define an indicator d_{ik} that takes value 1 if household/individual i belong to sub-group k and 0 otherwise. For individual and household outcomes, similarly to the previous section we then estimate the following model, where the impact on outcome Y_{im} of each treatment in sub-group k as opposed to the control group is given by β_{1k}, β_{2k} and β_{3k}:

$$Y_{im} = \alpha + \sum_k \beta_{1k} d_{ik} T1_{im} + \sum_k \beta_{2k} d_{ik} T2_{im} + \sum_k \beta_{3k} d_{ik} T3_{im} + \sum_k \eta_k d_{ik} + X'_{im}\gamma + \varepsilon_{im} \quad (10)$$

where X_{im} be a vector of controls and ε_{im} is a residual idiosyncratic error term picking up unobserved determinants of the outcome of interest. Similarly, we estimate the following model by controlling for Y_{imt-1} in order to check for potential imbalances in the outcomes at baseline.

$$Y_{im} = \alpha + \sum_k \beta_{1k} d_k T1_{im} + \sum_k \beta_{2k} d_k T2_{im} + \sum_k \beta_{3k} d_k T3_{im} + \sum_k \eta_k d_{ik} + X'_{im}\gamma + \delta Y_{im,t-1} + \varepsilon_{im} \quad (11)$$

For community-level outcomes, for each sub-group k in the variable for which we want to control for heterogeneity in the effect, we define an indicator d_k that takes value 1 if community m belongs to sub-group k and 0 otherwise. We can then estimate the effect of providing information using the following equation:

$$Y_m = \alpha + \sum_k \beta_{1k} d_k T1_m + \sum_k \beta_{2k} d_k T2_m + \sum_k \beta_{3k} d_k T3_m + \sum_k \eta_k d_k + X'_m\gamma + \varepsilon_m \quad (12)$$

where X_m is a vector of community characteristics and ε_m is an error term idiosyncratic to the community.

Procedure for addressing limited variation

Following McKenzie (2012), in order to limit noise caused by variables with minimal variation, outcomes for which 97 percent of observations have the same value within the relevant sample will be omitted from the analysis.

Procedure for addressing multiple hypothesis testing

The large set of outcomes studied in this project raises concerns about multiple inference. The probability of erroneously rejecting at least one null hypothesis of no treatment impact naturally increases with the number of outcomes considered. In order to test for multiple outcomes, we will rely on the methodology proposed by Romano and Wolf (2005) to perform multiple hypothesis testing. By capturing the joint dependence structure of the individual test statistics on the treatment impacts, this procedure improves on the ability to detect false hypothesis of program impact.

Outcomes

In this section, we describe which are the main outcomes we will collect and how they relate to the hypothesis stated above. Most of these outcomes will be updated during the first stage of the project, while designing and piloting the measurement instruments. For organization purposes, we present the outcomes by data source. Hence, we show below 5 tables containing the name of the outcome variable/indicator, a brief description of the outcome, a list of hypothesis it relates to, and the level of analysis.

The main source of heterogeneity in the impact is connected to the social position of the participant in the local community, whether he/she is leader or a citizen. This distinction is evident in the research questions and the way the hypotheses are stated. Nevertheless, we can expect other sources of variation of program impacts. This heterogeneity will mainly be captured through survey data outcomes, such as:

i. *Aspirations* – individuals' initial level of aspirations might explain differences in the impact of the information and the deliberation treatment. For example, if an individual has very high expectations concerning natural resources, the information treatment might have a very different impact compared to one individual with no expectations, ceteris paribus;

ii. *Demographic characteristics* – characteristics such as gender, education, occupation might help explain differences in heterogeneity of impacts;

iii. *Information* – if individuals perceive the information transmitted in a different manner, this might explain differences in outcomes;

iv. *Social capital* – individuals with different levels of social capital will face different opportunities concerning rent-seeking outcomes and political connections, for example;

v. *Time and risk preferences* – individual's patience and risk attitudes are usual sources of heterogeneity of impacts;

vi. *Wealth* – constructed using consumption of durable and non-durable goods, investment and assets. Households with different wealth constraints might be able to use the information in different manners and have different outcomes in terms of rent-seeking behaviour.

