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State Extraction and Anti-Colonial Rebellion – Quantitative Evidence from the Former German East Africa

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Abstract

Does extraction increase the likelihood of antistate violence in the early phases of state-building processes? While much research has focused on the impacts of war on state-building, the potential "war-making effects" of extraction have largely been neglected. The paper provides the first quantitative analysis of these effects in the context of colonial state-building. It focuses on the Maji Maji rebellion against the German colonial state (1905–1907), the most substantial rebellion in colonial Eastern Africa. Analyses based on a newly collected historical data set confirm the correlation between extraction and resistance. More importantly, they reveal that distinct strategies of extraction produced distinct outcomes. While the intensification of extraction in state-held areas created substantial grievances among the population, it did not drive the rebellion. Rather, the empirical results indicate that the expansion of extractive authority threatened the political and economic interests of local elites and thus provoked effective resistance. This finding provides additional insights into the mechanisms driving the "extraction–coercion cycle" of state-building.

Keywords: state-building, extraction, colonial, rebellion, Maji Maji, German East Africa

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Alexander De Juan

Article Outline

1 Introduction

Violence, extraction, and state-building are intrinsically linked (Finer 1975; Tilly 1990; Herbst 2000).[1] Numerous empirical studies have investigated how interstate war can increase extraction and state capacity more generally (Ames and Rapp 1977; Thies 2007; Thies 2005; Centeno 1997). The potential "war-making" effects of extraction, on the other hand, have largely been neglected. This is surprising. Numerous substantial tax revolts indicate that extraction can

1 I thank John Martin Preuss, Lennart Garbes, and Max Montgomery for their excellent research assistance.

contribute to antistate violence (Trotha 1994; Young 1994; Hopcroft 1999; Burg 2004; Burg 2004). From a theoretical perspective, the effects of extraction on intrastate war are considered key to the state-building "extraction–coercion cycle": resistance against extraction motivates investments in administrative and coercive state capacity, while increased state capacity supports effective extraction and increases the likelihood of antistate resistance (Finer 1975; Tilly 1990). This paper proposes and tests arguments about how extraction can lead to antistate violence.[2]

States that aim to increase revenues have two principal options. The first involves those areas where the state already has a firmly established extractive authority. It consists of intensifying extraction by increasing the amount of taxes, forced labor, or agricultural goods collected from the population. This can create economic hardship and result in grievances that can motivate rebellion. Alternatively, states may try to expand their extractive authority by stripping nonstate elites of their extractive capacities and gains. This may trigger resistance from local strongmen (Cohen, Brown, and Organski 1981). I argue that the expansion of extraction is substantially more likely to lead to violence than the intensification of extraction because it motivates elite participation in rebellion, something which is essential for translating grievances into effective mobilization and organizing sustained antistate resistance.

I investigate this argument in the context of the so-called Maji Maji rebellion in the former colony of German East Africa in the years 1905 to 1907. The revolt was the greatest uprising in early colonial East and Central Africa (Koponen 1995; Becker 2004), and it engulfed half of the colony's territory, which encompassed today's Tanzania, Burundi, and Rwanda. I have collated a comprehensive historical data set, mainly from unpublished historical sources, that features information on various dimensions of extraction as well as geocoded violent-event data. The empirical section of the paper combines district-level comparisons with more fine-grained statistical analysis. It exploits the fact that extraction strategies differed substantially for the colony's two principal extractive goods, cotton and rubber. Contrary to previous qualitative accounts of the Maji Maji rebellion, the findings indicate that grievances resulting from the intensification of cotton extraction can only partly explain the rebellion. Rather, it was the expansion of extraction into the lucrative rubber trade that threatened local elites' political and economic authority and thereby led to widespread antistate violence.

These findings make two main contributions to the literature. First, they provide new insights into the mechanisms driving the "extraction–coercion" cycle. They demonstrate that extraction is likely to increase the risk of intrastate violence when its expansion alienates influential local elites. The state-building consequences of extraction may therefore be particu-

2 In this paper, the term "extraction" refers to all activities undertaken by the state in order to generate revenues within the boundaries of its territory – namely, those activities related to taxes, forced labor, natural resources or agricultural production.

larly strong for specific strategies of extraction associated with specific periods of state-building. Second, they add to the literature on natural resource extraction and violence more generally, suggesting that it may not be the degree of extraction or state capacity but rather the process of state expansion into resource-rich areas that increases the risk of political instability.

2 Economic Extraction and Violent Resistance

Extraction is a key element of statehood. It represents the vast bulk of state activity in the early phases of state-building (Mann 1984; Tilly 1990). Every state's survival depends on its ability to extract resources that allow it to maintain and expand its authority. Extraction is "the central task for the state to master before pursuing any other goals" (Levi 1981; Thies 2007: 717; Tilly 1990). Extractive activities also strongly influence state–population interactions. They constitute a fundamental intervention into social life, and they affect local political and economic structures and create an economic burden (Campbell 1993). This can provoke opposition, most notably in phases of "primitive accumulation of power" (Cohen, Brown, and Organski 1981) – that is, the early phases of state-building, when "traditional" orders are strong and the state is only in the process of expansion and consolidation. Tax revolts were frequent in the early phases of European (Strayer and Taylor 1939; Hopcroft 1999; Lamborn 1983; Burg 2004) and colonial state-building (Scott 1977; Kilson and Affairs 1966; Redding 2000).

But how exactly does extraction lead to violence? I argue that the state's strategy for increasing extraction is of significant importance in this regard. At any given point in time, states may choose between two principal strategies for maximizing revenues: they may intensify extractive activities in those areas where they have already been able to monopolize extraction, meaning that all the main extractive activities are carried out on behalf of the state. Alternatively, states may also try to further expand their extractive authority across their territory, thereby depriving local nonstate elites of their preexisting extractive capacities. Both strategies may have distinct effects on local elites and the population at large, which in turn determine the probability that they will lead to antistate violence.

The intensification of extraction is associated with a negative impact on the population. It may reach a point where extraction exceeds people's economic possibilities or undermines subsistence (Migdal 1988; Scott 1977). The resulting economic grievances may be important drivers of rebellion (Collier and Hoeffler 2004; Fearon and Laitin 2003; Hegre and Sambanis 2006). Contemporary studies find that low absolute income and a low level of development increases the likelihood of violent conflict outbreak (Tadjoeddin and Murshed 2007; Østby et al. 2011). Historical cases seem to support the argument that the intensification of extraction can lead to violent resistance. It has been argued that rising taxes threatened local peasants' livelihoods and created grievances that motivated peasant rebellions across many parts of Europe (Brustein and Levi 1987). Similar effects have been observed in colonial states. For in-

stance, the extraction in the Congo Basin is among the well-known examples of ruthless colonial exploitation. Widespread unrest and outright rebellion were the consequences of this extraction and its negative impact on the population (Roes 2010).

While such a grievance-centered narrative is generally persuasive, I argue that the intensification of extraction is not one of the main drivers of violent resistance. Peace research strongly suggests that grievances alone rarely provide sufficient explanation for the occurrence of violence as they are generally too widespread to explain rare instances of large-scale rebellion (Collier, Hoeffler, and Rohner 2009; Fearon and Laitin 2003). Rather, grievances will translate into rebellion only if collective action is facilitated by influential leaders. Elites mobilize their constituencies, provide strategic leadership, coordinate troops, and ensure internal discipline (Brown 1997; Collier et al. 2009). Consequently, the "war-making" effects of extraction will depend on how the extraction impacts influential nonstate elites.

The intensification of extraction, however, does not necessarily contradict elites' interests. Remember that intensification refers to areas where the state already monopolizes extraction. In these areas, the nonstate elites have already been forcefully deprived of their authority. Disempowerment is then often followed by integration into the state system. In many early European and colonial states, the state's extraction activities relied on intermediaries (Levi 1989). In return for their acceptance of the state's authority, their support for tax collection, and their provision of labor, local strongmen received shares of taxes, new rents to distribute, or preferential access to economic goods (Lonsdale and Berman 1979; Trotha 1994). Once they are integrated into the state's extractive system, nonstate elites do not necessarily suffer from intensified extraction. This reduces the probability of unified and widespread elite opposition to such intensification.

Consequently, I argue that another extractive strategy is more conflict-prone. Early phases of state-building are marked by unevenness. The state may be comparably strong in some areas, while in others it may be no more than a symbolic presence without meaningful influence on the social, economic, and political orders. The expansion of extraction refers to the state's attempts to bring additional areas under effective state control by replacing preexisting systems of reciprocal rights and obligations with its own extractive system. This process may have an ambiguous impact on the population. In some cases, levels of extraction may increase and practices worsen. In other cases, the expansion of state extraction may boil down to replacing one extractive agent with another.

The expansion of extraction has a much more unequivocal and substantive effect on nonstate elites. Brustein and Levi (1987) point out that taxation effectively undercut the nobility's power base in sixteenth- and seventeenth-century Europe, as it undermined the basis of the nobility's authority and threatened to destroy local patron–client relationships. Similarly, in many colonial states the expansion of taxation effectively threatened local elites, as mere state presence evolved into effective state penetration. Elites lost their economic independence as well as an essential attribute of local power (Trotha 1994). Submission to taxation and

the fulfillment of demands for forced labor were seen by the population as the ultimate evidence of obedience to alien authority and control (Lonsdale and Berman 1979; Callahan 2002). Such consequences of a state's expanding extractive authority can motivate local elites into resistance and thereby increase the likelihood of effective mobilization (Brustein and Levi 1987; Lamborn 1983).

The connections between extraction and violence are certainly not deterministic. The effects of extraction are highly contingent upon state–society relations more generally. They depend on the level of political participation, the redistribution of state income, and the provision of basic public services. Such interaction effects make it difficult to investigate the role of extraction in violence. I believe, however, that focusing on a specific instance of state-building makes it easier to deal with these issues. Redistribution and participation were minimal in many colonial states, and state–society relations were more or less confined to extraction and repression. Consequently, analyses of colonial state-building allow for a more limited but also more focused and less challenging analysis of the arguments presented above.

