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Working Paper No. 201

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by Begoña Cabeza Martínez and Shaun Da Costa | July 2023

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Abstract

We explore the impact of the Ebola epidemic on attitudes toward taxation for development in West Africa. Utilising representative surveys from before and after the peak of the crisis, we estimate the impact of Ebola using both objective (recorded case rates) and self-reported measures of exposure (knowing a friend/relative who was infected with/died from Ebola). In addition, we consider the indirect impact of Ebola on redistributive preferences through disruption to different domains of life, including school, work, social gatherings, and medical care. Our empirical analysis demonstrates that higher levels of Ebola exposure and disruption are associated with greater levels of support for taxation for development.

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1 Introduction

Preferences for redistribution play a fundamental role in the definition of institutions and the extent of government intervention. A growing literature has explored a diversity of determinants of these preferences, such as self-interest and insurance motives, beliefs about the drivers of one's economic position, experienced and expected mobility, perceptions of inequality, institutional and cultural context, and risk attitudes.[1]

A key question in this field, still not fully addressed, is how redistributive preferences form, whether they are shaped by a specific environment and how they are updated when individuals are exposed to shocks. Empirical evidence suggests that economic, political, and natural factors affect beliefs and individual preferences for redistribution significantly. For instance, Alesina and Fuchs-Schündeln (2007) offer evidence that living in communist East Germany negatively impacted individual beliefs about the role of luck in one's achievements. Giuliano and Spilimbergo (2014) look at the effects of experiencing an economic recession at a young age and find that individuals become more supportive of redistribution, left-oriented, and conscious of the role of luck in determining one's socioeconomic position. Olivera (2014) and Cabeza and Decancq (2019) find that increasing unemployment levels correlate positively with preferences for redistribution and luck-oriented beliefs about one's success, respectively. Addressing the impact of a natural disaster, Gualtieri, Nicolini, Sabatini, & Zamparelli (2018) observe a positive influence of the intensity of the 2009 L'Aquila earthquake in Italy on support for government intervention. Within an experimental setting, Cappelen, Falch, Sørensen, & Tungodden (2021) find that the COVID-19 crisis makes respondents more likely to prioritise societal problems over their own, but also more willing to accept inequalities due to luck.

Our paper fits into the same category as the aforementioned literature by assessing whether the 2013-2016 Ebola Virus Disease outbreak in West Africa (hereafter, simply Ebola) has reshaped attitudes toward taxation in the three most heavily affected countries: Guinea, Liberia, and Sierra Leone.

We argue that the context of the West African Ebola outbreak is relevant to the literature on shocks and redistributive preferences for several reasons. First, the outbreak was the largest since the discovery of the pathogen in 1976. This is notable because Ebola is one of the deadliest diseases known to affect human beings, with a case-fatality rate of around 50% (World Health Organization, 2021). By the official end of the epidemic in June 2016, there had been 28,646 cases and 11,323 deaths due to Ebola, the vast majority of which were concentrated in Guinea, Liberia, and Sierra Leone.[2] These figures are likely to be under-reported due to the poor health surveillance systems in these countries. Furthermore, the impact of the epidemic on an already underfunded health-care system also led to a concomitant rise in mortality from other causes, such as HIV/AIDS, malaria, and tuberculosis (Parpia, Ndeffo-Mbah, Wenzel, & Galvani, 2016). Thus, the geographical location and the high case-fatality rates associated with the outbreak sharply contrast with conditions studied in previous work on the impacts of shocks on preferences for redistribution.

Second, aside from the large loss of life, the outbreak caused substantial economic and social disruption across these countries. Prior to the outbreak, each of the three countries had experienced a relatively long period of economic growth, which extended into the first half of 2014. Pre-crisis GDP growth estimates from the World Bank (2015) suggested that the economies of Guinea, Liberia, and Sierra Leone would grow by 4.3%, 6.8%, and 8.9% in 2015, respectively (World Bank, 2015). Instead, the economy of Sierra Leone contracted by more

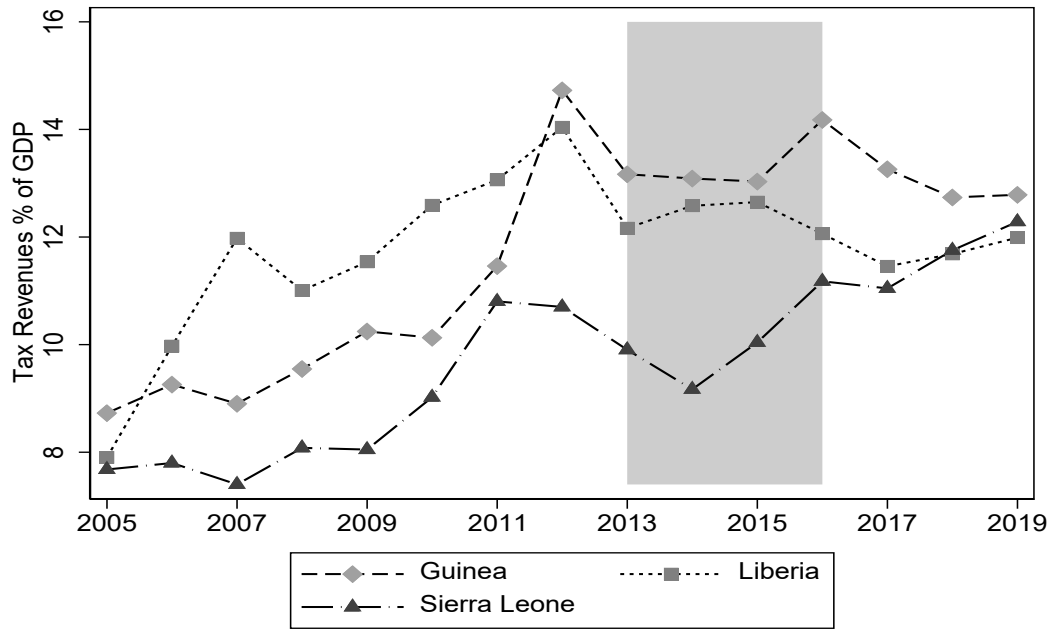
[1] See, among others, Fong (2001); Alesina, Glaeser, and Sacerdote (2001); Corneo and Grüner (2002); Alesina and La Ferrara (2005); Alesina and Angeletos (2005); Alesina and Giuliano (2011); Luttmer and Singhal (2011); Durante, Putterman, & Van der Weele (2014); Kuziemko, Norton, Saez, & Stantcheva (2015); Gärtner, Mollerstrom, & Seim (2017); Alesina, Stantcheva, & Teso. (2018).

[2] Guinea: 3,811 cases and 2,543 deaths. Liberia: 10,675 cases and 4,809 deaths. Sierra Leone: 14,124 cases and 3,956 deaths (World Health Organization,2015, 2016).

than one-fifth, while Liberia experienced no growth in 2015 (World Bank, 2021). Overall, the World Bank (2016) estimates the total foregone economic output due to Ebola for Guinea, Liberia, and Sierra Leone was around $2.8 billion. However, this figure does not reflect the true welfare costs of the epidemic, which several studies have found to be substantial (Kirigia, Masiye, Kirigia, & Akweongo, 2015; Huber, Finelli, & Stevens, 2018; Da Costa, 2020). The outbreak also disrupted the agricultural labour supply, leading to declines in household consumption levels (Gatiso et al., 2018; De La Fuente, Jacoby, & Lawin, 2020); closed schools for extensive periods of time; and stopped cross-border trade completely (Mullan, 2015). In addition, it is likely that the Ebola outbreak exacerbated the existing poverty crises in these countries, where more than half of the population lives below the national poverty line (UNDG, 2015). The multidimensional nature of the crisis therefore allows us to draw parallels with recent shocks of a similar nature (e.g. the COVID-19 pandemic).

Lastly, while preferences for redistribution have been shown to play a crucial role in the political feasibility of institutional outcomes, most international attitudinal surveys, and thus empirical studies, focus on developed countries in the Western world. Yet attitudes toward taxation are of particular interest in underdeveloped regions, given that, in this context, increased tax revenue, leading to larger state capacity, could facilitate independence from international donors and boost development (see the discussion on pp.150-151 in Luttmer & Singhal, 2014). Factors that impede revenue collection in such contexts include the existence of large informal sectors, dependence on natural resources or international aid, low levels of tax morale, and weak political institutions (Besley & Persson, 2014; Luttmer & Singhal, 2014). Like many sub-Saharan African countries, Guinea, Liberia, and Sierra Leone have narrow tax bases that limit the capacity of the state to invest in public services. While tax revenues as a proportion of GDP had been expanding prior to 2013 (see Figure 1), the Ebola outbreak led to a sharp decrease in economic activity and employment and subsequent contraction of the tax base. Moreover, Guinea and Liberia have been unable to regain the momentum they achieved prior to the epidemic, with taxes as a proportion of GDP remaining constant up to 2019.

Figure 1: Tax revenues in Guinea, Liberia, and Sierra Leone, 2005-2019



Source: International Monetary Fund World Longitudinal Dataset.
Note: Shaded area corresponds to Ebola outbreak.

Given the low levels of tax collection in these countries, it is not surprising that their health-care systems were already severely underfunded prior to the Ebola outbreak. Among other effects, the Ebola epidemic led to a substantial increase in international donor aid for health care (development assistance for health, or DAH). In 2013, DAH amounted to 12%, 14%, and 44% of total health spending in Guinea, Sierra Leone, and Liberia, respectively. In 2014 these figures rose to 31%, 50%, and 66% (see Figure A.4 in the Annex). Understanding how the epidemic has affected redistributive preferences is therefore a priority for national governments and international donors alike.

Linking to the literature on preferences for redistribution mentioned above, we posit that the Ebola outbreak could affect redistributive attitudes by exposing individuals to a random spell of bad luck. As noted by Cappelen et al. (2021), epidemics tend to generate health and income inequalities by chance. This, in turn, could make individuals more aware of the role of luck and circumstances[3] in determining one's economic situation, leading to increased support for taxation to fund a more extensive state "safety net."[4] To investigate this empirically, we require two elements: individual attitudes toward taxation and a measure of Ebola exposure. We obtain the former from two rounds of Afrobarometer surveys, collected before and after the outbreak in each country. More specifically, we consider redistributive preferences as support for taxation to fund development. To measure exposure to Ebola, we first combine Ebola prevalence rates, measured at the subnational level, with individual-level data from Afrobarometer. This allows us to test whether individuals living in regions more exposed to the epidemic shifted their preferences. However, this approach conceals heterogeneities in the experience of the epidemic among individuals living in the same region. Ebola case rates are also subject to under-reporting and subsequent measurement error. We therefore utilise a set of subjective measures of self-reported exposure to Ebola (knowing a friend or relative who was infected with or died because of Ebola) from the Afrobarometer survey, which captures disruption caused by the outbreak to different aspects of life, namely schooling, work, social activities, and medical care. Evidence suggests that subjective measures are a better predictor of redistributive preferences than objective indicators. Niehues (2014), for instance, found that perceptions of inequality in a society are a better predictor of redistributive preferences than the actual distribution of incomes. Our twofold approach, combining Ebola rates and reported experience, allows us to capture several channels of the effects of the epidemic on redistributive preferences.