Table 10 – Outcomes measured using survey data

Outcome	Description	Hypothesis	Level
Aspirations	Expectations about future living conditions of the household, of the village, the region, and the country. Answers using a Likert scale. Answers will be compared with similar questions for present conditions.	B1-B5	IND
Consumption	Batch of consumption questions: quantities consumed in the last 7 days in the household. We will use average prices of goods by village to create a consumption index.	A3, B2, C3	HH
Demand for political accountability	Batch of self-reported indicators on perceived quality of institutions and demand for accountability.	A2, A5, B2, B3, C2, C6	IND
Durable goods	Batch of questions on the current value of durable goods the HH owns.	A3, B2, C3	HH
Income and Assets	Self-reported income and assets.	A3, B2, C3	IND/ HH
Information	Batch of questions to measure self-reported level of knowledge on natural gas exploration and revenues management.	A1-A4	IND
Investment in health and education	Batch of questions to measure household investment in health and education.	A3, B2, C3	HH
Social capital	Dyadic data on networks and distance to the leader.	A1-A3, A5, B1-B3, C1-C3, C5, C6	IND/ HH/ COMM
Time and Risk preferences	We will test between the standard multiple price list and more recent options that allow for non-linear utilities while piloting the measurement instruments.	B1-B5	IND
Trust	Self-reported trust towards institutions and political representatives.	A2, B2, C2, C6	IND
Public Goods	Public goods quantity and quality. List of public goods still to be constructed. Data will be collected by the enumerators team, and not self-reported.	A1-A3, A5, B1-B3, B5, C1-C6	COMM

Table 11 – Outcomes measured using the SCAs

Indicator	Description	Hypothesis	Level
Gift consumption and distribution	Measure the patterns of consumption over time of a gift to the community, which can be consumed privately	A1, A2, B1, B2, C1, C2, C5	Elite
Political appointments	Observe appointments of villagers aimed at specific tasks. Combine with network data collected in the surveys	A1, A2, B1, B2, C1, C2, C5	Elite
Investment in political connections	Observe the spending of personal resources on communication with province-level party representatives	A1, A2, B1, B2, C1, C2, C5	Elite
Social cohesion	Recording citizens' propensity to match local (matching) grants	A2, A4, B2, B4, B5, C2, C6	Citizens
Investment in public goods	Observing citizens' degree of participation in community discussions deciding on a public good	A2, A4, B2, B4, B5, C2, C6	Citizens
Rent-seeking	Observe citizens rent-seeking behaviour - still to be designed.	A3, A5, B3, B5, C3, C6	Citizens

Table 12 – Outcomes measured using behavioural games

Indicator	Description	Hypothesis	Level
Dictator game	Behavioural measurement of elite's willingness to share resources with the citizens.	A1, B1, C1, C5, C6	Elite
Trust game	Behavioural measurement of citizens' trust on local leaders.	A2, B2, C2	Citizens
Public good game	Behavioural measurement of social cohesion.	A2, B2, C2	Citizens

Table 13 – Outcomes measured using electoral data

Indicator	Description	Hypothesis	Level
Political participation: turn-out	Turn-out data collected from local and national elections.	A4, B4, C4	COMM
Political participation: vote	Electoral data collected from local and national elections.	A2, A5, A6, B2, B4, C2, C4	COMM

Table 14 – Outcomes measured using qualitative data

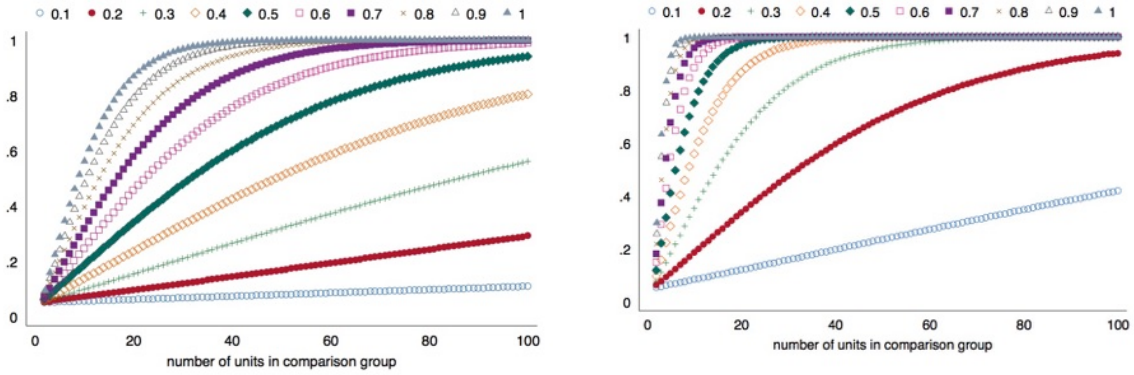
Indicator	Description	Hypothesis	Level
Quality of deliberation process	Quality measurement of the deliberation process - reported by the organizer responsible for each deliberation group	C1-C6	COMM
Open interviews at end-line	These will allow us to better understand the mechanisms behind the impacts	All	COMM/ HH