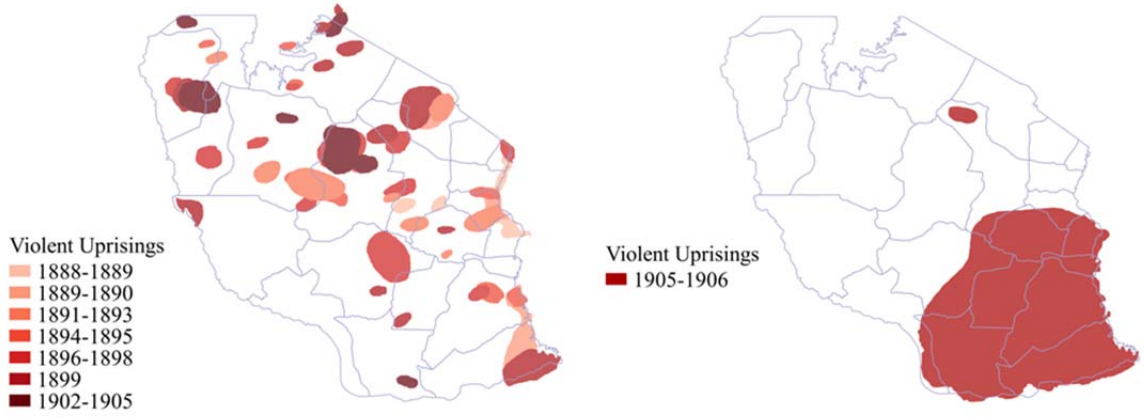
3 The German Colonial State and the Maji Maji Rebellion

The German colonial project started as a private enterprise. In 1884 a young German named Carl Peters founded the Society for German Colonialisation (which was later renamed the Deutsch-Ostafrikanische Gesellschaft (German East-African Society), DOAG). Peters had high ambitions: procuring colonies for Germany, improving the international status of the German Reich, and securing personal profit. He undertook a series of expeditions through East Africa, signing obscure treaties that made local authorities cede their land to the DOAG "for all time" (Bückendorf 1997). Over the years, the DOAG expanded its territory and its activities. This process was violently interrupted by the so-called "Arab Revolt," which ravaged the coast of the colony in 1888 (Iliffe 1979). Bismarck intervened on behalf of the DOAG and sent a military expedition that crushed the rebellion in 1890 (Bückendorf 1997). Following this intervention, all administrative functions were transferred from the DOAG to the imperial government (Iliffe 1979).

German colonial state-building was marked by substantial internal contradictions (Koponen 1995). On the one hand, the Germans had been able to establish control over most of the territory within only a few years. On the other hand, military control and civil bureaucracy were spread thinly across the territory. The colonial state was constructed through the consecutive establishment of military posts (Gwassa 1973). These stations were in charge of carrying out all rudimentary functions of the colonial state – namely, maintaining stability, collecting taxes, and ensuring the production of agricultural products. Given the limited German manpower and resources, native elites played a major role as middle men in the colonial administration, and various modes of direct and indirect rule were established across the colony (Iliffe 1979; Koponen 1995).

Violent resistance against German rule erupted with varying intensity across most parts of the territory. The map on the left in Figure 1 shows the approximate location of the various phases of violence that occurred before 1905. The map on the right shows the geographical extent of the Maji Maji rebellion, which took place from 1905 to 1907. I have prepared both maps according to drawings provided by Major Nigmann of the German military (Nigmann 1911). They illustrate that although violence was endemic, the Maji Maji rebellion represented a new dimension of resistance, affecting nearly half of the colony's territory.

Figure 1: Previous Periods of Violence and the Spatial Extent of the Maji Maji Rebellion



Source: Author's compilation.

The Maji Maji rebellion started in August 1905. In the southern Kilwa district, people attacked the home of a local *Akida*, an intermediary installed and paid by the colonial state. A few days later, hundreds of people ransacked the coastal town of Ssamanga. The rebellion quickly spread to the south and the west as well as northwards into Dar es Salam district. One week later the German post of Liwale was completely destroyed. The rebels staged numerous substantial attacks on German convoys and stations, often with several thousand fighters (Iliffe 1979; Iliffe 1967; Götzen 1909; Nigmann 1911; Bührer 2011; Gwassa 1973). Despite initial successes, the rebellion was crushed within less than two years. It has been estimated that rebels killed 15 Europeans and 400 African soldiers, while the number of dead amongst rebels and noncombatants is estimated to be between 100,000 and 300,000 (Iliffe 1979; Koponen 1995).

The causes of the rebellion have been the subject of lively academic debate. The first explanation highlights the oppressive character of German colonial rule as well as the resulting hardships and grievances among the population (Iliffe 1969; Sunseri 1997; Gwassa 1973). The second explanation stresses the role of a unifying ideology. In 1904 a healer from the Matumbi Mountains was said to have been possessed by one of the major spirits in the region (Larson 2010; Beez 2005). He distributed medicine that would prevent any harm from German bullets (*maji*, which means water in Kiswahili), thereby facilitating large-scale resistance (Iliffe 1979; Beez 2005; Gwassa 1973). The third explanation argues that while shared griev-

ances and ideologies may have played a role, they were not the driving forces. What mattered more were local conflicts among the various ethnic groups, who rebelled against the Germans to realize their political and material interests (Becker 2004; Greenstein 2010; Sunseri 1997). The remainder of this paper aims to provide the first quantitative analysis of the rebellion's background, focusing on the role of extraction.

4 Empirical Strategy, Data, and Results

The research design combines two levels of analysis. Given the high spatial concentration of the rebellion in the southern regions, I first compare the 22 districts of the colony to see if rebellious districts differed from the others in any systematic way. Next, I investigate extraction and violence on a more disaggregated level. The following subsections introduce the data and present the results of the district-level comparisons and the quantitative analysis.

4.1 Colonial Data

All the analyses presented below are based on a newly compiled historical data set that draws on four main sources: The first is the yearly reports of the German Imperial Colonial Office, which include substantive statistical annexes on the colonies. These reports are a rich source of information and include detailed numbers regarding state personnel, descriptions of the activities of missionary societies, and crime and taxation statistics.

The second source is a number of thematic maps produced by the colonial government as well as by various private colonial and missionary societies. These maps display the locations of military and missionary stations, the borders of the colony's districts, and the locations of various plantations and of roads and caravan routes. I have scanned and georeferenced these maps and have extracted relevant information using GIS software (QGIS 2.0.1).

The third main source is the so-called *Military Orientation Book for German East-Africa*. It was prepared by the German military and published in 1911 with the aim of providing "a picture of the colony as needed by soldiers in German East Africa." It contains, among other things, district-based information on ethnic groups as well as seven detailed maps that display thousands of individual road sections and include information on travel time.

Finally, the fourth source, which was used to obtain information on the location of violence, is the weekly issues of the *German East African Newspaper* (*Deutsch-Ostafrikanische Zeitung*, *DOAZ*) for the period under investigation. The *DOAZ* was edited in Dar es Salam and was the main German newspaper in the colony. From 1905 on, it featured a special section called "News from the areas of disturbances," which contained information on clashes in the rebellious districts.

Taken together, these data provide unique insights into the spatial features of the German colonial state and the Maji Maji uprising. The fact, however, that these data stem from a highly autocratic regime and are more than one hundred years old may raise doubts regard-

ing their accuracy. For example, the *DOAZ* may have underreported violence so as to play down the extent of the rebellion. Officials may have had incentives to under- or overreport on some issues. While I cannot rule out the possibility that some of the data are inaccurate, there are nevertheless good reasons to assume that they allow for meaningful analysis.

First, the *DOAZ* was in fact very critical of the colonial government. It was shut down twice – once because it printed a report on Governor von Rechenberg's alleged intimate relations with one of his servants (Schmidt 2008). It certainly underreported interethnic clashes. This, however, does not jeopardize my analysis: I intentionally focus on violence against the state and not on factional fighting.

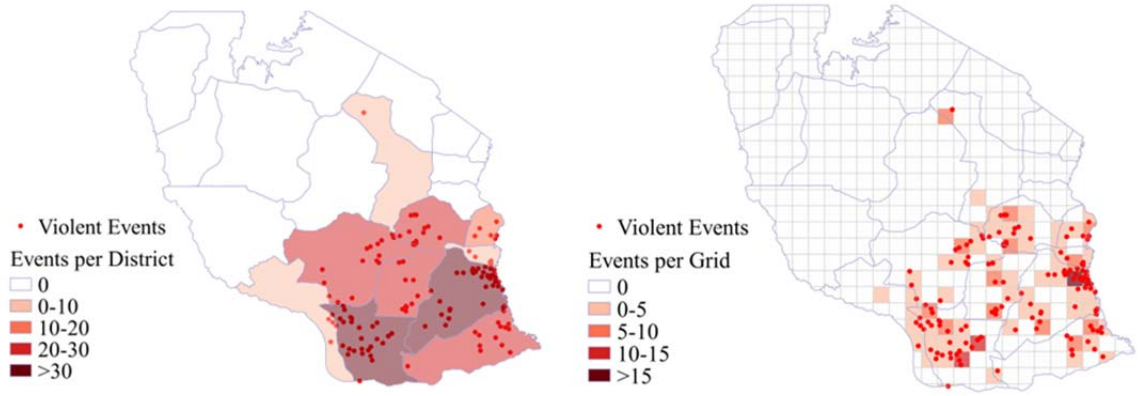
Second, most of the information used in this paper was either militarily important to the German government, thus creating incentives for accurate reporting (for example, road networks), or difficult to manipulate (for instance, the tax income had to be transferred into the German budget). In other cases, it is hard to think of plausible reasons that colonial staff would have manipulated the data – for example, on the location of rubber forests or cotton plantations.