We find that individuals living in areas more exposed to Ebola display greater support for taxation. At the individual level, being exposed to Ebola and experiencing life disruption during the outbreak are also positively correlated with increased support for raised taxes to develop one's country. These effects are robust to controlling for several other confounders, including trust in the government.[5] After ruling out several possible mechanisms, we posit that the change in redistributive preferences was due to the impact of the Ebola epidemic, which made citizens made more aware of the role of (bad) luck in determining their life outcomes.

[3] The reader is referred to the equality of opportunity literature, where luck and circumstances are considered unfair sources of inequality, while effort-related elements, such as personal effort, are deemed within one's responsibility, and hence fair sources of inequality (for an overview of theoretical and empirical contributions, see Roemer and Trannoy, 2016).

[4] See Alesina and Angeletos (2005) for a theoretical formalisation of this mechanism in the general context of social spending in a country and average public opinions about whether the drivers of one's economic position are more effort- or luck-related.

[5] Flückiger, Ludwig, & Sina Önder (2019) show that higher Ebola exposure is associated with more trust in government institutions and lower refusal to pay taxes. They hypothesise that the government's handling of the epidemic acted as a quality signal that enhanced state legitimacy in those areas most affected by the outbreak. In addition, Daniele and Geys (2015) find that trust in government institutions is associated with more support for paying higher taxes for increased social expenditures.

This paper makes three key contributions to the literature. First, it adds to the growing empirical evidence on the determinants of preferences for redistribution and the impact of shocks, such as natural disasters (e.g. Giuliano & Spilimbergo, 2014; Gualtieri et al., 2018). More specifically, we reveal another channel of the epidemic's impact on the affected countries, aside from the economic and health consequences, namely attitudes toward taxation. Second, we exploit variation in self-reported exposure and level of disruption at the individual level. To our knowledge, such measurements have not been employed to assess the impact of an epidemic on preferences for redistribution. As our results demonstrate, the direct (exposure) and indirect (life disruption) effects of an epidemic may both lead to a shift in redistributive preferences.[6] This may be of policy relevance for other health shocks that affect different aspects of life, e.g. COVID-19. Third, the paper assesses the impact of the Ebola outbreak on redistributive preferences in the context of development. It therefore adds to the understanding of the forces affecting the state's capacity to fund and improve public services through strengthened support for tax revenues within low-income settings. As noted by Besley and Persson (2014), the ability to raise taxes is at the core of a state's development.

The rest of the paper is structured as follows. Section 2 presents background information on the Ebola outbreak in West Africa. Section 3 introduces the data we employ in the empirical analysis, which include the information on attitudes toward taxation, the regional Ebola case rates, and the self-reported exposure to Ebola and life disruption due to the epidemic. Section 4 describes the empirical strategy carried out to study the association between exposure to Ebola and preferences for redistribution. In Section 5, we present the estimation of the different specifications and discuss mechanisms to explain our results. Finally, Section 6 presents our conclusions.

2 Background

Ebola Virus Disease is a viral haemorrhagic fever that is spread through direct contact with bodily fluids. The disease is highly contagious and has an average case-fatality rate of around 50%, although this figure has varied from 25% to 90% in the past (Coltart, Lindsey, Ghinai, Johnson, & Heymann, 2017). The disease is not curable, which means its spread must be curtailed with prevention measures, such as social distancing, effective hand hygiene, contact tracing, and quarantining of infected individuals.[7]

There have been around 30 known outbreaks of Ebola since its discovery in the early 1970s, the largest being in West Africa between 2013 and 2016. The first cases were reported in the Gueckedou prefecture of Guinea in December 2013. A highly mobile population and porous borders meant that the virus spread to urban centres in Liberia and Sierra Leone through 2014. This contrasted with previous outbreaks that had been largely limited to rural areas. Initially, government efforts to contain the epidemic were unsuccessful, leading to a rapid increase of cases by late 2014. In August 2014, the World Health Organization (WHO) declared a public health emergency of international concern. New interventions, alongside enforced containment efforts and international support, helped to progressively control the outbreak. These included a ban on certain mass cultural celebrations,[8] the adaptation of burial practices (in agreement with religious leaders), effective contact tracing and monitoring, and engagement with local leaders to boost awareness campaigns that would

[6] Rees-Jones, D'Attoma, Piolatto, & Salvadori (2020) also use a combination of objective and subjective measures in relation to the COVID-19 pandemic. However, their subjective measures refer to individuals' risk perception (e.g. risk of getting COVID-19 or losing their jobs during the pandemic) and not experiences of the pandemic. Our measures, on the other hand, capture (ex-post) the levels of exposure and disruption caused by the Ebola outbreak, as self-reported by individuals.

[7] However, several vaccines have also been under development, with the first being approved by the United States in 2019.

[8] Public gatherings were prohibited in Liberia from July 2014 to January 2015. A 6 p.m. curfew was also put in place in the country.

reduce popular opposition and lead to behavioural changes. All these actions combined eventually to stop the spread of the epidemic, limiting it to localised outbreaks in the latter part of 2015 (Coltart et al., 2017). In 2016, the WHO officially declared the Ebola epidemic over.

According to the WHO,[9] several elements were conducive to the initial spread of the epidemic, including a lack of knowledge among health-care workers and the general population about the disease, weakened public infrastructure following recent civil conflicts, the high volume of cross-border population movement, traditional burial practices,[10] poor state communication strategies, and a lack of community engagement from the outset. Demographic and socioeconomic factors were also important drivers of the epidemic. For instance, Fallah, Skrip, Gertler, Yamin, & Galvani (2015) find that population density and poverty are highly correlated with exposure in Montserrado County, Liberia. Grépin, Poirier, & Fox (2020) show that education levels at the individual and community levels are also key correlates of exposure. Their findings also indicate that wealthier households in Sierra Leone were more likely to be exposed to Ebola than those in Liberia.

Aside from these factors, the health-care systems of the affected countries were largely unprepared to cope with the Ebola outbreak and were quickly compromised due to a combination of health-care worker deaths, increased demand for services, diversion of resources, and the closure of facilities. As of 2013, government health-care spending as a proportion of GDP was much lower in Guinea (0.5%), Liberia (0.6%), and Sierra Leone (0.9%) than the sub-Saharan Africa average (1.7%) (Institute for Health Metrics and Evaluation, 2021). Furthermore, a substantial proportion of total health-care spending in these countries is financed through out-of-pocket expenditures.[11] In 2013, these expenditures accounted for as much as 71% of total health-care spending in Guinea, 44% in Liberia, and 76% in Sierra Leone (Institute for Health Metrics and Evaluation, 2021). Low levels of funding meant that there were only one to two physicians per 100,000 inhabitants in these countries prior to the outbreak, and these ratios were further diminished by the high numbers of deaths among workers in the health-care sector (Coltart et al., 2017, p. 7). By July 2015, 509 health-care workers had died of Ebola across the three countries, representing around 5% of total deaths during the outbreak (World Health Organization, 2015). Health-care workers faced a heightened risk of infection during the outbreak – up to 100 times higher than the general population (Kilmarx et al., 2014, as cited in Coltart et al., 2017). In addition, they were unfortunately also subjected to violence[12] and poor working conditions.[13]

[9] See WHO (https://www.who.int/news-room/spotlight/one-year-into-the-ebola-epidemic) and Coltart et al. (2017) for detailed reports.

[10] Blair, Morse, & Tsai (2017) offer evidence that Liberians who trusted the government less took, on average, fewer precautions against Ebola and were less likely to follow the measures implemented to control the spread of the virus. Furthermore, the authors find no evidence to suggest that the understanding of the transmission mechanisms was a driver of such attitudes.

[11] These are "payments made by individuals for health maintenance, restoration, or enhancement at or after the time of health care delivery, including health insurance co-payments or payments devoted to deductibles," to be distinguished from prepaid private health spending, which involves private health insurance schemes and free services offered by non-governmental agencies (Institute for Health Metrics and Evaluation, 2021, p. 44).

[12] For instance, in Guinea, rumours spread that health-care workers were taking part in a conspiracy to introduce the virus or take blood or organs of patients at Ebola treatment centres (Coltart et al., 2017). Shortly after, a group of health-care workers were killed while implementing an information campaign in a village in southern Guinea (BBC, 2014).

[13] Sierra Leone was the country that suffered the most health-care worker losses, and the only one where strike action took place to request better safety conditions and wages. Burial workers had similar claims (Coltart et al., 2017).

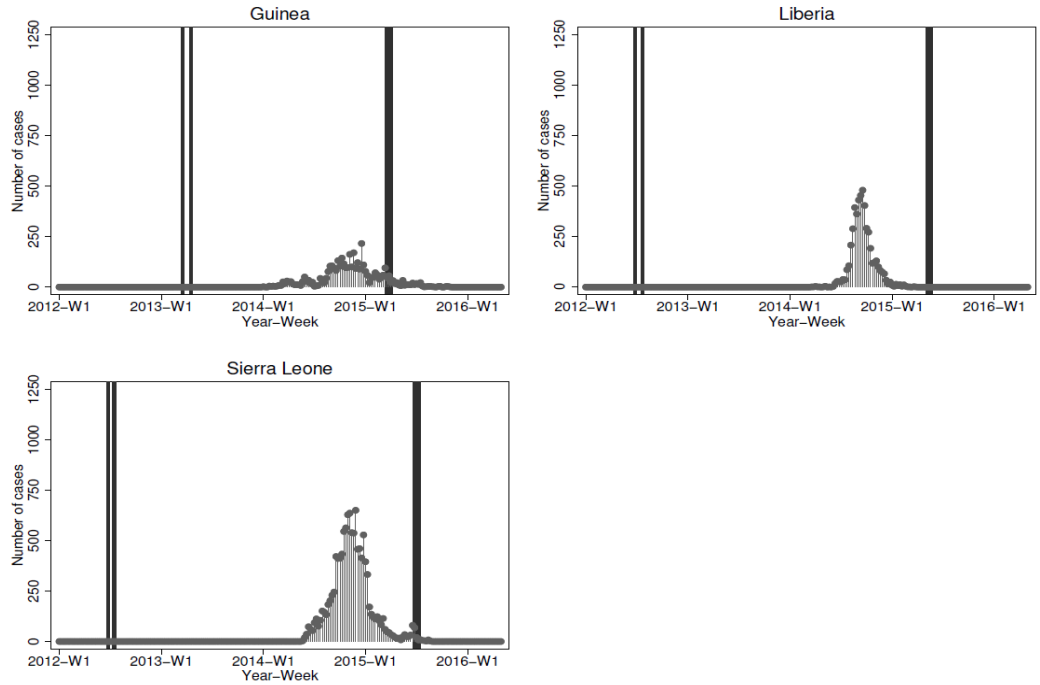
3 Data

3.1 Afrobarometer survey

Throughout this paper, we use data from the Afrobarometer survey,[14] which is nationally representative of the adult population in each country. This survey is carried out in more than 30 African countries, gathering attitudes on democracy, governance, and society. We use data from Round 5 (2011/2013) and Round 6 (2014/2015) for Guinea, Liberia, and Sierra Leone. With a sample size of around 1,200 respondents per round and country, we obtain a data set of more than 7,000 observations. A random selection process is applied at every sampling level, with proportionate probability to the corresponding population size. The sampling universe targets all citizens aged 18 and above.[15]

The timing of the Afrobarometer surveys in Guinea, Liberia, and Sierra Leone are of particular interest, as they allow us to observe pre- and post-epidemic attitudes toward taxation. Figure 2 presents the absolute Ebola case counts (probable and suspected) in the three countries over time. These data are taken from the official WHO situation reports in each week of the crisis. The pairs of vertical lines represent the data collection periods for the fifth and sixth rounds of the Afrobarometer survey. The graphs show that Round 5 of the survey was carried out in mid-2012 in Liberia and Sierra Leone and in early 2013 in Guinea. Round 6 of the survey was carried out in mid-2015, after the peak of the epidemic had passed in each country, with a few sporadic cases thereafter. All of the reported cases in Liberia had been reported by 6 May 2015, the field collection start date of the Round 6 survey. This figure was slightly lower in Sierra Leone (97%) and Guinea (89%).