Appendix. Sample size and power calculations

This study involves measuring outcomes at both the community and individual levels. Community level outcomes are part of a single or one-level experimental design. Individual level outcomes involve clustering at the community level and are considered through a two-level design. We present power calculations for one-level and two-level designs with varying levels of standardized effect sizes (from 0.1 to 1). Figure 9 presents the power calculations for the one-level and the two-level designs. In the *one-level design*, we have 50 villages for each comparison group when considering outcomes at the community level. We need relatively high effects to be able to capture these impacts with 80 percent statistical power. Specifically, the minimum detectable effect size (standardized units) for 50 units is 0.57 (see intersection of the different curves in Figure 9 with the 0.8 level of power in the y-axis). In the *two-level design*, we observe 10 households within each of the 50 villages per treatment arm. To compute the intra-cluster correlation (ICC), we looked at a series of outcomes identified in the pre-analysis plan, and we averaged the ICCs computed for each of these outcomes[15]. We obtain an ICC estimate of 0.068, in line with the ICC of 0.06 used for the original design of the intervention, which was based on Aker et al. (2013). With an ICC of 0.068, we can identify (with 80 percent of power) a minimum detectable size effect of 0.227.

Figure 9 – Power calculations

One-level design *Two-level design*



Note: power calculations are computed using the Stata command *rdpower*.

To approximate the effect sizes in units of each of the outcomes, we focus on the outcome variables identified in the pre-analysis plan. Since standardized effects correspond to the difference in means (across two groups) divided by the standard deviation of the two groups together, we need to multiply our standardized effects by the referred standard deviation. In Table 15, we present the mean, standard deviation and ICC of the selected outcomes in columns (1) to (3). Column (4) presents the standardized effect size based on the evaluation design (50 clusters in control and 50 clusters in treatment and 10 households in each clusters) and the ICC computed using the baseline survey. We implement in this case a model without covariates (unconditional model). We supplement the standardized effect size with the minimum detectable effects (MDEs) for the main variables of interest by multiplying it by the standard deviation of the variable. In addition, in columns (6) to (9), we compute the standardized effect size when we control for basic baseline characteristics. Specifically, we include gender, age, household size, education and

[15] We consider the following outcomes: Trust index, Trust: General, Trust: District government, Trust: Family, Trust: Local leaders, Trust: Local people, Trust: Mozambicans, Trust: National leaders, Trust: Neighbours, Trust: Province government, Active member/leader in group, Attitudes towards bribes, knowledge of community leaders and of official/influent people, and attitudes related to the allocation of public funds.

income of the respondent, a control for whether the village where the household live is urban or sub-urban, and a set of district identifiers. We first compute R^2 by regressing the outcome variable at the household level and at the village level on the selected covariates. We then compute standardized effect size and MDE. Since we include only a very restricted set of controls, this represents a conservative estimate of the gain in power obtained by using baseline information.