Finally, colonial agents were eagerly trying to provide as detailed and as accurate maps of the colony as possible (Hafeneder 2008). Comparisons of historical georeferenced maps with current national boundaries demonstrate that these attempts were quite successful. In order to account for any remaining geographical inaccuracies, the data set uses a comparably crude scale, with 50 km x 50 km grid cells as the smallest units of analysis.

4.2 Measurement of Outcomes and the Main Explanatory Variables

To obtain a precise idea of the geographical distribution of violence during the rebellion, I have created a newspaper-based geolocated event data set along the lines of current data sets such as the Armed Conflict Location and Event Data Project (ACLED) or the UCDP Georeferenced Event Dataset (UCDP GED) (Raleigh et al. 2010; Sundberg and Melander 2013). We first retrieved information from the *DOAZ* on all reported clashes from August 1905 to January 1907, when reporting ended. Overall, we collated 299 events. Next, we located the events using the *German Colonial Atlas*, published in 1920 with a complete village register. We attributed 231 events to specific places on the map. In line with current event data sets, we attributed remaining events to the capitals of the districts mentioned in the *DOAZ*. All grid-cell analyses make use only of those events that have been attributed to precise locations.

Figure 2: Violent Events, 1905–1906, per District and per Grid Cell



Source: Author's compilation.

Taxation is the most straightforward indicator for economic extraction. The German administration introduced a hut tax in 1898, according to which every household had to pay a certain amount of cash or in kind (Bursian 1910). From this point up to the beginning of the rebellion, the colonial state undertook a dual strategy of intensification and expansion of tax extraction. Germany continuously enforced tax collection in the areas already under state control while simultaneously increasing the number of territories subject to effective taxation (Bursian 1910). It is hardly possible to identify which areas of the colony had predominantly been exposed to which extraction strategy when the rebellion began in 1905. Consequently, while the analysis of taxation may tell us if extraction mattered for violence, it will not tell us *how* it mattered. I therefore consider tax income per district (1904) only as an initial, general indicator that provides insights into the overall role of extraction in the rebellion.

To differentiate between the various facets of extraction, I follow Dube and Vargas (2013) and de la Sierra (2014) in using specificities of natural resources to investigate the effects of their extraction. Overall, German extraction centered heavily on agricultural exploitation (Gwassa 1973; Bald 1970; Koponen 1995). Cotton and rubber were the colony's two main export products. The extraction of these goods constituted the backbone of the colonial economy. German demand for both products increased tremendously prior to the rebellion. German rubber imports tripled from 1885 to 1905, while cotton imports increased by approximately 30 percent (Koponen 1995). Consequently, the colonial government substantially increased its extraction of both products. The extraction strategies for each product, however, differed significantly. The state fostered cotton production by forcefully increasing agricultural outputs in the cotton-growing strongholds of state and settler presence along the coast. Rubber extraction, on the other hand, was promoted by expanding German production and regulation from the coast into the vast rubber-growing and rubber-trading hinterlands of the southern districts. The remainder of this subsection provides additional information on these divergent strategies.

Around the turn of the century, the state substantially intensified cotton extraction. Most notably, from 1902 on, the colonial government introduced communal cotton schemes (Bald 1970; Tetzlaff 1970). These were based on systems of collective forced labor and administered by local intermediaries. These additional extractive activities focused on areas that had already been under firm state control for a relatively long period – namely, the coastal regions where the state had established its extractive monopoly with the violent suppression of the "Arab Revolt" (Bührer 2011; Bückendorf 1997; Pesek 2005). Nonstate elites had either been executed or integrated into the extractive system as state-sponsored intermediaries, the so-called *Akida* or *Jumbe*. For these local elites, communal plantation schemes provided new economic opportunities: the elites were allowed to keep a certain share of cotton incomes (Gwassa 1973; Bursian 1910). For the population, however, the intensification of cotton extraction brought a tremendous human and economic burden. Forced labor didn't just mean the loss of personal freedom; people also had to abandon their own agricultural activities, something which led to massive socioeconomic hardship for entire villages (Gwassa 1973).

The increased rubber extraction took place according to the logic of expansion rather than of intensification. The local rubber economy had existed prior to colonial state intervention, and in the period prior to the beginning of the rebellion it was strongest in those areas where the state was comparably weak. Here, coastal trade had created influential economic elites who owed their wealth and power to rubber extraction and trade. Around the turn of the century, however, the state amplified its efforts to transfer the economic gains of local, nonstate elites to the colonial regime. The German administration substantially expanded its extractive activities from the coast into the rubber-growing hinterland of the southern districts. The expansion of German rubber plantations, accompanied by state-sponsored economic regulations and price controls, constituted an outright attack on local economic networks and eroded "the ability of chiefs to accumulate wealth and attract followers" (Sunseri 2009; Larson 2010; Becker 2004).

This expansion process had a smaller effect on the population at large. Forced labor played a negligible role in the colonial rubber economy. Rubber can easily be collected "by anyone with a knife in the forest" (Becker 2004; Krajewski 2005). Until 1910 the exploitation of rubber was not as centrally organized and not based on large plantation schemes (Bald 1970; Koponen 1995). Local intermediaries had previously tried to coerce local rubber collectors by means of advances on future rubber collection, but they could not effectively force them to work. This did not change with the expansion of German rubber extraction. Quite to the contrary, German regulations reduced big traders' leverage, and price controls created at least a minimum level of transparency for rubber collectors and petty traders (Larson 2010; Krajewski 2005; Becker 2004).

Certainly, cotton extraction was not only intensified but also expanded into new areas to some degree. Similarly, some rubber-growing areas had already been under effective state control prior to the rebellion. Nonetheless, the historical evidence suggests substantial quali-

tative differences in terms of the main extractive strategies for each product and the associated impacts on the population and local "big men," as outlined above. Consequently, analyzing these goods from a comparative perspective allows for insights into how these differences affected the connection between extraction and violence. I use information on the major rubber and cotton production sites provided in an economic map published in 1906.

4.3 District-Level Comparisons

I begin with simple district-level visual inspections and statistical tests. These analyses are not meant to provide any causal claims. Their objective is to investigate whether the strong north–south divide of the rebellion coincides with patterns of extraction and variations in extractive goods and strategies. Such district-level associations allow for an initial assessment of the plausibility of the hypotheses and provide a helpful frame of reference for interpreting the more systematic and lower-scale quantitative analysis presented below.

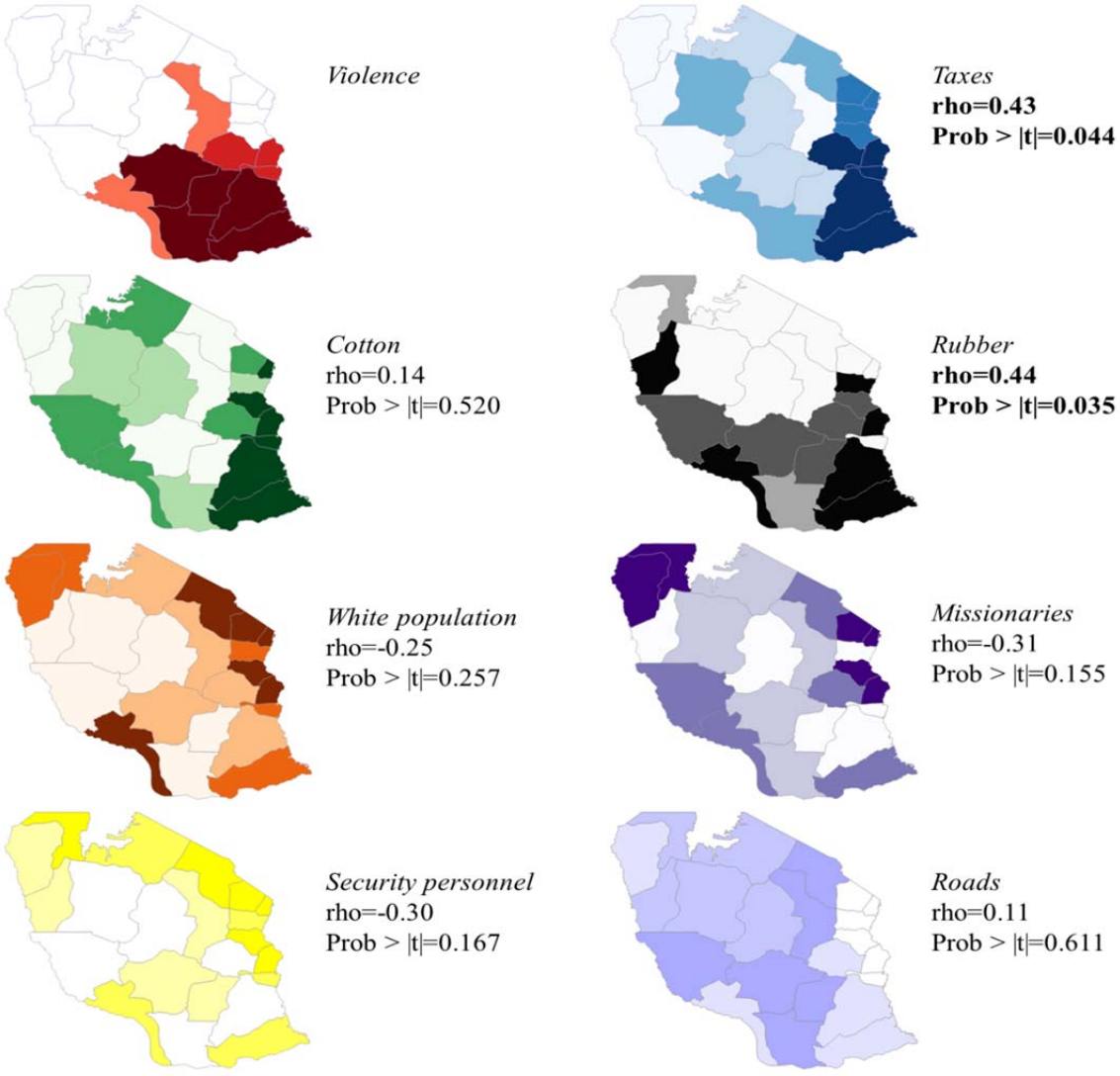
Figure 3 illustrates the geographical distribution of some features of the colonial state. In each figure, the different shades represent quartiles that divide the districts into four equal groups according to the values of the respective indicators. The darker shades represent higher values. Each map is assigned the coefficient of the respective indicator's correlation with the number of violent events as well as the measure of statistical significance for this association (Spearman Rank Correlation Coefficients).