Figure 2: Ebola case counts and timing of Afrobarometer rounds 5 and 6 surveys



[14] Afrobarometer is a non-profit network of more than 30 research institutes and universities based in Accra, Ghana.

[15] The method consists of a clustered, stratified, multi-stage, area probability sample. The sample stages include the drawing of secondary sampling units, the random selection of primary sampling units, the random selection of sampling starting points, the random selection of households, and finally the random selection of an individual within the household (alternating men and women to achieve gender balance). More details may be found at https://afrobarometer.org/surveys-and-methods/sampling-principles.

3.2 Dependent variable

We obtain a measure of attitudes toward taxation from rounds 5 and 6 of the Afrobarometer survey. Our main dependent variable is constructed from a question that presents respondents with two statements presenting opposing views:

> *"Citizens must pay their taxes to the government in order for our country to develop."*
>
> *"The government can find enough resources for development from other sources without having to tax the people."*

Respondents are asked to choose which statement corresponds most closely to their view and the degree to which they agree with the chosen statement. They may also opt to agree with neither of the statements. The two statements therefore provide a scale against which respondents' attitudes toward taxation can be assessed. Since few individuals agreed with neither of the statements,[16] we create a dichotomous variable that is equal to 1 if individuals agreed or strongly agreed with Statement 1 (i.e. support for paying taxes to develop the country) and 0 otherwise. Looking at the proportion of individuals in each country and round supporting taxation for development (Table 1), we notice that more respondents in Round 5 had a positive attitude toward taxation in Liberia and Sierra Leone than in Guinea (about 80% vs. 50%). The proportion increases over time in Sierra Leone, remains relatively constant in Liberia, and declines in Guinea. This preliminary analysis suggests that the epidemic may have had disparate effects on attitudes toward taxation across the three countries. Still there may be potential confounders, e.g. trust in the government, driving these trends. We explore this further in later sections.

Table 1: Support for paying taxes to develop the country, by country and survey year

Country	Year of survey	Mean	S.D.	Count
Guinea	2013	0.52	0.50	1,171
	2015	0.40	0.49	1,197
Liberia	2012	0.81	0.39	1,182
	2015	0.82	0.38	1,189
Sierra Leone	2012	0.78	0.41	1,178
	2015	0.94	0.24	1,150

Notes: Summary statistics for Support for taxation variable. Coded 1 if individuals agreed or strongly agreed that "Citizens must pay taxes to the government in order for our country to develop" and 0 if they agreed or strongly agreed that "The government can find enough resources for development from other sources without having to tax the people." All statistics weighted using Afrobarometer sampling weights. S.D. is standard deviation.

The phrasing of our main dependent variable question refers to "further develop the country," which seems adequate, given that our study focuses on three of the least-developed countries in the world.[17] In Sen's (1999) words, development involves the process of expanding the freedoms of individuals. Achieving development thus entails the elimination of obstacles to freedom, such as poverty or a lack of economic opportunities, public services, and the institutions required to maintain peace. In this sense, development is a comprehensive target for governments to spend tax revenue on, and an interesting angle from which to look at redistributive attitudes. However, most international opinion surveys

[16] Only 50 respondents across the three countries (0.70% of the total) chose this option.

[17] Guinea, Liberia, and Sierra Leone are ranked in positions 175, 178, and 182 (out of a total of 189 countries) in the Human Development Index. See https://hdr.undp.org/en/content/latest-human-development-index-ranking.

exploited in the empirical literature on preferences for redistribution usually measure support for the reduction of income differences in society. For instance, the phrasing in the International Social Survey Programme (2019 "Social Inequality V") refers to the government's responsibility to reduce income differences between people with high and low incomes, on a five-point agreement scale. It also includes a question about the progressivity of the taxation system. The European Social Survey has included a question in several rounds about the extent to which the government should take action to reduce income differences. In Round 4 (2008), a question tackled agreement with higher taxes and social spending vs. lower taxes and social spending. Also, the World Values Survey contains a question on whether incomes should be made more equal or rather be encouraged as an incentive. Finally, the General Social Survey, with a U.S. sample, allows the study of attitudes toward the state's responsibility to reduce income differences.[18] While these questions are highly relevant in Western societies, as they target one of the main challenges of the welfare state, we consider them to be less suitable for our study.

3.3 Ebola variables

3.3.1 Subnational prevalence rates

To assess the impact of the epidemic across all three countries, we first use the subnational-level data on the number of probable and confirmed Ebola cases from the WHO situation reports. Prior to the dates of the Afrobarometer surveys in 2012/2013, these data are provided for 63 regions in total: 34 in Guinea, 15 in Liberia, and 14 in Sierra Leone.[19] The WHO situation reports provide counts of probable and confirmed Ebola cases. Since it is likely that the true number of Ebola cases was under-reported,[20] we combine both the probable and confirmed cases of Ebola (before the Afrobarometer survey dates) to give the total number of cases in each subnational region across the three countries. We then combine the total case figures with subnational population data from the closest official estimates to the outbreak years for each country to yield Ebola cases per 100,000 inhabitants.[21]

Figure 3 presents a map of the case rates for all 63 regions in the three countries included in the analysis. In Guinea, the northern regions (prefectures) display the lowest case counts per 100,000 inhabitants. The worst-affected regions are located along the southeastern border of the country, including Forecariah, Gueckedou, and Macenta prefectures, with 130, 131, and 248 cases per 100,000 inhabitants, respectively. Higher case rates (all above 280 cases per 100,000 inhabitants) are observed across much of Sierra Leone, with the worst-affected regions around the capital of Freetown and Port Loko in the northwest of the country. A similar pattern is observed in Liberia, where Montserrado County, which contains the capital (Monrovia), was the worst-affected region with a case rate of 190 per 100,000 inhabitants.

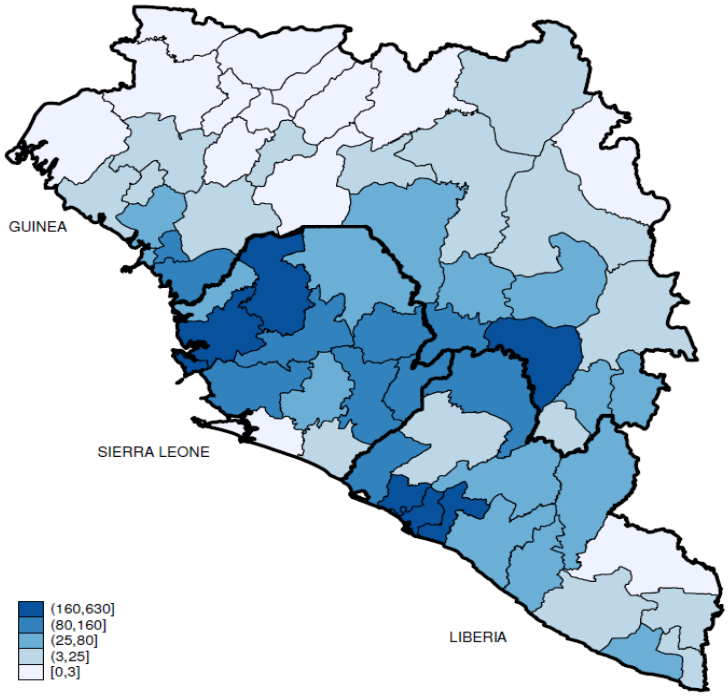
[18] Some papers making use of the mentioned surveys are those by Fong (2001), Corneo and Grüner (2002), Alesina and La Ferrara (2005), Alesina and Giuliano (2011), Luttmer and Singhal (2011), and Giuliano and Spilimbergo (2014).

[19] These regions correspond to different administrative levels in each country: second level in Guinea and Sierra Leone and first level in Liberia.

[20] Meltzer et al. (2014), for example, estimate that the number of Ebola cases may have been 2.5 times greater than the number actually reported across all affected countries by the end of 2014.

[21] Population data sources: 2014 Census, Institut National de la Statistique (Guinea); 2014 values for Liberia, World Bank Subnational Population Database (Liberia), accessed at: https://datacatalog.worldbank.org/dataset/subnational-population-database; and 2015 Population and Housing Census, Statistics Sierra Leone.

Figure 3: Ebola cases per 100,000 inhabitants by subnational region, 2014-2015



Source: Authors' calculations from WHO situation reports and national statistics

3.3.2 Self-reported measures

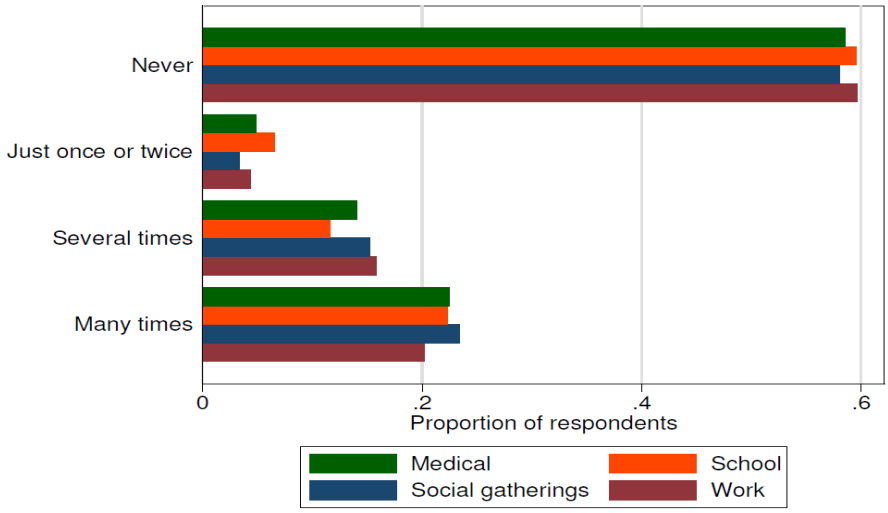
We make use of some special questions included in Round 6 of the Afrobarometer survey in Sierra Leone and Liberia to assess the impact of the Ebola epidemic at the individual level. Unfortunately, these questions were not asked in Round 6 of the survey in Guinea. The survey asked two questions regarding whether the respondent knew a close friend or relative who was infected with or died of Ebola (coded "yes" or "no"). As a proxy measure for direct exposure to Ebola, we create a dichotomous variable that takes the value of 1 if an individual answered "yes" to either of these questions and 0 otherwise. While it is conveniently recorded at the individual level, this variable has some limitations. For instance, it does not capture the number of cases a person was exposed to or cases that were not defined as close friends or family members. In addition, it is likely that many of the individuals who were exposed to the virus also died, therefore leading to some sample selection bias. Finally, the survey lacks information on the size of respondents' social networks, when knowing more people would likely lead to being in contact with more cases. We address this limitation by including several controls in our empirical analysis, such as an indicator for being "participative" (see Section 3.4), number of adults in the household, and level of education.