Table 15 – Minimum detectable effects

				Without covariates		With covariates			
	Mean	Std. Dev.	ICC	Std. Effect size	MDE	R^2 (hh. level)	R^2 (village level)	Std. Effect size	MDE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Trust index	0.75	0.25	0.08	0.24	0.06	0.10	0.18	0.22	0.06
Trust: General	0.54	0.50	0.13	0.27	0.13	0.13	0.21	0.24	0.12
Trust: District government	0.83	0.38	0.07	0.23	0.08	0.06	0.15	0.22	0.08
Trust: Family	0.89	0.31	0.04	0.21	0.07	0.03	0.09	0.21	0.06
Trust: Local leaders	0.86	0.35	0.04	0.21	0.07	0.05	0.09	0.20	0.07
Trust: Local people	0.66	0.47	0.04	0.21	0.10	0.08	0.19	0.20	0.09
Trust: Mozambicans	0.56	0.50	0.07	0.23	0.11	0.05	0.11	0.22	0.11
Trust: National leaders	0.81	0.39	0.09	0.24	0.09	0.04	0.09	0.23	0.09
Trust: Neighbours	0.73	0.45	0.06	0.22	0.10	0.05	0.14	0.21	0.09
Trust: Province government	0.83	0.38	0.05	0.22	0.08	0.04	0.08	0.21	0.08
Active member/leader in group	0.42	0.49	0.02	0.20	0.10	0.07	0.13	0.19	0.09
Attitudes towards bribes	0.35	0.48	0.11	0.25	0.12	0.15	0.27	0.22	0.11
Knows community leader	0.70	0.46	0.07	0.23	0.11	0.06	0.10	0.22	0.10
Knows official/influent person	0.55	0.50	0.11	0.25	0.12	0.12	0.15	0.23	0.12
Public funds to influent people	0.55	0.50	0.04	0.21	0.10	0.04	0.15	0.20	0.10

Note: To compute the R^2, we include in the regression the gender, age, household size, education and income of the respondent, control for whether the village where the household live is urban or sub-urban, and a set of district identifiers.

Appendix. Descriptive statistics

For each outcome of household/leader *i* living in community *j*, Y_{ij}, we test for balance by first using the following least squares regression:

$$Y_{ij} = \alpha + \beta T_j + \varepsilon_{ij} \qquad (13)$$

where T_j is an indicator variable for living in a community in either treatment groups 1, 2, or 3 and ϵ_{ij} is an individual-specific error term which is assumed to be clustered at the community level. We then look at balance specifically within each treatment group, by estimating the following specification:

$$Y_{ij} = \alpha + \beta_1 T1_j + \beta_2 T2_j + \beta_3 T3_j + \varepsilon_{ij} \qquad (14)$$

where T_{1j}, T_{2j} and T_{3j} are indicator variables for living in a community in treatment groups 1, 2, and 3 and ϵ_{ij} is an individual-specific error term which is assumed to be clustered at the community level. We test for jointly-significance of β_1, β_2 and β_3 by using an F-test.

We begin by looking at household-level outcomes. Table 16 presents randomization checks for respondent, leader, and community characteristics. Table 17 presents the main correlates of awareness about the natural gas discovery at baseline.