I use three different proxies from the sources described above – namely, (a) the total value of taxes collected per district in the year prior to the uprising, (b) the number of rubber sites divided by district size, and (c) the number of cotton plantations divided by district size. A look at the spatial distribution of the first two variables indicates that tax incomes were particularly high and rubber forests particularly frequent in the southern districts where violence erupted in 1905. The number of cotton plantations, on the other hand, is only very weakly correlated with violence. If we look at similar plots for a number of other characteristics of the colonial state – such as the number of missionaries, the number of security personnel, the accessibility in terms of road length, or the overall number of Germans (all divided by district size) – we see that none display a comparable correlation with the spatial variation of violence during the uprising.

One has to be cautious in drawing conclusions from these rather crude district-level comparisons. Nonetheless, this initial exploratory analysis of district-level data seems to lend some support to the proposition that economic narratives were behind the uprising, as mentioned above. Most importantly, the variation between the findings for cotton and for rubber lends support to the argument that the specificities of rubber extraction made it a more conflictual process than cotton extraction. Interestingly, looking at the connection between extraction and crime rather than extraction and collective violence paints a different picture. There is a significant link between cotton extraction and the number of material crimes (involving evasion of taxes and of forced labor) reported in German colonial reports, which in-

dicates that there was substantial economic pressure on the local population in cotton-growing areas. However, the associated grievances seemingly did not translate into organized violent resistance during the rebellion. On the other hand, while the data indicates a rather strong connection between rubber extraction and collective violence, there are no similar correlations between rubber extraction and material crimes. It could be argued that this is because the expansion of rubber extraction did not impact the broader population in the same way as the intensification of cotton production did.

Figure 3: District-Level Comparisons



Source: Author's compilation.

4.4 Cross-Sectional Analysis

Districts were the only meaningful and formalized administrative units of the German colonial state. As they were not subdivided into more numerous second-tier units that would allow for statistical analyses on a more disaggregated level, I have created an artificial grid

comprising 450 50 km x 50 km cells covering the colony's territory. The size of the cells mirrors the objective of providing a sufficient number of cases for meaningful statistical analysis while taking into account the potential imprecisions resulting from colonial maps. The horizontal and vertical outer boundaries of the grid-net have been defined randomly.

For the main models, I have created a binary "occurrence of violence" variable that has the value "1" if at least one violent event took place within a cell's boundaries during the Maji Maji rebellion of 1905–1907 (see alternative specifications in the section on robustness checks). The indicators for levels of extraction correspond to the district-level comparisons: I use the number of cotton plantations and rubber forests per grid cell. Colonial statistical reports provide information on the absolute value of taxes collected by each of the German stations. Tax collection was mainly confined to areas easy to reach from German stations (Pesek 2005). Consequently, the levels of taxation varied substantially according to distance from stations, rather than population size. To proxy for tax burden per grid cell, I use the tax revenue of the nearest German station responsible for the respective area according to the administrative setup of the territory (meaning that the cells' centroids and the German station have to be within the same district), weighted by the geographical distance from the grid cell's centroid to the station. I have log-transformed the quotient to account for excessive variation in distances and increase normality of the left-skewed variable.

The main argument against using geographical distances to proxy logistical accessibility is that actual travel time may differ from the distances depending on terrain and transportation infrastructure. To check the validity of this critique I have georeferenced maps from the *Military Orientation Book* and measured the length of straight lines between military stations and 100 locations with a minimum distance of 25 kilometers. I have compared these distances with travel times as indicated on the maps. The correlation is 0.95, which indicates that the distances correspond to travel time for the scaling and levels of aggregation used in this study.

I also consider a number of control variables in the statistical analysis. The first is the German population per grid cell. In addition, I consider the approximate locations of previous phases of violence as provided by Nigmann. I use a dummy variable that has the value "1" for all grid cells that had previously seen violent clashes with the colonial state. Roads may have eased the deployment of troops and increased military action in areas connected to road networks (Herbst 2000). The respective control variable is the length of all roads within the grid cells. The colonial state was not the only alien actor in German East Africa. Missions ran stations and schools across the colony. For each grid cell I consider the number of baptisms in the nearest missionary station, weighted by the distance to the station (log-transformed). It may be possible that the likelihood of violence is affected by the duration of continuous state presence in a specific region. I use information on the date of the establishment of every German station that existed in 1905 to calculate the number of years it had been present when the rebellion began. Rebellion against the state is likely only when the state is not capable of effectively deterring violent uprisings (Cohen, Brown, and Organski 1981). I

consider the total number of security personnel per nearest station, weighted by the distance and log-transformed.

Table 1 presents the results of simple logistic regressions with standard errors clustered by district to account for serial correlation and heteroscedasticity. The results indicate a highly significant positive correlation between tax extraction and the likelihood of violence. There is only a weak correlation between cotton extraction and violence. This association wanes in the full model, which considers all three variables of extraction. Models 3 and 4 indicate a significant correlation between rubber extraction and violence.

Table 1: Logit Models (without Fixed Effects) – Extraction and Violence

	(1)	(2)	(3)	(4)
German Pop	-0.025*	-0.015	-0.004	-0.021*
	(0.072)	(0.219)	(0.649)	(0.094)
Station/Years	-0.055	-0.033	-0.028	-0.065
	(0.417)	(0.600)	(0.666)	(0.316)
Prev Violence	-0.223	0.059	0.169	-0.226
	(0.679)	(0.912)	(0.747)	(0.676)
Road Length	1.044***	1.687***	1.880***	1.025***
	(0.009)	(0.000)	(0.000)	(0.007)
Military/Dist (ln)	-0.241	-0.252	-0.186	-0.208
	(0.332)	(0.508)	(0.624)	(0.433)
Mission/Dist (ln)	-0.310	-0.328	-0.415	-0.396*
	(0.187)	(0.146)	(0.137)	(0.055)
Taxation/Dist (ln)	0.910***			0.867***
	(0.000)			(0.000)
Cotton		0.406*		0.127
		(0.059)		(0.492)
Rubber			0.844***	0.831***
			(0.000)	(0.000)
Constant	-9.734***	-0.650	-1.213	-9.558***
	(0.000)	(0.614)	(0.355)	(0.000)
Observations	437	437	437	437
AIC	292.268	342.294	327.057	278.765
BIC	324.908	374.933	359.696	319.564
ll	-138.134	-163.147	-155.528	-129.382

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table 2 displays the results of conditional fixed-effects logistic regression, controlling for all time-invariant factors across the colony's 22 districts. The findings mirror those outlined above. The indicators for taxation and rubber extraction are significantly correlated with the outcome variable, while there is no indication of a significant role of cotton extraction in this more conservative model specification.

Table 2: Logit Models (with Fixed Effects) – Extraction and Violence

	(1)	(2)	(3)	(4)
German Pop	-0.007	-0.005	-0.004	-0.005
	(0.396)	(0.460)	(0.546)	(0.465)
Station/Years	0.167**	0.151**	0.153**	0.166**
	(0.034)	(0.040)	(0.036)	(0.048)
Prev Violence	0.087	0.117	0.142	0.029
	(0.846)	(0.794)	(0.757)	(0.952)
Road Length	0.839	0.921	0.950	0.819
	(0.224)	(0.174)	(0.166)	(0.252)
Military/Dist (ln)	-0.206	0.200	0.219	-0.282
	(0.595)	(0.440)	(0.406)	(0.503)
Mission/Dist (ln)	-0.201	-0.253	-0.195	-0.330
	(0.551)	(0.463)	(0.566)	(0.350)
Taxation/Dist (ln)	0.787*			0.821*
	(0.065)			(0.075)
Cotton		0.414		0.283
		(0.130)		(0.288)
Rubber			0.593**	0.586**
			(0.011)	(0.013)
Observations	183	183	183	183
AIC	165.157	166.120	161.977	160.568
BIC	187.623	188.586	184.443	189.454
ll	-75.579	-76.060	-73.988	-71.284

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Due to the nonlinear nature of the model specifications, we cannot judge the substantive significance of the associations. I therefore estimate the predicted probabilities of violence occurrence as a function of extraction. Holding all other variables at their respective means and moving from the minimum to the maximum level of tax extraction increases the likelihood of violence from 0 to more than 70 percent. The simulated effect of rubber extraction is comparable, with a difference of approximately 55 percent in the likelihood of violence between the minimum and the maximum level of rubber extraction.

These results lend support to the paper's main hypothesis. Even more so as they clearly mirror the findings from the initial district comparisons – not only in terms of the general correlation between the indicators for extraction and violence but also with respect to the divergent findings for rubber on the one hand and cotton extraction on the other. To further substantiate the plausibility of the arguments related to the specificities of rubber extraction, I estimate some auxiliary models (for more detailed results, please see the appendix).