We believe that our measure of exposure complements our analysis employing the prevalence measure for at least two reasons. First, case-mortality rates are defined for a specific geographical population (e.g. a province). Within a regression framework, the use of such rates assumes that all individuals within an area were exposed to the virus with equal intensity. However, it may be the case that some individuals living in high-prevalence localities were not directly exposed to the virus. Self-reported Ebola exposure allows us to capture this individual heterogeneity in the experience of the outbreak. Second, case-mortality rates are likely subject to measurement error, which may also vary by region. Evidence suggests that the proportion of unreported cases ranges from 17% to 66% (Scarpino et al., 2015; Gignoux et al., 2015). Utilising a self-reported measure of exposure bypasses this issue to some extent but still raises the possibility of other measurement errors, as discussed above.

In addition, Ebola brought disruption to the lives of those who were not directly exposed to the virus. Round 6 of the Afrobarometer survey includes questions on whether individuals or members of their families had been unable to attend school, work, or social gatherings, or to access medical care (all coded 0 for "Never," 1 for "Just once or twice," 2 for "Several times," and 3 for "Many times"). To capture this aspect of the crisis, we follow Crisman (2020) in constructing a "disruption" index using the first principal component of the four latter measures (e.g. unable to attend work, social gatherings, etc.). We scale this index from 0 to 1. Thus, an individual with a score of 1 experienced disruption across all domains "many times," while a score of 0 corresponds to having "never" experienced disruption in any domain. Figure 4 presents the summary statistics for each dimension of disruption considered.

Table 2 presents the summary statistics of the disruption index for individuals who were exposed to Ebola and those who were not in each of the countries. Approximately 40% of our total sample reported having a close friend or relative who was infected with or died of Ebola. This figure is slightly higher for Liberia (47%) than Sierra Leone (36%). Moreover, individuals who were not directly exposed to the virus experienced a substantial level of disruption in their daily lives, reflecting the widespread economic and social consequences of the outbreak discussed in the introduction.

Figure 4: Dimensions of disruption due to Ebola | Liberia and Sierra Leone



Source: Authors' calculations using Afrobarometer data (Round 6)

Table 2: Ebola exposure and disruption index

		Disruption index	
Country	**Exposed to Ebola**	**Mean**	**S.D.**
Liberia	Yes (n=557)	0.70	0.27
	No (n=628)	0.65	0.31
Sierra Leone	Yes (n=417)	0.71	0.35
	No (n=732)	0.62	0.39
Total	Yes (n=974)	0.71	0.30
	No (n=1,360)	0.63	0.35

Notes: Ebola exposure is defined as knowing a close friend or relative who was infected with or died of Ebola. The Ebola disruption index is the first principal component of the four variables reflecting level of disruption to work, social life, schooling, and medical care. Results for Round 6 (post-Ebola) only. Summary statistics calculated using Afrobarometer sampling weights. S.D. is standard deviation.

3.4 Other explanatory variables

While our main focus is the impact of the Ebola pandemic, we also explore other elements that influence support for redistribution, such as the level of trust in institutions and assessments of the government's performance. Evidence on this topic is mixed. For instance, Kuziemko et al. (2015) find, by means of a series of information provision experiments, that citizens' doubts about the government's ability to handle taxes decreases their support for redistribution significantly. However, Di Tella, Dubra, and Lagomarsino (2016) observe instead that, when citizens' trust in the government increases, they favour lower tax rates. The recent work of Stantcheva (2021) presents evidence of respondents in an online survey who show more trust in the government and are also much more supportive of higher taxation levels. Round 6 of the Afrobarometer survey includes a set of questions that collect individuals' opinions on the effectiveness of different institutions in controlling the Ebola outbreak and looking after Ebola victims. We find these questions insightful, given that the friends or relatives of those who were infected or died may have a heightened level of distrust of the government or the health-care system.[22]

Prior studies in the African context indicate that trust in government institutions is a key determinant of individuals' attitudes toward increased taxation. Bwalya (2020), for instance, analyses Afrobarometer survey data across 12 Southern African countries and finds that trust in the government is associated with individuals' stated willingness to pay taxes for improving health care. Alongside tax compliance, Flückiger, Ludwig, & Sina Önder (2019) also examine the impact of the Ebola outbreak on trust in government institutions. They find that the Ebola outbreak led to increased trust in different institutions (e.g. Parliament, president, and police) in the hardest-hit regions. They argue that this effect is driven by the enhancement of individual perceptions of the state due to the implementation of Ebola containment measures. For this reason, we included a measure of trust in the president in our main regression analyses. Responses to the level of trust are recorded on a four-point scale ranging from "Not at all" to "A lot." The Afrobarometer survey also asked respondents to rate, on a four-point scale from "Very badly" to "Very well," how they think the current government is handling "Improving basic health services." We include these responses as controls in our core analyses.

Tax morale, broadly understood as non-pecuniary motives driving compliance with tax duties (Luttmer & Singhal, 2014), could also offer insights to better understand support for redistribution. While the seminal work of Meltzer and Richard (1981) predicts that progressive taxation will increase tax morale among those who benefit from such a scheme, there exists abundant literature indicating that a large proportion of citizens are inequality-averse and support higher redistribution. For instance, Fong (2001) provides evidence that income level is not enough to explain individual redistributive preferences. Besides, the results of Corneo and Grüner (2002) and Alesina and Giuliano (2011) confirm that higher taxation and redistribution are indeed preferred by a majority. Other factors, such as individual history, cultural elements, prospects of mobility, and fairness beliefs, should not be disregarded as influencing taxation preferences.[23] In the context of developing countries, tax morale and compliance and their connection with attitudes toward increased taxation are of particular importance, since many governments still fail to raise enough revenue to provide adequate public services to their citizens (Fuest & Riedel, 2009). In this sense, Ali, Fjeldstad, and Sjursen (2014)

[22] For instance, at the peak of the epidemic in Liberia, many individuals were not informed whether their relatives had died or not after entering an Ebola treatment centre. This led to rumours within communities that patients were disappearing or being killed in such centres (Omidian, Tehoungue, & Monger, 2014; Cohn & Kutalek, 2016). These rumours were a primary reason for many individuals to care for relatives infected with Ebola in their homes rather than informing the health authorities (Allen, Lacson, Patel, & Beach, 2015). Qualitative evidence from Sierra Leone also suggests that many people initially blamed medical centres for spreading the disease and felt let down by the response of the health-care system (Elston et al., 2016).

[23] See Bénabou and Ok (2001), Alesina and La Ferrara (2005), Bénabou and Tirole (2006), Kenworthy and McCall (2008), and Singhal (2008).

highlight the fact that, in developing countries, tax non-compliance, closely connected to tax morale, is even more problematic than in developed countries. To capture tax morale, we include a control variable that is coded 1 if individuals think it is wrong to not pay taxes and 0 otherwise.

As mentioned in the previous section, a shortcoming of one of our exposure measures (the one indicating whether respondents know a relative or friend who was infected with or died of Ebola) is the fact that we don't know how extensive respondents' social networks are. While this information falls beyond the scope of the Afrobarometer survey, we do have information about an element that has been identified as a determinant of preferences for redistribution, which is the level of interaction between people. Yamamura (2012) finds that people who are more engaged in community activities also tend to support higher levels of redistribution. We therefore include in our specifications an indicator of whether respondents belong to some voluntary association or community group, which we take as a proxy of their "participative" character.

Finally, the Afrobarometer survey includes a range of information on key demographic and socioeconomic variables, such as age, sex, education level, employment status, ethnicity, religion, and urban/rural location. The survey did not collect information on individual income or consumption levels. However, each respondent was asked about assets they owned (e.g. radio, television, mobile phone, etc.), location of the toilet, and water supply source, and observations were made by the interviewer on the quality of their housing. We use the responses to these questions to create an asset-based wealth index, similar to that used in the demographic health surveys (DHS). Following the DHS approach,[24] we construct the index using the first principal component of a principal component analysis (PCA) for asset and housing variables for each country separately. We then use the index to place each individual into a wealth quintile, given that relative position in the distribution is likely to influence support for redistribution. The interviewers also collected information about the characteristics of the enumeration area (EA) where the respondent lives, such as whether the area is connected to the electricity grid and has various amenities (e.g. a post office, market stalls, cell phone service, etc.).

3.5 Sample descriptive statistics

In this section, we offer descriptive information about the main variables in our analysis. Concerning the demographic characteristics, the sample is balanced in gender, and respondents are, on average, 38 years old. There are about six adults per household, and most respondents live in rural areas (61% vs. 39% in urban). A large proportion of the respondents are Christian (43%), and the most widely represented ethnic groups are the Malinke, Mende, Susu, and Temne. In terms of socioeconomic features, about one-third of respondents considered themselves unemployed at the time of the survey, and almost 40% had not completed any level of formal education. Only 15% of the sample had post-secondary training. Regarding selected assets of the respondents' households, more than two-thirds of respondents had a radio, while 24% and 16% had a television and a vehicle, respectively. As for house utilities, 11% of respondents had a toilet inside the home, and 4% enjoyed access to running water in the home. Fewer than 30% of respondents lived in enumeration areas connected to the electricity grid, and just 13% in areas with a sewage system. While as many as 90% had a school nearby, 40% were not within walking distance of a health clinic. For more details about the sample, see Table 3.

[24] Filmer and Pritchett (2001) and Hodler, Srisuma, Vesperoni, & Zurlinden (2020) employ the same approach with Afrobarometer data.