Table 16 – Descriptive Statistics

	Control Group	Any treatment	Treatment Group			Joint test (3)-(5)
			Info to Leader	Info to Leader and Citizens	Info plus Deliberation	
	(1)	(2)	(3)	(4)	(5)	(6)
	mean	diff.	diff.	diff.	diff.	p-value
	[std.dev.]	(std.err.)	(std.err.)	(std.err.)	(std.err.)	[N]
Individual Characteristics						
Female respondent	0.273	-0.025	-0.036	-0.022	-0.018	0.761
	[0.446]	(0.027)	(0.033)	(0.022)	(0.022)	[2165]
Age in years	44.756	-0.016	0.304	0.397	-0.729	0.774
	[16.733]	(1.010)	(1.298)	(0.870)	(0.870)	[2147]
Household size	5.582	0.137	-0.098	0.271*	0.216	0.236
	[2.863]	(0.171)	(0.199)	(0.146)	(0.146)	[2159]
No formal education	0.313	-0.025	-0.025	-0.016	-0.034	0.769
	[0.464]	(0.027)	(0.032)	(0.023)	(0.023)	[2165]
Primary education	0.573	0.007	0.028	0.012	-0.016	0.658
	[0.495]	(0.030)	(0.036)	(0.026)	(0.026)	[2165]
Secondary or higher education	0.114	0.017	-0.002	0.004	0.048**	0.450
	[0.318]	(0.024)	(0.027)	(0.020)	(0.020)	[2165]
Years of schooling	3.676	0.106	0.024	-0.105	0.397*	0.434
	[3.406]	(0.238)	(0.274)	(0.206)	(0.206)	[2165]
Muslim	0.558	0.024	0.013	0.058	-0.002	0.809
	[0.497]	(0.059)	(0.074)	(0.052)	(0.052)	[2148]
Macua ethnic group	0.601	0.068	0.087	0.057	0.062	0.744
	[0.490]	(0.065)	(0.081)	(0.056)	(0.056)	[2147]
Maconde ethnic group	0.298	-0.058	-0.057	-0.078	-0.039	0.763
	[0.458]	(0.063)	(0.079)	(0.056)	(0.056)	[2147]
Semi-urban	0.109	-0.002	-0.009	-0.011	0.013	0.980
	[0.312]	(0.049)	(0.060)	(0.042)	(0.042)	[2050]
Urban	0.091	-0.031	-0.031	-0.032	-0.030	0.917
	[0.288]	(0.043)	(0.051)	(0.039)	(0.039)	[2050]
Trust index	0.751	0.006	-0.003	-0.003	0.023	0.539
	[0.246]	(0.017)	(0.020)	(0.015)	(0.015)	[2044]
Public funds to influent people	0.55	0.010	0.008	0.013	0.008	0.982
	[0.498]	(0.027)	(0.035)	(0.023)	(0.023)	[2004]
Ever heard about the natural gas	0.487	-0.015	-0.052	0.000	0.004	0.690
	[0.500]	(0.046)	(0.056)	(0.041)	(0.041)	[2164]
Leader Characteristics						
Female respondent	0.036	-0.016	-0.036	0.003	-0.016	0.556
	[0.189]	(0.024)	(0.030)	(0.021)	(0.021)	[206]
Leader's age	54.091	0.505	0.549	0.517	0.449	0.991
	[10.624]	(1.556)	(1.94)	(1.339)	(1.339)	[206]
Years of schooling	6.2	-0.783*	-0.500	-0.631	-1.220***	0.182
	[2.946]	(0.446)	(0.554)	(0.382)	(0.382)	[206]
Village Characteristics						
Natural resources index	0.033	0.000	-0.011	0.01	-0.001	0.302
	[0.055]	(0.009)	(0.011)	(0.007)	(0.007)	[206]
Infrastructure index	0.52	0.013	0.00	0.027	0.010	0.826
	[0.161]	(0.027)	(0.033)	(0.023)	(0.023)	[204]

Note: *** p<0.01, ** p<0.05, * p<0.1. Column (1) reports sample mean and standard deviation in brackets for the control group. Column (2) reports the difference between all treatment groups pooled together and the control group using an OLS regression of the corresponding characteristic on the treatment indicator. Columns (3)-(5) report the difference between each treatment group and the control group. Standard errors clustered at community level are reported in parentheses. Column (5) presents a joint test of significance of the coefficients for each treatment dummy.

Table 17 – Correlates of awareness at baseline

Dep.Var.	Have you ever heard about the natural gas discovery?			
	(1)	(2)	(3)	(4)
Female respondent	-0.192***	-0.193***	-0.194***	-0.168***
	(0.025)	(0.025)	(0.025)	(0.027)
Age in years	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Household size	0.013***	0.013***	0.012***	0.010***
	(0.003)	(0.003)	(0.003)	(0.003)
Primary education	0.119***	0.119***	0.119***	0.082***
	(0.021)	(0.021)	(0.021)	(0.024)
Secondary or higher education	0.420***	0.419***	0.418***	0.371***
	(0.038)	(0.038)	(0.038)	(0.040)
Below median distance		0.072	0.073	0.051
		(0.060)	(0.059)	(0.052)
Leader's age			0.000	0.000
			(0.001)	(0.001)
Leader's education			-0.005	-0.003
			(0.004)	(0.003)
Knows official/influent person				0.056***
				(0.021)
Active member/leader in group				0.131***
				(0.023)
General trust				-0.036*
				(0.020)
Public funds to influent people				0.004
				(0.020)
Infrastructure index				0.096
				(0.086)
Natural resources index				-0.269
				(0.247)
Constant	0.030	0.029	0.058	0.006
	(0.057)	(0.057)	(0.075)	(0.087)
Observations	2140	2140	2140	1845
R2	0.308	0.309	0.310	0.349
Village Controls	No	Yes	Yes	Yes
Household Controls	Yes	Yes	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parenthesis and clustered at village level.

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