Political and economic power in rubber-producing regions was highly dependent on having control over the main trading routes (Becker 2004). Consequently, "big men" resided close to the traditional caravan routes that had already played a major role in the economy

prior to the colonial period (Larson 2010). If the argument about the effects of expanded rubber extraction holds, we would expect violence to be particularly likely in rubber-growing areas close to these routes. I have extracted information on their locations from a map published in 1892 and interacted the distance to the nearest trading route with the number of rubber forests per grid cell. As expected, the interaction term is negative and statistically significant in models with and without district-level fixed effects. There is no similar effect for cotton extraction.

German extractive expansion into the rubber-growing areas threatened local economic networks. Local strongmen risked losing their grip on the lucrative rubber trade. Consequently, violence should have been more likely in rubber forests close to the location of these plantations. I have extracted information on the location and size (in terms of rubber trees) of 25 German rubber plantations and interacted the log-transformed quotient of the number of rubber trees and the distance to the respective grid cell's centroid. The interaction term shows the expected positive sign and is statistically significant below the 10 percent level in the basic model without fixed effects.

If the expansion of rubber extraction actually played a particularly important role in motivating southern strongmen into violence, events requiring particular organizational resources should have been more frequent in rubber-producing areas. I extract information from the violent-event data set about events that reportedly involved more than 1,000 rebel fighters or that constituted an organized attack on German missionary or military stations. The latter displayed patterns of military strategy that required centralized and strategic planning (Gwassa 1973; Bührer 2011). I have reestimated the main models with this alternative outcome variable and find that the occurrence of large-scale events was more likely in rubber-growing areas. In the full model with fixed effects, only rubber is associated with the occurrence of these events at conventional levels of statistical significance.

Finally, I have investigated the interactions of both agricultural goods and the level of tax extraction. According to the theoretical arguments presented above, the effects of taxation depend on whether it is based on intensification or on expansion. Whereas it is not possible to identify strategies of taxation across the entire colony, qualitative evidence suggests that strategies of taxation correlated with strategies of extraction of agricultural goods. The colonial administration intensified taxation in cotton-growing areas – mainly because it was a means of forcing people into plantation work (Gwassa 1973; Koponen 1995). Whereas taxation had been comparably low in the southern hinterlands, taxation drives accompanied extractive expansion into rubber-growing areas prior to the rebellion (Wright 1995; Larson 2010). Consequently, we should expect a positive interaction effect for taxation and rubber, while we should not find any similar effects for cotton. This is what the estimations indicate.

5 Robustness Checks

Before discussing these findings in light of previous district-level findings and additional qualitative evidence, I briefly summarize the main findings of additional robustness checks intended to test the sensitivity of the main correlations presented above. Detailed tables of all estimations can be found in the appendix.

The main models presented above rely on a binary outcome variable and logit models. Alternatively, I have estimated a rare events logit model; an OLS model on the log-transformed count variable with and without fixed effects; and a negative binomial regression on the count variable, again, with and without fixed effects. To account for potential spatial clustering below the district level, I have estimated additional models that control for a spatial lag of the outcome variable and the distance of each grid cell's centroid to the location of the first violent event. All the findings correspond to those of the main models.

Next, I have tested alternative ways of operationalizing the outcome and the main explanatory variables. Nigmann provides information on the location of major clashes involving German troops. I have geolocated these events for the period of the Maji Maji rebellion, creating a measure of violence that is independent from the newspaper reports used previously. The alternative measurement of rubber and cotton extraction relies on information on the approximate location of cotton and wild-rubber-growing areas, which is extracted from two economic maps (1906 for cotton and 1920 for rubber). Unlike the maps used previously, these do not represent agricultural resources as clearly located points but rather as crude polygons. I have created binary variables that have the value "1" if grid cells are located in these regions. The results are in line with the main models but substantially weaker, which may be due to lower levels of variation in the alternative measurements.

Next, I have controlled for the features of local ethnic groups, relying on information on precolonial ethnic organization from Murdock (1967), Gennaioli and Rainer (2007), and Nunn (2008). Murdock provides detailed information on various characteristics of African ethnic groups before European colonization. Nunn (2008) georeferences this information and provides an index of political centralization, measured as the number of jurisdictional hierarchies beyond the local level, originally constructed by Gennaioli and Rainer (2007). I have first controlled for the index of political centralization. Next, I have estimated models with actual ethnic group fixed effects, thereby controlling for any time-invariant differences across these groups. Overall, the control for characteristics of ethnic groups does not substantially affect the main patterns found previously, whereas taxation proves to be sensitive to additional controls.

Potential endogeneity issues cannot be ruled out in the multivariate regressions presented above. As a final robustness check, I have estimated two-stage-least-squares (2SLS) models that exploit exogenous variation, induced by an instrumental variable (for example, Imbens and Angrist 1994).

The geographical distribution of wild rubber vines is driven by exogenous climatic and soil conditions. *Landolphia Kirkii*, the rubber species most prevalent in the former German East Africa, grows best in hot and humid areas with low elevation and sandy soils (Sethuraj and Mathew 1992; Schnee 1920; Ehrhardt 1903). I have created a simple additive index using data on elevation from the Shuttle Radar Topography Mission (SRTM) 1-km-resolution data (elevation below 500 meters), information on climatic conditions from a study on rainfall and temperature in German East Africa (Marner 1940; "very hot and humid" regions), and data on soil properties from the European Soil Portal for Africa (minimum 50 percent sand in soil). Given these arbitrary thresholds as well as the additive character and composition of the index, it is unlikely that the index affects the risk of violence through causal channels other than the presence of rubber vines. Most notably, neither individual components nor the index itself are correlated with German settlement patterns (r=0.052 for the total index). The first-stage regression presented in the appendix shows that the instrument is a statistically significant predictor of the presence of rubber. The Kleibergen-Paap Wald F statistics are above the critical values of relative bias suggested by Stock and Yogo (2005). Second-stage estimations confirm the previous findings on the positive association between rubber extraction and violence.[3]

6 Discussion

Overall, the investigations support the paper's general hypothesis that extraction played a pivotal role in the Maji Maji rebellion – most notably when the expansion of extractive activities threatened the economic and political interests of local elites. This section discusses these findings against the backdrop of previous historical and qualitative studies.

German attempts to increase cotton production and trade were mainly based on an intensification strategy, in that the state worked to augment cotton output through communal cotton schemes in areas under firm state control (Koponen 1995; Bald 1970; Sunseri 1997). Cotton extraction can be considered the utmost form of extraction in terms of its direct negative impact on the local population. Its intensification created substantial economic hardships for the population. There is ample qualitative evidence that the resulting grievances motivated violence against the colonial state. In many cases attacks were directed against local state intermediaries involved in cotton extraction (Beez 2005; Iliffe 1967; Iliffe 1969). Interviews with eyewitnesses underscore that the intensification of cotton extraction created grievances that nurtured the rebellion (Gwassa 1973). However, as has been noted elsewhere, brutal extrac-

3 As I have used only one instrument, it has been impossible to test for exogeneity using Hansen J statistics. I have therefore also run an additional 2SLS model, including a dummy for the presence of rivers, as wild vines supposedly grow near running waters (National Research Council 2008). Hansen J statistics indicate that we cannot reject the null hypothesis of exogenous instruments. The second-stage model confirms the correlations found in previous models.

tion was a feature of the colonial state across most areas of the colony, not just in the cotton-growing districts (Becker 2004; Tambila 1981). Additionally, while there was substantial overlap between cotton production sites and violence, most of the violence took place in the colony's hinterland, far away from the communal cotton schemes. Thus, the grievances associated with the increased economic and social burden alone cannot persuasively explain the patterns of violence. We get a clearer picture of the background of the rebellion if we also consider the expansion of extraction and its effects on local elites.

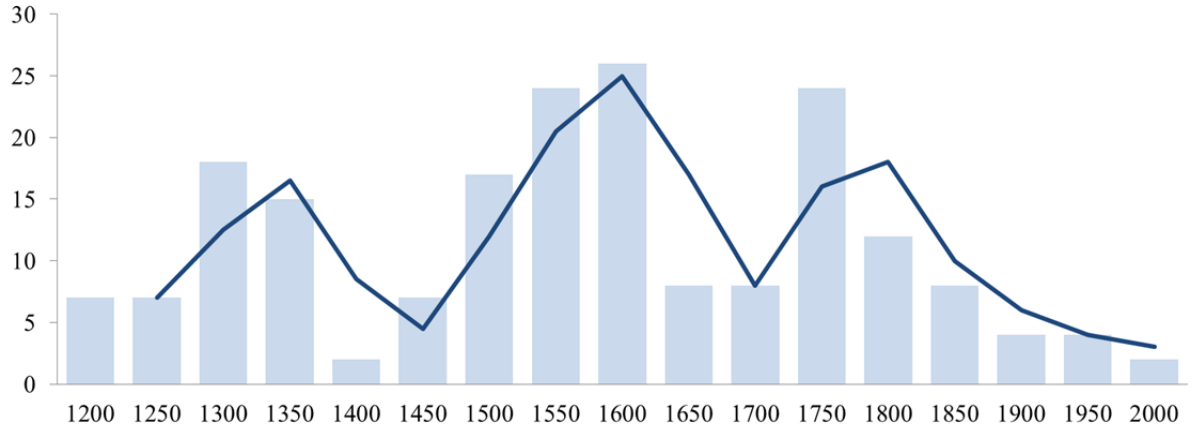
The rubber trade had evolved into a very lucrative economy in the southern districts of the colony around the turn of the century, when Germany's interests and actual presence were still rudimentary (Koponen 1995; Bald 1970). Local elites became rich through the rubber trade, tributes from caravans traders, the employment of rubber collectors, or their own rubber plantations (Bald 1970; Monson 1993; Wright 1985). However, with time the "rubber boom" attracted state interest and led to the substantive expansion of extractive activities into rubber-growing areas. The period preceding the rebellion was marked by substantial pressure on local elites. The number of foreign rubber traders increased from approximately 200 in 1902 to up to 700 in 1905 (Wright 1985), and tax agents followed closely (Wright 1995; Larson 2010). The colonial state worked to increase its grip on the local economy: the influence of German trading companies increased, German rubber plantations emerged, and the state imposed economic regulations and price controls (Larson 2010; Becker 2004; Krajewski 2005; Wright 1995). It aimed to eliminate or control local economic elites' involvement in the trade to the benefit of German traders and planters (Monson 1993). The effectiveness of these interventions is underscored by the fact that by 1910 the original wild-rubber trade had effectively been eliminated (Sunseri 2009). It comes as no surprise that these developments created resentment among local "big men" able to draw hundreds or thousands of people into violent conflict (Larson 2010; Becker 2004; Krajewski 2005; Wright 1995). The qualitative evidence underscores the fact that such elites were crucial in mobilizing fighters, coordinating rebel troops, and planning large-scale attacks (Gwassa 1973).