Table 3: Sample summary statistics

	Count	Mean	S.D.	Min	Max
Support for taxation	7,067	0.71	0.45	0	1
Ebola exposure	2,390	0.42	0.49	0	1
Ebola disruption index	2,334	0.66	0.34	0	1
Age	7,106	38.05	13.97	18	99
Female	7,179	0.50	0.50	0	1
Adults in household	7,165	6.16	3.47	1	35
Urban	7,179	0.40	0.49	0	1
Christian	7,179	0.43	0.50	0	1
Unemployed	7,128	0.32	0.47	0	1
Education					
None	7,133	0.39	0.49	0	1
Primary	7,133	0.17	0.38	0	1
Secondary	7,133	0.29	0.45	0	1
Post-secondary	7,133	0.15	0.36	0	1
Ethnicity					
Malinke	7,179	0.12	0.33	0	1
Mende	7,179	0.12	0.32	0	1
Susu	7,179	0.08	0.27	0	1
Temne	7,179	0.01	0.30	0	1
Assets					
Radio	7,179	0.69	0.46	0	1
TV	7,179	0.24	0.43	0	1
Vehicle	7,179	0.16	0.37	0	1
Mobile phone	7,179	0.37	0.48	0	1
Personal computer	7,179	0.06	0.24	0	1
Metal roof	7,179	0.78	0.42	0	1
Formal housing	7,179	0.57	0.50	0	1
Toilet in home	7,179	0.11	0.31	0	1
Water in home	7,179	0.04	0.19	0	1
Enumeration area					
Electricity grid	7,179	0.29	0.45	0	1
Piped water system	7,179	0.37	0.48	0	1
Sewage system	7,179	0.13	0.34	0	1
Cell phone service	7,179	0.82	0.38	0	1
Post office	7,179	0.08	0.27	0	1
School	7,179	0.89	0.31	0	1
Police station	7,179	0.34	0.47	0	1
Health clinic	7,179	0.60	0.49	0	1
Market stalls	7,179	0.47	0.50	0	1
Tarred/ paved road	7,179	0.42	0.49	0	1

Notes: Ebola exposure and Ebola disruption index variables are only reported for Round 6 in Liberia and Sierra Leone. All other variables are reported for Guinea, Liberia, and Sierra Leone over both rounds. S.D. is standard deviation.

4 Empirical strategy

We first assess the impact of the Ebola epidemic on attitudes toward taxation using the objective measure that captures regional prevalence rates. For ease of interpretation, we estimate the parameters of the following linear probability model using ordinary least squares (OLS):[25]

$$Y_{irt} = \alpha + \beta EbolaPrev_{rt} + \gamma X_{irt} + \delta_r + \delta_t + \varepsilon_{irt} \quad (1)$$

where Y_{irt} indicates support for increased taxation of Individual *i*, living in Region *r*, and in Round *t* of the survey; $EbolaPrev_{rt}$ is the number of Ebola cases per 100,000 individuals in Region *r* and Round *t*; X_{irt} is a vector of individual-/local-level controls, and ε_{irt} is the stochastic error term. The terms δ_r and δ_t capture region and round fixed effects, respectively.[26] Thus, we only exploit the variation of Ebola exposure within regions over time. Individual-level controls include demographic, socioeconomic, and attitudinal factors, namely sex, number of adults in the household, residence in an urban area, age, professing the Christian religion, ethnicity, level of education, wealth quintile, being unemployed, being active in the community (*Participative*), considering tax evasion wrong and punishable (*Tax morale*), trusting the president (*Trust president*), and believing that the government is doing well on improving health services (*Govt. health*). For this regression, we cluster the standard errors at the level of the treatment, in this case the regional level at which the Ebola case data are provided. All regressions are weighted using the sample weights included in the Afrobarometer survey.

We then estimate a second model, based on our subjective measures of Ebola impact, employing individual-level data on reported Ebola exposure and life disruption:

$$Y_{irt} = \alpha + \beta_1 EbolaExp_{irt} + \beta_2 EbolaDis_{irt} + \gamma X_{irt} + \delta_{rt} + \varepsilon_{irt} \quad (2)$$

where Y_{irt} again is support for taxation; $EbolaExp_{irt}$ is a variable coded 1 if Individual *i* reports knowing a close friend or relative who was infected with the Ebola virus or died from the disease, and 0 otherwise. $EbolaDis_{irt}$ is an index that captures the level of life disruption faced by individuals in the domains of work, education, social gatherings, and access to medical care, scaled from 0 to 1; and ε_{irt} represents the error term. Since we have individual-level data for the subjective exposure measures, we control for region-round fixed effects through the term δ_{rt}. We cluster standard errors at the level of the sampling unit used in the Afrobarometer data collection, in this case the enumeration area.

To interpret coefficients in these models as causal, there must be no other unobserved factors correlated with both attitudes toward taxation and the measures of Ebola impact or any reverse causation. One potential concern is that taxation preferences may be correlated with better local institutions and capacities to mitigate the impact of the Ebola outbreak. Following the collapse of the health system, local communities in Liberia played a key role in halting the spread of the epidemic through the use of different coping strategies, such as community task forces and surveillance measures (Abramowitz et al., 2015). In Sierra Leone, a tradition of decentralised local governance may have hastened the uptake of control efforts, such as restrictions on unsafe funeral practices and the enactment of local quarantines (Wilkinson & Fairhead, 2017). To partially account for such effects, we include a full set of local-level controls capturing time-varying characteristics of each survey enumeration area (typically a village or smaller geographic unit). These controls capture each enumeration area's level of development in several categories, such as whether there is a school, health clinic, police station, electricity grid, paved road, and sewage system present. Region, round, and region-round fixed effects also control for any unobserved

[25] Note that core estimates are robust to alternative model specifications, e.g. logit and probit.

[26] Note that controlling for region-time fixed effects would absorb all the variation in Ebola case rates over time. We therefore control for region and round fixed effects separately.

factors at the geographical level that may be correlated with redistributive preferences and our Ebola measures in each round of the survey.

An additional concern is that redistributive preferences may be correlated with individual behaviour and adherence to government control measures during the outbreak (e.g. local quarantines or social distancing). If individuals who are more in favour of redistribution are more likely to follow such measures, we would expect this effect to bias our estimates of Ebola exposure and preferences for redistribution downward. While it is not possible to explicitly control for such effects, we can control for variables that may be highly correlated with behaviour during the epidemic, such as trust in the government's handling of the epidemic. Using survey evidence from Monrovia, Blair et al. (2017) find that individuals who distrust the government were less likely to take precautions against Ebola exposure and adhere to government-mandated social distancing measures. They were also less likely to support state-mandated measures intended to slow the spread of Ebola, such as safe burial practices. We therefore control for the level of trust prior to and after the epidemic, as proxied by trust in the president.[27]

Round 6 also allows us to control for ratings of the government's response to the epidemic in Liberia and Sierra Leone.

Lastly, a limitation of our subjective exposure variable is that we do not have corresponding information on the size of an individual's social network within the Afrobarometer survey. One could argue that having a broader social network could increase the chances of knowing a close friend or relative who was infected or died during the outbreak. Social capital, more broadly defined, is also likely to be correlated with redistributive preferences (see Yamamura, 2012). We therefore include a control for whether the individual participates in community meetings to mitigate this effect.[28] The Afrobarometer survey also allows us to control for the number of adults over 18 years of age in the household (i.e. family members). This is important because close contact between household members was a key driver of Ebola transmission (Agua-Agum et al., 2016).

5 Results

5.1 Ebola prevalence rates

In this section, we first discuss the link between attitudes on taxation and our objective measure of Ebola impact, which assigns respondents with the prevalence rates of the subnational unit where they live. We then look at the connection with the self-reported measures of exposure, namely whether respondents know someone who was infected with or died of Ebola, and the index capturing the level of disruption of some key life dimensions (going to work, attending school, accessing health care, and participating in social gatherings).

Table 4 presents estimates of the relationship between Ebola case rates at the regional level and support for taxation. In line with previous evidence regarding the impact of shocks on redistributive preferences (e.g. Gualtieri et al., 2018), we observe that individuals living in subregions more affected by the Ebola epidemic are more likely to be supportive of raising taxes to develop their country compared to those residing in areas with lower prevalence (Column 1). This relationship is robust to the inclusion of geographical and individual-level

[27] We also tested various other measures of trust in different government institutions (e.g. Parliament, tax department, local government, etc.). The results are robust to these different measures and to a PCA-derived index based on the first principal component of all aspects. However, the use of some aspects and the index reduces our sample size substantially due to non-response. We therefore used trust in the president as a proxy for overall trust in the government.

[28] We also note that the size of an individual's social network could be implicitly controlled for through other socioeconomic variables, such as age, education, wealth, and so on.

controls, which we present in Column 2 (demographic and socioeconomic) and Column 3 (also attitudinal, such as being participative, having a strong tax morale, trusting the president, and assessing the government's performance in terms of health care positively).

Table 4: Support for taxation for development and Ebola exposure

	(1)	(2)	(3)
Ebola rates/100	0.038**	0.044***	0.046***
	(0.015)	(0.014)	(0.015)
Female		-0.010	-0.009
		(0.009)	(0.009)
Adults in household		-0.005**	-0.005**
		(0.002)	(0.002)
Urban		0.039***	0.037**
		(0.014)	(0.015)
Age: 31-45		0.003	-0.000
		(0.014)	(0.014)
Age: over 45		0.009	0.008
		(0.018)	(0.017)
Christian		0.007	0.009
		(0.012)	(0.013)
Primary education		0.041**	0.042**
		(0.018)	(0.018)
Secondary education		0.042**	0.043**
		(0.017)	(0.017)
Post-secondary education		0.048**	0.049*
		(0.024)	(0.026)
Quintile_2		-0.038*	-0.040*
		(0.020)	(0.020)
Quintile_3		-0.022	-0.025
		(0.017)	(0.016)
Quintile_4		0.013	0.014
		(0.021)	(0.021)
Quintile_5		0.018	0.019
		(0.028)	(0.028)
Unemployed		-0.065***	-0.063***
		(0.015)	(0.014)
Participative			0.001
			(0.014)
Tax morale			0.068***
			(0.023)
Trust president			0.009
			(0.006)
Govt. health			-0.002
			(0.006)
Constant	0.266***	0.325***	0.269***
	(0.025)	(0.032)	(0.042)
N	7,067	6,969	6,700
R²	0.2248	0.2356	0.2413

*Weighted estimates, standard errors clustered by region between brackets. Ethnicity EA controls and region-round fixed effects included in all specifications. *p<0.10, **p<0.05, ***p<0.01.*

Note that the magnitude of the coefficient barely changes with the inclusion of the latter. This implies that other mechanisms, aside from trust and assessment of government performance, are driving the shift in redistributive preferences. While we cannot rule out the

influence of other unobserved factors, we hypothesise that a shift in individual beliefs regarding the role of effort and luck in one's life may be a plausible channel. Focusing on the full model, we see that those residing in urban areas, those having completed some level of education (compared to those with no formal education), and those who consider not paying taxes wrong and punishable (labelled "tax morale" in the specifications) are more likely to display a high level of support for taxation. On the contrary, respondents living in more populated households, who said they were unemployed at the time of the survey, or who are classified in the second wealth quintile are less likely to favour higher tax levels as a means to further develop the country.[29]

We test the robustness of our results in the Annex by i) leaving one region out of the analysis at a time; ii) removing regions randomly until the effect disappears; iii) utilising non-linear probability models (e.g. logit and probit); iv) calculating the logarithm of Ebola prevalence rates (plus one) to minimise the impact of outliers; and v) using lower-level administrative data on Ebola prevalence collected by Soumahoro (2020).[30] First, we find that the coefficients and level of significance remain relatively stable when one subnational region is removed sequentially from the data set. Second, the coefficient remains statistically significant when slightly more than a quarter (18 out of 63) of the subnational regions are randomly removed from the sample. Third, employing non-linear models (e.g. logit and probit) or the log of Ebola rates does not drastically alter the results. Lastly, using lower-level administrative data from Guinea and Sierra Leone yields a statistically significant coefficient that is almost identical to the one obtained from the main sample.