7 Conclusion

This paper has presented an initial quantitative analysis of the connection between extraction and violent anticolonial resistance. The empirical results indicate that extraction had the greatest impact on violence when the expansion of extractive activities threatened the interests of local elites. Overall, the quantitative and qualitative findings lend support to the argument that distinct strategies of extraction produce distinct outcomes in terms of violent antistate rebellion in the early phases of state-building. Certainly, the study is limited in that it focuses on one specific instance of antistate violence only. Replications in other contexts are needed to corroborate the results. Nonetheless, the findings from this single case study may have important theoretical implications for two research strands.

First, they may inform our understanding of long-term state-building processes. As the state consolidates territorial control, opportunities for the further expansion of extractive authority decrease while the process of extractive monopolization provides additional prospects for the intensification of extraction. If the former is substantially more likely to lead to violence than the latter, the dynamics of the "extraction–coercion" cycle may change over time. Most notably, we would expect increasingly strong associations between extraction and violence, up to a tipping point. From here on the intensification of extraction promises larger economic gains than the expansion of extraction, which means weaker associations between extraction and violence. From this point on the "extraction–coercion" cycle should slow down, reducing the violence and state-building effects of further extraction.

Figure 4: Number of Major Tax Rebellions in Europe according to Burg



Source: Author's compilation based on Burg (2004).

I do not dispose of the data needed to investigate such potential long-term implications. Moreover, the extraction–coercion cycle is doubtless strongly affected by simultaneous economic, social, and political developments. It is nonetheless interesting to look at longer-term changes in the absolute numbers of a specific type of extraction-related conflict. Burg lists hundreds of instances of protest and rebellion related to taxation (Burg 2004). The list is certainly not exhaustive. Moreover, we don't know if temporal trends signify specific developments in tax-related violence or mirror more general conflict trends. Still, Figure 4 indicates that it may be worthwhile to investigate these arguments further. We see that the development of absolute numbers of tax rebellions in Europe corresponds to what one would expect from cyclical developments, with phases of significant tax-related violence followed by phases of limited violence. Moreover, as suggested above, these developments seem to flatten following a peak in the first half of the sixteenth century. Further analysis of single cases as well as long-term qualitative and quantitative analysis may provide additional evidence that confirms or challenges the hypotheses presented in this paper.

Second, insights from colonial times may contribute to the development of hypotheses on the effects of natural resource extraction under contemporary conditions of weak statehood.

Numerous previous studies have emphasized that state institutions play a crucial role when it comes to associations between natural resource extraction and intrastate violence. They show that the capacity, the quality, and the democratic nature of institutions matter (Basedau and Richter 2014; Snyder and Bhavnani 2005; Besley and Persson 2011). The findings presented in this paper indicate that another factor may also be relevant: trends of state expansion into resource-extraction areas and the associated effects on the economic and political interests of local elites. From such a perspective, abundance and high levels of extraction per se may not increase the risk of violence if the respective regions are not targeted by the state for the expansion of extraction or if they have already been brought under effective state control. Geospatial time-series analyses could investigate whether the risk of violence increases in periods of increasing state capacity in resource-rich areas.

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Extraction and Violent Resistance in the Early Phases of State-Building: Quantitative Evidence from the Maji Maji Rebellion, 1905–1907

Appendix

Table A1: Summary Statistics

	mean	min	max	sd	count
Violence	0.142	0.000	1.000	0.350	450
Taxation/Dist (ln)	10.141	6.457	14.211	1.519	441
Cotton	0.227	0.000	7.000	0.827	450
Rubber	0.198	0.000	4.000	0.625	450
German Pop	3.800	0.000	584.000	29.258	450
Station/Years	10.848	2.000	17.000	4.112	441
Prev Violence	0.433	0.000	1.000	0.496	450
Road Length	0.223	0.000	1.160	0.290	450
Military/Dist (ln)	4.511	0.815	8.734	0.992	441
Mission/Dist (ln)	0.925	0.000	6.064	1.077	446

Table A2: Logit Models – Interaction of Caravan Routes with Rubber

	(1)	(2)	(3)	(4)
	NoFE	FE	NoFE	FE
German Pop	-0.006	-0.004	-0.005	-0.003
	(0.532)	(0.547)	(0.590)	(0.654)
Station/Years	-0.052	0.137*	-0.061	0.140*
	(0.415)	(0.063)	(0.376)	(0.061)
Prev Violence	0.097	0.159	-0.028	-0.037
	(0.853)	(0.735)	(0.958)	(0.940)
Road Length	1.732***	1.044	1.818***	1.058
	(0.000)	(0.138)	(0.000)	(0.140)
Military/Dist (ln)	-0.177	0.162	-0.166	0.222
	(0.632)	(0.547)	(0.650)	(0.422)
Mission/Dist (ln)	-0.457*	-0.251	-0.438	-0.321
	(0.085)	(0.468)	(0.105)	(0.363)
Caravan Dist.	-0.015*	-0.014*	-0.011	-0.006
	(0.052)	(0.094)	(0.107)	(0.457)
Rubber	0.836***	0.608***	1.617***	1.604***
	(0.000)	(0.010)	(0.000)	(0.003)
Caravan Dist. # Rubber			-0.024**	-0.030**
			(0.014)	(0.028)
Constant	-0.435		-0.549	
	(0.738)		(0.667)	
Observations	437	183	437	183
AIC	320.108	160.907	314.908	157.360
BIC	356.828	186.583	355.707	186.246
ll	-151.054	-72.453	-147.454	-69.680

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A3: Logit Models – Interaction of Rubber Plantations with Rubber Forests

	(1)	(2)	(3)	(4)
	NoFE	FE	NoFE	FE
German Pop	-0.005	-0.003	-0.004	-0.003
	(0.565)	(0.626)	(0.619)	(0.613)
Station/Years	-0.030	0.171**	-0.026	0.177**
	(0.636)	(0.019)	(0.696)	(0.017)
Prev Violence	0.127	0.270	0.095	0.238
	(0.799)	(0.567)	(0.851)	(0.618)
Road Length	1.864***	0.892	1.790***	0.861
	(0.000)	(0.205)	(0.000)	(0.224)
Military/Dist (ln)	-0.161	0.100	-0.149	0.107
	(0.682)	(0.716)	(0.710)	(0.701)
Mission/Dist (ln)	-0.405	-0.222	-0.390	-0.247
	(0.127)	(0.517)	(0.132)	(0.476)
Plantation/Dist (ln)	0.065	0.207*	0.018	0.187
	(0.603)	(0.085)	(0.885)	(0.128)
Rubber	0.841***	0.620***	0.638***	0.495
	(0.000)	(0.009)	(0.005)	(0.118)
Plantation/Dist (ln) # Rubber			0.112*	0.046
			(0.095)	(0.570)
Constant	-1.421		-1.396	
	(0.360)		(0.374)	
Observations	437	183	437	183
AIC	327.754	160.638	327.454	162.303
BIC	364.473	186.314	368.254	191.188
ll	-154.877	-72.319	-153.727	-72.151

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A4: Logit Models – Only Large-Scale Violent Events

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	NoFE	FE	NoFE	FE	NoFE	FE	NoFE	FE
German Pop	-0.033	-0.009	-0.018	-0.007	-0.005	-0.006	-0.025	-0.007
	(0.162)	(0.533)	(0.407)	(0.536)	(0.587)	(0.564)	(0.258)	(0.522)
Station/Years	-0.008	0.123*	-0.008	0.117	0.003	0.133*	-0.017	0.129*
	(0.876)	(0.092)	(0.908)	(0.110)	(0.963)	(0.080)	(0.748)	(0.091)
Prev Violence	-0.362	-0.049	-0.011	-0.133	0.163	-0.114	-0.361	-0.113
	(0.523)	(0.938)	(0.985)	(0.835)	(0.776)	(0.865)	(0.547)	(0.867)
Road Length	1.277*	1.038	1.688***	0.888	2.149***	1.176	1.258*	0.938
	(0.059)	(0.238)	(0.005)	(0.350)	(0.000)	(0.195)	(0.082)	(0.340)
Military/Dist (ln)	-0.005	0.132	0.051	0.375	0.159	0.460	0.057	0.197
	(0.978)	(0.721)	(0.908)	(0.237)	(0.705)	(0.155)	(0.812)	(0.608)
Mission/Dist (ln)	0.115	0.683	0.015	0.774*	-0.073	0.700	0.065	0.505
	(0.671)	(0.123)	(0.943)	(0.084)	(0.773)	(0.116)	(0.783)	(0.274)
Taxation/Dist (ln)	1.042***	0.635					0.943***	0.641
	(0.000)	(0.192)					(0.000)	(0.216)
Cotton			0.405**	0.130			0.149	0.098
			(0.013)	(0.549)			(0.397)	(0.647)
Rubber					0.846***	0.565**	0.754***	0.549**
					(0.000)	(0.029)	(0.000)	(0.034)
Constant	-14.496***		-3.695**		-4.679***		-13.944***	
	(0.000)		(0.018)		(0.003)		(0.000)	
Observations	437	162	437	162	437	162	437	162
AIC	155.614	96.813	180.260	98.074	172.216	93.865	149.835	96.195
BIC	188.254	118.426	212.899	119.687	204.856	115.478	190.634	123.983
ll	-69.807	-41.406	-82.130	-42.037	-78.108	-39.932	-64.917	-39.097

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A5: Logit Models – Interaction Effects of Taxation and Rubber/Cotton

	(1)	(2)	(3)	(4)
	NoFE	FE	NoFE	FE
German Pop	-0.017	-0.005	-0.028*	-0.006
	(0.142)	(0.519)	(0.065)	(0.450)
Station/Years	-0.068	0.182**	-0.058	0.164**
	(0.316)	(0.042)	(0.381)	(0.040)
Prev Violence	-0.257	-0.042	-0.245	0.051
	(0.639)	(0.930)	(0.651)	(0.910)
Road Length	1.112***	0.848	0.968***	0.888
	(0.007)	(0.235)	(0.007)	(0.209)
Military/Dist (ln)	-0.199	-0.311	-0.237	-0.234
	(0.460)	(0.494)	(0.350)	(0.554)
Mission/Dist (ln)	-0.367*	-0.400	-0.325	-0.254
	(0.080)	(0.269)	(0.173)	(0.462)
Taxation/Dist (ln)	0.803***	0.877*	0.882***	0.796*
	(0.000)	(0.070)	(0.000)	(0.071)
Rubber	-2.412	-3.814		
	(0.124)	(0.252)		
Taxation/Dist (ln) # Rubber	0.302**	0.398		
	(0.037)	(0.181)		
Cotton			0.386	3.609
			(0.786)	(0.312)
Taxation/Dist (ln) # Cotton			-0.018	-0.269
			(0.881)	(0.362)
Constant	-8.881***		-9.409***	
	(0.000)		(0.000)	
Observations	437	183	437	183
AIC	276.787	159.331	295.161	166.238
BIC	317.586	188.216	335.960	195.124
ll	-128.393	-70.666	-137.581	-74.119

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A6: Alternative Model Specifications

	(1)	(2)	(3)	(4)	(5)
	Rare Events	OLS	OLS FE	NBReg	NBReg FE
German Pop	-0.018	-0.002*	-0.003***	-0.013	-0.007**
	(0.101)	(0.067)	(0.000)	(0.339)	(0.014)
Station/Years	-0.043	-0.032	0.089**	-0.075	0.090*
	(0.437)	(0.317)	(0.030)	(0.411)	(0.092)
Prev Violence	-0.238	-0.015	0.065	0.209	0.789
	(0.586)	(0.936)	(0.672)	(0.711)	(0.292)
Road Length	0.892***	0.371	0.216	1.813***	1.065
	(0.003)	(0.116)	(0.355)	(0.001)	(0.151)
Military/Dist (ln)	-0.183	-0.111	-0.220	-0.181	-0.173
	(0.424)	(0.448)	(0.217)	(0.328)	(0.417)
Mission/Dist (ln)	-0.295	-0.060	-0.057	-0.550***	-0.329
	(0.144)	(0.294)	(0.159)	(0.000)	(0.234)
Taxation/Dist (ln)	0.693***	0.266***	0.378**	0.970***	0.600***
	(0.000)	(0.000)	(0.016)	(0.000)	(0.000)
Cotton	0.140	0.137	0.143	-0.029	0.341*
	(0.290)	(0.293)	(0.181)	(0.884)	(0.069)
Rubber	0.626***	0.370***	0.243**	0.492***	0.272***
	(0.000)	(0.004)	(0.012)	(0.005)	(0.008)
Constant	-8.156***	-3.801***	-5.733***	-10.015***	-23.099***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnalpha				1.802***	0.713*
				(0.000)	(0.060)
Observations	437	437	437	437	437
AIC	281.768	1308.234	1164.346	577.204	499.204
BIC	322.567	1349.033	1201.065	622.083	597.122
ll	-130.884	-644.117	-573.173	-277.602	-225.602

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A7: Additional Control for Spatial Lag of Outcome Variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	NoFE	FE	NoFE	FE	NoFE	FE	NoFE	FE
German Pop	-0.008	-0.006	-0.005	-0.004	-0.002	-0.003	-0.006	-0.005
	(0.331)	(0.455)	(0.476)	(0.540)	(0.568)	(0.636)	(0.264)	(0.539)
Station/Years	-0.053	0.118	-0.045	0.099	-0.045	0.103	-0.058	0.129
	(0.217)	(0.170)	(0.217)	(0.195)	(0.174)	(0.178)	(0.180)	(0.168)
Prev Violence	0.008	0.103	0.169	0.151	0.232	0.169	-0.000	0.041
	(0.986)	(0.825)	(0.701)	(0.747)	(0.582)	(0.724)	(0.999)	(0.934)
Road Length	0.941**	0.782	1.334***	0.927	1.335***	0.900	0.895**	0.759
	(0.011)	(0.283)	(0.000)	(0.191)	(0.000)	(0.214)	(0.024)	(0.312)
Military/Dist (ln)	-0.115	-0.371	-0.144	0.010	-0.108	0.025	-0.095	-0.432
	(0.622)	(0.383)	(0.596)	(0.972)	(0.677)	(0.930)	(0.693)	(0.366)
Mission/Dist (ln)	-0.158	-0.123	-0.141	-0.166	-0.180	-0.110	-0.224	-0.263
	(0.337)	(0.717)	(0.313)	(0.631)	(0.283)	(0.746)	(0.140)	(0.461)
Neigh Violence	0.165***	0.068**	0.194***	0.068**	0.188***	0.068**	0.157***	0.062**
	(0.000)	(0.012)	(0.000)	(0.012)	(0.000)	(0.013)	(0.000)	(0.027)
Taxation/Dist (ln)	0.485***	0.752					0.447**	0.791
	(0.001)	(0.104)					(0.014)	(0.119)
Cotton			0.259	0.369			0.060	0.239
			(0.326)	(0.190)			(0.832)	(0.383)
Rubber					0.642***	0.564**	0.633***	0.551**
					(0.002)	(0.018)	(0.001)	(0.022)
Constant	-7.135***		-2.377***		-2.673***		-6.897***	
	(0.000)		(0.009)		(0.001)		(0.000)	
Observations	437	183	437	183	437	183	437	183
AIC	230.777	160.379	238.576	161.352	231.495	157.335	227.292	157.367
BIC	267.497	186.055	275.295	187.028	268.215	183.011	272.172	189.462
ll	106.389	-72.190	110.288	-72.676	106.748	-70.668	102.646	-68.683

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A8: Alternative Measurement of Outcome Variable – Data from Nigmann, 1911

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	NoFE	FE	NoFE	FE	NoFE	FE	NoFE	FE
German Pop	0.006**	0.019	0.009***	0.035	0.010***	0.036	0.006**	0.025
	(0.044)	(0.558)	(0.006)	(0.285)	(0.003)	(0.277)	(0.034)	(0.453)
Station/Years	-0.107	0.062	-0.108	0.052	-0.102	0.057	-0.109	0.052
	(0.111)	(0.318)	(0.152)	(0.381)	(0.161)	(0.329)	(0.102)	(0.409)
Prev Violence	-0.274	-0.484	-0.067	-0.572	0.009	-0.483	-0.240	-0.522
	(0.631)	(0.374)	(0.904)	(0.297)	(0.987)	(0.371)	(0.686)	(0.354)
Road Length	1.192**	1.143	1.835***	1.109	1.996***	1.267*	1.147**	0.896
	(0.017)	(0.130)	(0.000)	(0.159)	(0.000)	(0.095)	(0.023)	(0.266)
Military/Dist (ln)	-0.279	-0.387	-0.310	-0.050	-0.246	-0.006	-0.250	-0.400
	(0.421)	(0.252)	(0.525)	(0.856)	(0.613)	(0.983)	(0.501)	(0.241)
Mission/Dist (ln)	0.017	0.054	-0.041	0.174	-0.083	0.193	-0.001	-0.019
	(0.916)	(0.880)	(0.813)	(0.604)	(0.660)	(0.565)	(0.995)	(0.958)
Taxation/Dist (ln)	0.619***	0.953**					0.579***	0.947**
	(0.000)	(0.043)					(0.000)	(0.050)
Cotton			0.256**	0.241			0.075	0.229
			(0.030)	(0.246)			(0.540)	(0.272)
Rubber					0.461**	0.230	0.371**	0.208
					(0.041)	(0.377)	(0.042)	(0.460)
Constant	-6.975***		-0.612		-1.046		-6.783***	
	(0.000)		(0.643)		(0.465)		(0.000)	
Observations	437	199	437	199	437	199	437	199
AIC	217.053	127.816	234.695	130.494	233.072	131.192	218.641	129.957
BIC	249.692	150.869	267.335	153.547	265.711	154.246	259.440	159.596
ll	-100.526	-56.908	-109.348	-58.247	-108.536	-58.596	-99.320	-55.978

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A9: Alternative Measurement of Explanatory Variables – Data from Economic Maps, 1906/1920