5.2 Self-reported measures of Ebola exposure and disruption

Table 5 presents estimates of the relationship between exposure and life disruption due to Ebola and support for increased taxation. Note that these specifications only refer to Liberia and Sierra Leone, given that these self-reported Ebola data are unavailable for Guinea. We first look at the correlation only controlling for the geographical characteristics of the respondent's area of residence and for region-round fixed effects. We then progressively add demographic, socioeconomic, and attitudinal controls. Focusing on the full model, the results in Column 5 suggest that individuals who know someone who was infected with or died of Ebola are about 3.4% more likely to support a tax increase to further develop their country. Similarly, those whose lives were most disrupted by the pandemic have, on average, a 6.3% higher probability of favouring increased taxation (compared to those who suffered no disruption).

When testing the robustness of these positive relationships through the inclusion of individual-level controls, we learn that some demographic, socioeconomic, and attitudinal characteristics are also relevant drivers of taxation preferences. For instance, while respondents who live in more-populated households are slightly less redistributive (-0.008***), the opposite is true for those who identify as Christian (0.032**) or live in an urbanised area, at a lower level of significance. Those who have completed primary education are also slightly more in favour of increased taxation (with respect to those with no formal education, set as the reference category). Finally, the unemployed seem more averse to taxation than employed individuals in the sample. However, the sign, size, and significance of our main variables of interest, proxying Ebola impact, remain relatively constant after the inclusion of these controls.

[29] We comment on the presence of heterogeneity in the impact of the Ebola shock on taxation attitudes in the Annex.

[30] These data are only available for Guinea and Sierra Leone but include case rates for 172 different subnational areas. Soumahoro (2020) collates data from WHO national offices in Guinea and from Fang et al. (2016) for Sierra Leone.

Table 5: Support for taxation for development and Ebola impact

	(1)	(2)	(3)	(4)	(5)
Ebola direct	0.036**		0.036**		0.034**
	(0.018)		(0.017)		(0.017)
Ebola disruption		0.065***		0.067***	0.063***
		(0.020)		(0.022)	(0.022)
Female			-0.012	-0.011	-0.011
			(0.013)	(0.013)	(0.013)
Adults in household			-0.008***	-0.008***	-0.008***
			(0.002)	(0.002)	(0.002)
Urban			0.032*	0.032*	0.031*
			(0.017)	(0.017)	(0.017)
Age: 31-45			-0.003	-0.002	-0.003
			(0.013)	(0.014)	(0.014)
Age: over 45			0.007	0.010	0.009
			(0.017)	(0.017)	(0.017)
Christian			0.032**	0.033**	0.032**
			(0.016)	(0.016)	(0.016)
Primary education			0.037*	0.039*	0.039*
			(0.021)	(0.022)	(0.022)
Secondary education			0.025	0.026	0.025
			(0.019)	(0.019)	(0.019)
Post-secondary education			0.000	0.003	0.002
			(0.024)	(0.024)	(0.024)
Quintile_2			-0.038	-0.041*	-0.040*
			(0.023)	(0.024)	(0.024)
Quintile_3			-0.030	-0.031	-0.031
			(0.022)	(0.022)	(0.022)
Quintile_4			0.022	0.018	0.020
			(0.021)	(0.021)	(0.021)
Quintile_5			0.006	0.004	0.005
			(0.025)	(0.024)	(0.025)
Unemployed			-0.046***	-0.045***	-0.045***
			(0.014)	(0.014)	(0.014)
Participative			0.022	0.024*	0.024*
			(0.014)	(0.014)	(0.014)
Tax morale			0.028	0.031	0.031
			(0.024)	(0.024)	(0.024)
Trust president			0.008	0.007	0.007
			(0.006)	(0.006)	(0.006)
Govt. health			0.003	0.004	0.004
			(0.008)	(0.008)	(0.008)
Constant	0.657***	0.652***	0.694***	0.680***	0.681***
	(0.062)	(0.061)	(0.089)	(0.088)	(0.088)
N	4699	4656	4418	4389	4389
R^2	0.0926	0.0928	0.1079	0.1083	0.1092

5.2.1 Effectiveness of outbreak control and funding for Ebola

The analysis presented so far aims to shed light on the impact of Ebola on taxation attitudes, and therefore information from before and after the epidemic is required. We now exploit several questions addressing how the emergency was handled from Round 6 of the Afrobarometer survey in Liberia and Sierra Leone, i.e. once the worst part of the epidemic had been overcome. These questions are of interest because greater support for taxation could be driven by respondents' perceptions of the government's response to the outbreak. Flückiger et al. (2019), for instance, find that state legitimacy (measured as trust in different institutions and a lower inclination to refuse to pay taxes) improved in areas where Ebola outbreak control measures were perceived to be more effective. The questions in the Afrobarometer survey captured each respondent's assessment of the "effectiveness to control the Ebola outbreak" of 1) the central government, 2) the local government, 3) local non-governmental organisations, 4) international organisations (such as Doctors Without Borders, the Red Cross, the World Health Organization, and the United Nations), and 5) governments of other countries (such as the United States or the United Kingdom). Responses to these questions were recorded on a four-point scale ranging from "Not at all effective" to "Very effective." We dichotomise these responses to measure whether the respondents thought the institution was effective or not.

In Table 6, we linearly regress these measures on the Ebola exposure/disruption variables and socioeconomic controls from the last section.[31] The results reveal that individuals who suffered a higher degree of disruption to their lives due to the Ebola outbreak were more likely to state that the national and local governments were ineffective in controlling the Ebola outbreak. Meanwhile, those who knew a friend/relative who was infected with or died of Ebola were more likely to state that local NGOs were effective in controlling the outbreak. Given these negative correlations, we can argue that respondents' assessments of the government's performance do not seem to be driving greater support for taxation among those highly exposed to/affected by the Ebola outbreak, as observed in the previous sections. Moreover, the inclusion of these variables as controls in a single cross-sectional regression does not affect the significance or magnitude of the coefficients of our variables of interest, that is, the self-reported measures of exposure and disruption due to Ebola (see Table A.6 in Annex Section A.3).

Table 6: Ebola exposure and institutional effectiveness

	(1)	(2)	(3)	(4)	(5)
	Nat. govt.	**Local govt.**	**Local NGOs**	**Intl. orgs.**	**Intl. govts.**
Ebola direct	-0.026	0.037	0.050**	0.011	0.018
	(0.023)	(0.026)	(0.025)	(0.017)	(0.016)
Ebola disrupt	-0.113***	-0.096***	0.061	0.042	0.033
	(0.030)	(0.033)	(0.037)	(0.027)	(0.027)
Constant	0.982***	0.894***	0.848***	0.863***	0.741***
	(0.087)	(0.092)	(0.096)	(0.063)	(0.064)
N	2236	2236	2236	2236	2236
R^2	0.1683	0.1596	0.1303	0.1586	0.1622

*OLS weighted estimates, standard errors clustered by enumeration area between brackets. Full set of demographic and socioeconomic controls included. Region dummies included. Results for Liberia and Sierra Leone only. *p<0.10, **p<0.05, ***p<0.01.*

[31] We use linear regression for consistency with the previous sections and ease of interpretation. The statistical significance and sign of the estimates remain largely unchanged when we use non-linear probability models (e.g. logit).

Respondents were also asked whether they had confidence in the government's preparedness to respond to a new outbreak and whether the government should devote more resources to combating Ebola or focus on solving other problems. To further explore the preferences of those affected by the Ebola outbreak, we dichotomise the responses to these questions[32] and linearly regress each measure on the Ebola exposure and disruption variables introduced in the last section. Column 1 of Table 7 indicates that individuals whose lives were disrupted by Ebola are more likely to report that the government is unprepared for the next crisis. Meanwhile, Column 2 suggests that individuals who were exposed to the virus or suffered disruption were more likely to agree that the government should devote resources to combating Ebola, even if it means less money is spent on other things, such as education. This suggests that the results from previous sections regarding taxation may be driven in part by affected respondents' desire to protect against future outbreaks.

Table 7: Ebola exposure, preparedness, and funding

	(1)	(2)
	Govt. prepared	**Fund Ebola**
Ebola direct	0.028	0.137***
	(0.024)	(0.026)
Ebola disrupt	-0.180***	0.238***
	(0.040)	(0.038)
Ebola nat. govt.	0.130***	-0.064*
	(0.036)	(0.033)
Ebola local govt.	0.005	0.006
	(0.029)	(0.028)
Constant	0.290***	0.602***
	(0.101)	(0.085)
N	2,236	2,117
R^2	0.1659	0.2741

*OLS weighted estimates, standard errors clustered by enumeration area between brackets. Full set of demographic and socioeconomic controls included. Region dummies included. Results for Liberia and Sierra Leone only. Ebola nat. govt. and Ebola local govt. refer to the respondents' ratings of the control of the outbreak from Table 6. *p<0.10, **p<0.05, ***p<0.01.*

6 Conclusion

In this paper, we investigate whether a large health shock, namely the West African Ebola outbreak of 2013-2016, shifted attitudes toward taxation in three heavily affected countries: Guinea, Liberia, and Sierra Leone. Conditioning on a set of individual-/local-level covariates, as well as survey round and region fixed effects, our results suggest that this shock has affected attitudes toward taxation for development. Our results are robust to using different measures for Ebola exposure, either objective or self-reported. This finding reiterates the need to consider individuals' self-reported experience of a shock when studying potential drivers of redistributive preferences. It therefore fills an important gap in the existing literature, which

[32] Responses to the former were on a four-point scale ranging from "Not at all confident" to "Very confident." The latter asks individuals if they agree with one of two statements: A: "The government should devote many more resources to combating Ebola even if this means that less money is spent on things like education" or B: "There are many other problems facing this country besides Ebola; even if people are dying in large numbers, the government needs to keep its focus on solving other problems." We dichotomise these responses into confident or not and agree with Statement A or not.

has largely focused on objective measures of impact (Giuliano & Spilimbergo, 2014; Olivera, 2014; Gualtieri et al., 2018; Cabeza & 2019, among others).