	(1)	(2)	(3)	(4)	(5)	(6)
	NoFE	FE	NoFE	FE	NoFE	FE
German Pop	-0.041*	-0.013	-0.005	-0.005	-0.077**	-0.016
	(0.094)	(0.799)	(0.402)	(0.447)	(0.033)	(0.868)
Station/Years	-0.055	0.015	0.008	0.157**	-0.037	0.074
	(0.467)	(0.906)	(0.898)	(0.030)	(0.584)	(0.712)
Prev Violence	-0.068	-0.118	0.039	0.034	-1.104*	-0.146
	(0.903)	(0.897)	(0.941)	(0.941)	(0.061)	(0.875)
Road Length	0.434	-2.066	1.681***	0.774	-1.206*	-2.108
	(0.487)	(0.187)	(0.000)	(0.259)	(0.057)	(0.194)
Military/Dist (ln)	0.409	0.383	-0.183	0.232	0.303	0.006
	(0.434)	(0.503)	(0.551)	(0.368)	(0.377)	(0.996)
Mission/Dist (ln)	-0.417	0.218	-0.488**	-0.303	-0.280	0.330
	(0.141)	(0.663)	(0.022)	(0.392)	(0.549)	(0.567)
Cotton (alternative)	1.297	16.699			1.217*	16.542
	(0.101)	(0.994)			(0.077)	(0.994)
Rubber (alternative)			1.709***	0.787	0.307	-0.341
			(0.002)	(0.120)	(0.611)	(0.697)
Taxation/Dist (ln)					1.585***	0.497
					(0.000)	(0.674)
Constant	-3.352*		-1.585		-20.295***	
	(0.055)		(0.208)		(0.000)	
Observations	105	41	437	183	105	41
AIC	127.212	47.071	323.831	166.435	100.565	50.830
BIC	148.443	59.066	356.471	188.901	127.105	66.252
ll	-55.606	-16.536	-153.916	-76.217	-40.283	-16.415

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A10: Extended Models – Additional Control Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	NoFE	FE	NoFE	FE	NoFE	FE	NoFE	FE
German Pop	-0.039*	-0.009	-0.035**	-0.009	-0.022**	-0.007	-0.032*	-0.007
	(0.074)	(0.350)	(0.031)	(0.364)	(0.035)	(0.401)	(0.061)	(0.413)
Station/Years	-0.083	1.539	-0.148***	0.446	-0.147**	0.387	-0.095	1.493
	(0.190)	(0.995)	(0.006)	(0.407)	(0.011)	(0.291)	(0.109)	(0.993)
Prev Violence	-0.215	-0.220	-0.026	-0.206	0.052	-0.267	-0.211	-0.301
	(0.673)	(0.679)	(0.961)	(0.695)	(0.923)	(0.619)	(0.689)	(0.580)
Road Length	0.800*	1.274	1.062**	1.277	1.264**	1.465*	0.806*	1.418
	(0.095)	(0.134)	(0.034)	(0.129)	(0.013)	(0.094)	(0.089)	(0.104)
Military/Dist (ln)	0.323	-0.403	0.733***	0.905**	0.743***	0.889**	0.326	-0.604
	(0.201)	(0.999)	(0.001)	(0.046)	(0.000)	(0.049)	(0.179)	(0.997)
Mission/Dist (ln)	-0.585	-0.364	-0.547*	-0.434	-0.564**	-0.431	-0.668**	-0.418
	(0.124)	(0.397)	(0.060)	(0.309)	(0.042)	(0.297)	(0.048)	(0.336)
Akida System	0.248	0.284	2.006***	0.313	1.945***	0.366	-0.015	0.386
	(0.754)	(0.746)	(0.005)	(0.721)	(0.004)	(0.680)	(0.985)	(0.665)
Askari - Ethnic	-0.014***	-0.032	-0.011**	-0.032	-0.011**	-0.038	-0.015***	-0.036
	(0.000)	(0.169)	(0.037)	(0.159)	(0.022)	(0.106)	(0.000)	(0.131)
Ethnic Size (ln)	0.318*	1.196**	0.020	1.193**	0.055	1.341**	0.341**	1.259**
	(0.055)	(0.029)	(0.900)	(0.026)	(0.745)	(0.017)	(0.037)	(0.029)
Taxation/Dist (ln)	0.977***	1.370					0.931***	1.461
	(0.001)	(0.996)					(0.000)	(0.993)
Cotton			0.370	0.202			0.177	0.148
			(0.104)	(0.492)			(0.409)	(0.609)
Rubber					0.768***	0.543*	0.808***	0.545*
					(0.000)	(0.056)	(0.000)	(0.056)
Constant	-15.754***		-4.250**		-4.928***		-15.590***	
	(0.000)		(0.017)		(0.007)		(0.000)	
Observations	378	143	378	143	378	143	378	143
AIC	231.409	128.522	249.607	128.091	241.524	124.824	222.905	128.257
BIC	274.693	158.150	292.891	157.719	284.808	154.453	274.059	163.811
ll	-104.705	-54.261	-113.803	-54.045	-109.762	-52.412	-98.453	-52.128

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A11: Additional Control for Ethnic Centralization

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	NoFE	FE	NoFE	FE	NoFE	FE	NoFE	FE
German Pop	-0.039	-0.008	-0.010	-0.006	-0.005	-0.005	-0.031	-0.007
	(0.289)	(0.380)	(0.585)	(0.421)	(0.597)	(0.532)	(0.242)	(0.451)
Station/Years	-0.107	0.155	-0.056	0.207	-0.074	0.163	-0.134**	0.046
	(0.138)	(0.186)	(0.440)	(0.115)	(0.308)	(0.246)	(0.043)	(0.725)
Prev Violence	-0.264	0.380	-0.126	0.595	-0.011	0.552	-0.104	0.287
	(0.717)	(0.518)	(0.854)	(0.304)	(0.987)	(0.358)	(0.885)	(0.638)
Road Length	0.804*	0.886	1.531***	0.942	1.727***	1.036	0.951**	1.041
	(0.052)	(0.316)	(0.001)	(0.271)	(0.000)	(0.239)	(0.018)	(0.282)
Military/Dist (ln)	-0.310	-0.279	-0.110	0.225	-0.079	0.196	-0.365	-0.630
	(0.439)	(0.568)	(0.846)	(0.571)	(0.889)	(0.640)	(0.328)	(0.251)
Mission/Dist (ln)	-0.142	-0.154	-0.085	-0.181	-0.241	-0.154	-0.310*	-0.051
	(0.576)	(0.706)	(0.678)	(0.669)	(0.280)	(0.725)	(0.063)	(0.904)
Ethnic Central.	0.187	0.161	-0.763**	0.095	-0.744**	0.352	0.476	0.535
	(0.671)	(0.796)	(0.022)	(0.876)	(0.024)	(0.612)	(0.224)	(0.475)
Taxation/Dist (ln)	1.058***	0.817					1.300***	1.301**
	(0.000)	(0.111)					(0.000)	(0.028)
Cotton			0.075	0.038			-0.109	-0.130
			(0.678)	(0.883)			(0.523)	(0.589)
Rubber					0.855***	0.797**	1.137***	1.039***
					(0.000)	(0.017)	(0.000)	(0.006)
Constant	-10.965***		0.421		0.200		-13.994***	
	(0.000)		(0.834)		(0.920)		(0.000)	
Observations	369	131	369	131	369	131	369	131
AIC	215.617	111.948	243.033	114.524	228.026	108.239	198.097	107.039
ll	-98.808	-47.974	-112.516	-49.262	-105.013	-46.120	-88.049	-43.519

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A12: Ethnic Groups Fixed Effects

	(1)	(2)	(3)	(4)
German Pop	-0.008	-0.006	-0.004	-0.006
	(0.474)	(0.517)	(0.557)	(0.521)
Station/Years	-0.062	-0.070	-0.087	-0.065
	(0.334)	(0.274)	(0.171)	(0.321)
Prev Violence	0.151	0.168	0.162	0.108
	(0.742)	(0.712)	(0.728)	(0.819)
Road Length	1.423*	1.381*	1.541**	1.364*
	(0.054)	(0.065)	(0.043)	(0.082)
Military/Dist (ln)	0.045	0.087	0.102	0.064
	(0.852)	(0.722)	(0.675)	(0.794)
Mission/Dist (ln)	-0.113	-0.147	-0.152	-0.287
	(0.739)	(0.676)	(0.654)	(0.428)
Taxation/Dist (ln)	0.362			0.340
	(0.231)			(0.281)
Cotton		0.229		0.148
		(0.349)		(0.542)
Rubber			0.641**	0.649**
			(0.016)	(0.017)
Observations	136	136	136	136
AIC	133.627	134.097	128.111	130.165
BIC	154.016	154.485	148.500	156.379
ll	-59.814	-60.048	-57.055	-56.083

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A13: Instrumental Variables Regression – First-Stage Regression

	(1)	(2)
	Taxation	Rubber
German Pop	0.005**	-0.001**
	(0.031)	(0.021)
Station/Years	0.083	-0.003
	(0.170)	(0.704)
Prev Violence	0.364	-0.030
	(0.169)	(0.700)
Road Length	1.253***	0.065
	(0.003)	(0.519)
Military/Dist (ln)	0.196	-0.032
	(0.339)	(0.393)
Mission/Dist (ln)	-0.206*	0.050*
	(0.092)	(0.089)
Settlement Pattern (concentrated)	0.954*	
	(0.057)	
Rubber Growth Index		0.158***
		(0.000)
Constant	7.458***	0.199
	(0.000)	(0.197)
Observations	390	437
AIC	1301.390	821.105
ll	-642.695	-402.553

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table A14: Instrumental Variables Regression – Second-Stage Regression

	(1)	(2)
Taxation/Dist (ln)	0.149**	
	(0.017)	
German Pop	-0.001*	0.000
	(0.074)	(0.774)
Station/Years	-0.020*	-0.006
	(0.075)	(0.356)
Prev Violence	-0.019	0.016
	(0.704)	(0.772)
Road Length	0.006	0.133
	(0.944)	(0.189)
Military/Dist (ln)	-0.041	0.019
	(0.387)	(0.691)
Mission/Dist (ln)	0.006	-0.049*
	(0.743)	(0.058)
Rubber		0.653***
		(0.000)
Constant	-0.964	-0.004
	(0.110)	(0.983)
Observations	390	437
AIC	220.046	572.068
ll	-102.023	-278.034

p-values in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

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