Our results align closely with previous findings in the literature, mainly that large shocks can lead to an increase in support for taxation and redistribution (see Olivera, 2014; Cabeza & Decancq, 2019; Gualtieri et al., 2018). This result is obtained using both our objective measure of Ebola prevalence rates and self-reported measures of Ebola exposure and impact. Moreover, aside from exposure, we find that individuals whose lives have been heavily disrupted in different ways are also more likely to support greater taxation. This finding demonstrates that individuals' self-reported experience of an epidemic adds a relevant layer of information to more objective measures, such as prevalence rates.

A limitation of this paper is that the precise mechanism driving the impact of the Ebola shock on citizens' attitudes toward taxation is difficult to ascertain from the available Afrobarometer data. However, we can rule out several possibilities commonly highlighted in the literature. For instance, controlling for the level of trust in government institutions does not alter the magnitude or significance of the explanatory variables that are at the centre of our analysis.[33] Nor does adding controls for level of government performance in areas of policy making. One may expect, in addition, that the Ebola epidemic led to a deterioration in living standards for many individuals, thereby shifting their support for redistribution. However, the inclusion of individual wealth levels and employment status in our specifications does not reduce the significance of the Ebola impact variables.[34] Thus, after ruling out these mechanisms, we posit that one plausible mechanism driving the impact of the Ebola shock on taxation attitudes is the exposure to a spell of bad luck that enhances individuals' awareness of the role of luck and circumstances on their economic situation. This, in turn, could lead to an increase of support for taxation as a form of social insurance against such shocks (see Gualtieri et al., 2018; Cappelen et al., 2021). This interpretation aligns with the evidence presented in the previous section, which revealed that individuals who were more exposed to or whose lives were more disrupted by Ebola are more likely to support increased funding to combat future Ebola outbreaks.

Future studies in this line of research could address some of the limitations of our study and test whether the effects we find are long-lasting. Besides, the data set we exploit is limited in that it doesn't contain information on beliefs about the sources of inequality. As highlighted in the literature (see Alesina & Giuliano, 2011, for an overview), these beliefs are integral to understanding redistributive attitudes. Such studies could also yield useful insights into the mechanisms driving redistributive preferences in the different domains explored within this study, such as development and health care.

[33] Our results are robust to using trust in different institutions and a trust index created from the first principal component of the institutional categories included in the Afrobarometer survey.

[34] We also used a self-reported measure of living standards in each round to test this effect. In addition, like Gualtieri et al. (2018), we tested whether the individual's assessment of the economic conditions of their country matters. The magnitude and significance of the Ebola exposure/disruption variables are not altered by these controls.

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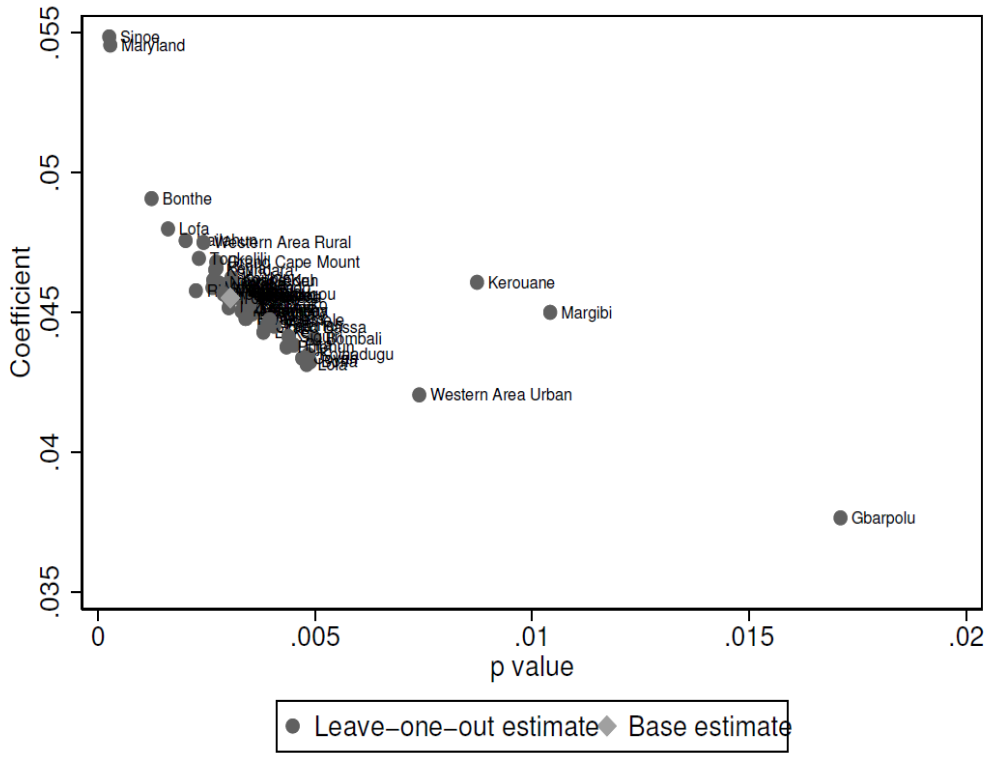
Annex

A.1 Robustness checks

i) Leave-one-out estimates

Figure A.1 presents the estimates of the Ebola prevalence rates coefficient from Equation 1 (alongside the corresponding p-values) when a single region is removed one at a time from the analysis. Each point corresponds to an estimate when a region has been left out. The region left out is labelled in the graph.

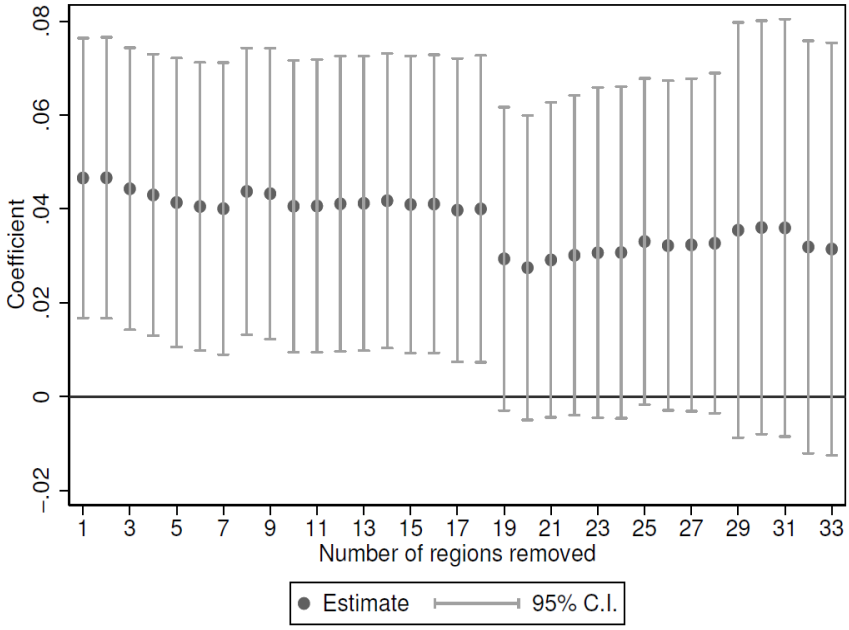
Figure A.1: Leave-one-out estimates



ii) Randomly removing regions

Figure A.2 re-estimates the model when we leave out multiple regions from the analysis. These regions are removed one at a time randomly to assess the stability of the coefficient. We observe that the statistical significance of the coefficient disappears after 18 regions are randomly removed from the analysis. The main analysis in the paper includes 63 regions.

Figure A.2: Leaving multiple regions out



iii) Logit/Probit model estimates

Table A.1: Ebola case rates: Logit and probit estimates

	Logit	Probit
Ebola rates/100	0.384***	0.198***
	(0.096)	(0.056)
Tax morale	0.410***	0.235***
	(0.129)	(0.077)
Trust president	0.065*	0.039*
	(0.037)	(0.021)
Govt. health	-0.010	-0.004
	(0.039)	(0.023)
Constant	-1.043***	-0.659***
	(0.239)	(0.137)
N	6700	6700
Pseudo R^2	0.2050	0.2047

*Standard errors clustered by region between brackets. Full set of demographic and socioeconomic controls included. Region and wave dummies included. *p<0.10, **p<0.05, ***p<0.01.*

iv) Logarithm of Ebola prevalence

Table A.2: Ebola case rates: Logarithmic transformation

	(1)	(2)
Log(Ebola rates +1)	0.112***	0.113***
	(0.038)	(0.031)
Participative		0.000
		(0.014)
Tax morale		0.068***
		(0.023)
Trust president		0.010
		(0.006)
Govt. health		-0.002
		(0.006)
Constant	0.295***	0.274***
	(0.018)	(0.042)
N	7067	6700
R²	0.2166	0.2419

*Standard errors clustered by region between brackets. Full set of demographic and socioeconomic controls included in column 2. Region and wave dummies included. *p<0.10, **p<0.05, ***p<0.01.*

v) Lower-level administrative data

This table uses lower-level administrative data on Ebola prevalence rates from Soumahoro (2020). These data are only available for Guinea and Sierra Leone.

Table A.3: Ebola case rates: Lower-level administrative data | Guinea and Sierra Leone

	(1)	(2)
Ebola rates/100	0.038**	0.045***
	(0.015)	(0.010)
Round	0.006	-0.020
	(0.033)	(0.028)
Tax morale		0.091***
		(0.031)
Trust president		0.014
		(0.009)
Govt. health		-0.000
		(0.008)
Constant	0.369***	0.262***
	(0.033)	(0.083)
N	3580	3424
Controls	No	Yes
R²	0.3039	0.3308

*Standard errors clustered by subregion between brackets. Full set of demographic and socioeconomic controls included in Column 2. Subregion and round fixed effects included. *p<0.10, **p<0.05, ***p<0.01.*

A.2 Heterogeneous effects

Ebola rates: The models presented in Section 5 could be masking differences in how the taxation attitudes of certain groups were impacted by the Ebola pandemic shock. In order to study these attitudes, Table A.4 presents the estimation results of a set of models that include interaction terms between the measure of Ebola prevalence and the main demographic, socioeconomic, and attitudinal characteristics. We find that, for instance, individuals who live in urban areas are less supportive of increased taxation as Ebola prevalence rates go up, as compared to those living in rural areas. The same is true for respondents categorised into the first wealth quintile when compared to the rest of respondents, classified into richer quintiles. Those with no formal education are more likely to support increased taxation where Ebola prevalence rates are higher, compared to respondents who have some education. Also, those who are unemployed and live in an area with higher Ebola rates are more likely to favour more taxation for development (as compared to those who are employed).

Life disruption index: After looking at the results of the baseline model, we proceed to examine possible heterogeneities in how the Ebola shock affects individual taxation attitudes. We do so by interacting the variables of interest, being directly exposed to Ebola first, and then life disruption due to the epidemic, with relevant demographic, socioeconomic, and attitudinal indicators. In Column 4 of Table A.5, which includes our first proxy of Ebola exposure (knowing someone who was infected or died), we can see that, while the demographic and attitudinal interaction terms have no or little statistical significance, some socioeconomic elements do add extra information, namely that those who were directly exposed and have no formal education are more favourable to increasing taxation than those who have a higher level of education (0.073**). Also, those who were exposed and are unemployed display a slightly more favourable attitude towards a tax raise than those who are employed, but at a lower level of statistical significance. Those in the lowest quintile of our wealth index who were exposed to Ebola are, on average, less supportive of a tax raise than those also affected but classified into higher wealth quintiles (-0.146***). When we estimate the same models, including the interaction terms with the life disruption index, we confirm that demographic and attitudinal variables don't seem to reveal any systematic heterogeneities. Similarly, having no formal education and being unemployed do result in stronger taxation preferences (than among the more educated and employed), while those categorised in the lowest wealth quintile express weaker support for increased taxation (-0.215***).

Table A.4: Support for taxation for development and Ebola exposure

	(1)	(2)	(3)	(4)
Ebola rates/100	0.046***	0.073***	0.057***	0.041
	(0.010)	(0.017)	(0.017)	(0.028)
Ebola rates/100 X Female		-0.004	-0.008	-0.006
		(0.009)	(0.009)	(0.008)
Ebola rates/100 X Adults in household		0.000	-0.000	-0.000
		(0.002)	(0.002)	(0.002)
Ebola rates/100 X Urban		-0.042***	-0.040***	-0.042***
		(0.012)	(0.013)	(0.013)
Ebola rates/100 X Age over 45		0.004	-0.003	-0.003
		(0.010)	(0.010)	(0.010)
Ebola rates/100 X No formal education			0.036***	0.036***
			(0.012)	(0.012)
Ebola rates/100 X Quintile 1			-0.038**	-0.037**
			(0.018)	(0.018)
Ebola rates/100 X Unemployed			0.026**	0.025**
			(0.011)	(0.011)
Ebola rates/100 X Participative				0.018
				(0.011)
Ebola rates/100 X Tax morale				0.010
				(0.018)
Ebola rates/100 X Trust president				-0.004
				(0.005)
Ebola rates/100 X Govt. health				0.004
				(0.005)
Constant	0.269***	0.261***	0.266***	0.271***
	(0.064)	(0.065)	(0.066)	(0.068)
N	6700	6700	6700	6700
R^2	0.2413	0.2427	0.2445	0.2449

*Standard errors clustered by region between brackets. Full set of EA, demographic and socioeconomic controls included. Region and round fixed dummies included. *p<0.10, **p<0.05, ***p<0.01.*

Table A.5: Support for taxation for development and Ebola impact: Model with interactions (Ebola direct)

	(1)	(2)	(3)	(4)
Ebola direct	0.036**	0.060*	0.039	0.040
	(0.017)	(0.036)	(0.038)	(0.078)
Ebola direct X Female		-0.000	0.004	0.002
		(0.025)	(0.025)	(0.025)
Ebola direct X Adults in household		-0.002	0.000	0.000
		(0.004)	(0.004)	(0.004)
Ebola direct X Urban		-0.036	-0.052*	-0.053*
		(0.028)	(0.028)	(0.029)
Ebola direct X Age over 45		0.029	0.026	0.026
		(0.030)	(0.031)	(0.031)
Ebola direct X No formal education			0.073**	0.073**
			(0.031)	(0.031)
Ebola direct X Quintile 1			-0.144***	-0.146***
			(0.043)	(0.043)
Ebola direct X Unemployed			0.053*	0.052*
			(0.027)	(0.027)
Ebola direct X Participative				-0.024
				(0.025)
Ebola direct X Tax morale				0.019
				(0.058)
Ebola direct X Trust president				-0.001
				(0.013)
Ebola direct X Govt. health				-0.003
				(0.013)
Constant	0.694***	0.692***	0.706***	0.706***
	(0.089)	(0.090)	(0.091)	(0.094)
N	4418	4418	4418	4418
R^2	0.1079	0.1084	0.1124	0.1126

*Standard errors clustered by enumeration area (EA) between brackets. Full set of demographic, EA, and socioeconomic controls included. Region-round fixed effects included. *p<0.10, **p<0.05, ***p<0.01.*

A.3 Additional figures and tables

Figure A.3: Health spending as % of GDP (Institute for Health Metrics and Evaluation, 2021)

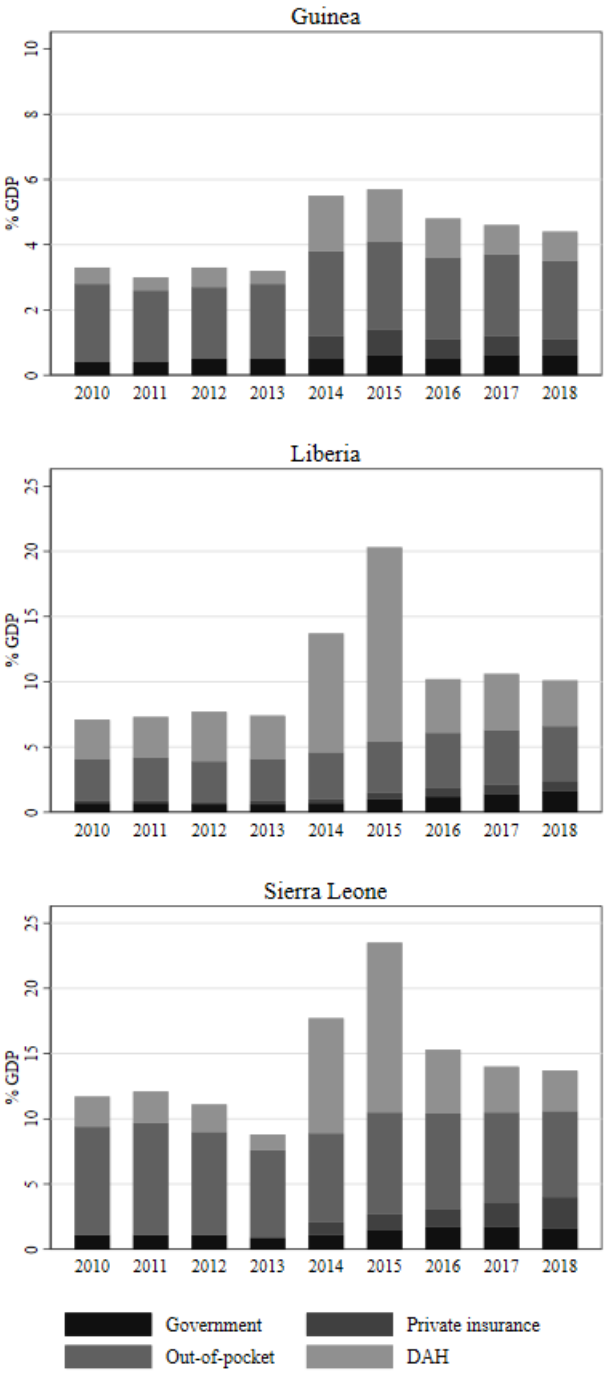


Figure A.4: Total health spending by source (Institute for Health Metrics and Evaluation, 2021)

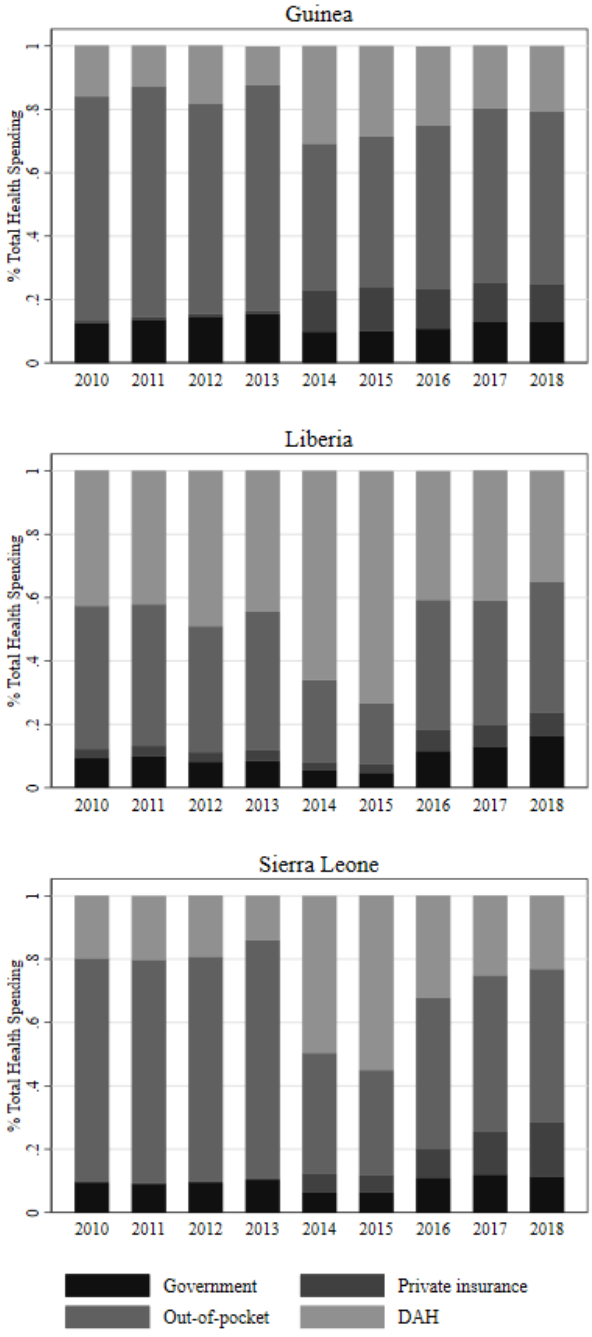


Table A.6: Support for increased taxation: Outbreak control

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ebola direct	0.035**	0.034**	0.035**	0.035**	0.036**	0.036**	0.033**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Ebola disrupt	0.064***	0.060***	0.064***	0.064***	0.066***	0.066***	0.059***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
National govt.		-0.040*					-0.053*
		(0.020)					(0.030)
Local govt.			-0.007				0.013
			(0.018)				(0.025)
Local NGOs				0.003			0.026
				(0.018)			(0.021)
Intl. orgs.					-0.030		0.018
					(0.030)		(0.052)
Intl. govts.						-0.046*	-0.054
						(0.027)	(0.043)
Constant	0.746***	0.785***	0.752***	0.744***	0.772***	0.782***	0.791***
	(0.064)	(0.067)	(0.068)	(0.067)	(0.071)	(0.069)	(0.072)
N	2207	2207	2207	2207	2207	2207	2207
R^2	0.1319	0.1342	0.1320	0.1319	0.1327	0.1338	0.1366

*OLS weighted estimates, standard errors clustered by enumeration area between brackets. Region fixed effects and full set of demographic, EA, and socioeconomic controls included. *p<0.10, **p<0.05, ***p<0.01.*

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