

# Witchcraft and Economics in Sierra Leone

An Interdisciplinary Approach

MSc. Thesis Development Economics

DEC-80436

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**Abstract:** The main question we ask ourselves is whether witchcraft in the African context plays a role in development. We test this hypothesis quantitatively, using OLS, random effects and instrumental variable models, and conclude that stronger village level witchcraft belief is associated with differential patterns of economic behavior. Moreover in a somewhat daring approach we find strong suggestions of causality. The behavioral differences are those in investment and labor arrangement decisions. Our data suggest that higher levels of witchcraft belief relate to less investment and stronger reliance on labor pooling.

**Keywords:** Witchcraft, trust, investment, labor rotation, income shock, civil war, Africa

## 1. Introduction

Witchcraft is an old facet of societies around the world and a current one in many agrarian tribal civilizations that are particularly numerous in the developing regions of the world. Sub-Saharan Africa (SSA) is likely to be the best example of this. Although West Africa receives most attention in this respect, scholars have reported on modern day witchcraft in relation to many Sub-Saharan countries such as, Kenya, Tanzania, Malawi, South Africa, Nigeria, Cameroon and Sierra Leone, to name a few (Dolan 2002; Ferme 2001; Fisiy and Geschiere 2001; Frank 1995; Golooba-Mutebi 2005; Miguel 2005; Moore and Sanders 2001; Richards 2000; Shaw 1997). Witchcraft is first and foremost a spiritual belief that can have many different consequences that are perceived as real to the true believer. This is essential, as it provides incentives to act and react in certain culturally predefined ways and not to divert from these norms. Belief in witchcraft and the characteristics of such beliefs vary locally, but an overall image of real world impact, that is consistent across SSA, seems to be that witchcraft is a mechanism to ensure compliance with egalitarian norms that are persistent in these agrarian societies (Platteau 2000).

Witchcraft has different expressions in different regions and under different tribes but the underlying similarities are striking. Both Shipton (1989) and Parry and Bloch (1989) find that in many cultures there are two kinds of exchange, differentiated by their moral evaluation. “These are long-term economic transactions serving the interests of a perpetuating group, and short-term exchanges conducted for the goals of an individual. [...] Parry and Bloch argue that in most cultures both modes of exchange exist and that the short-term, individually oriented one is permitted within certain limits” (Frank 1995). Ancestral spirits can for example be angered by illegitimately spending money earned by means of short-term self-interested transactions, this is without purifying it, to the objective of achieving long-term goals such as marriages by expenditures on bridewealth. “What needs to be stressed is therefore that evil spirits are conceived as being ultimately activated by human actors when they are angered by the behavior or situation of fellow villagers” (Platteau 2000). What upsets neighbors is often arising inequality, jealousy of certain people’s ability to utilize opportunities that go hand in hand with the commercialization of traditional societies (Dolan 2002; Evans-Pritchard 1935; Fisiy and Geschiere 2001; Golooba-Mutebi 2005).

This is of interest to economists because anthropological accounts of accusations of those who do well for themselves are so numerous and seem to be growing in number especially where economic development is getting a foothold. Two economic studies have shown that negative income shocks, in very different localities and times, lead to more witchcraft accusations and killings (Miguel 2005; Oster 2004). Economic circumstances thus affect intensities of the expression of witchcraft. Moreover, witchcraft is a concept that is omnipresent in societies across Africa and, based on anthropological theory, appears to deter economic initiatives, i.e. it affects behavior.

Until now the focus from an economic perspective has been on the determinants of witchcraft and its various expressions. As we have just seen there are strong implications that witchcraft belief and its associated behaviors affect economic decision-making as well. Theory, as we will see, tends towards predominantly negative effects, but does not ignore the possibility of positive influences on economic performance. Due to its vicious characteristics, as witchcraft appears to involve both economic causes and effects, we expect the possible existence of a

poverty trap. We are interested in empirically verifying the underlying causes of witchcraft as they are detailed in both the anthropological and economic literature, as well as to assess its effects on economic behavior in a West-African context. We do this by exploring household and community level data that was gathered by the development economics group of Wageningen University in 182 villages during 2009 and 2010 in Sierra Leone's Eastern and Southern provinces.

The main objective is to illuminate the role of African witchcraft belief in development. We approach this by first exploring the causes that underlie witchcraft belief and the manifestation of its expressions by finding an answer to the question: does socioeconomic inequality lead to a higher incidence of witchcraft belief and how, if at all, does this affect behavior? Next we ask: do income shocks and war sufferance indeed affect the intensity of witchcraft belief and, if so, how are associated practices affected? Secondly, and this entails a novelty, we explore the consequences of these omnipresent beliefs for economic development in Sierra Leone, and more generally, in West Africa. Do witchcraft belief and its practices affect economic decision-making, especially investment and labor arrangements, and if so, which effects do we encounter and are these beneficial or detrimental to development?

Our approach contributes to both anthropological and economic literature. We find empirical results on what has been documented by many scholars in the field of anthropology that safeguarding collectivist systems and/or pure jealousy are indeed major causes of higher witchcraft incidence. Positive and negative income shocks such as extremely high yields or crop disease are a cause of respectively reductions and increases in witchcraft accusations, a result that expands the economic literature on reactions of witchcraft to economic shocks.

A first in both strands of literature is our finding that concern about witchcraft in Sierra Leonean villages is indeed related to differential patterns of economic decision-making, and that more concern is associated with reduced soil investment and a greater reliance on labor pooling. Moreover, generalized trust is negatively affected by these concerns and constitutes one of the channels through which the negative relation between witchcraft concern and investment is sustained. Moreover, it reveals a first of possibly many indirect effects of African witchcraft belief. These

results combined show that witchcraft within the African context plays a role in development.

This paper is outlined as follows: Section 2 discusses witchcraft in more detail, reviews both anthropological and economic theory on the topic, and formulates our hypotheses. In Section 3 we provide backgrounds on the study region in Sierra Leone, present our data and elucidate our concept of witchcraft. The empirical approach is detailed in Section 4 and we present our results in Sections 5 and 6, resorting to more adventurous approaches in the latter. We close with discussion and conclusions in Section 7.

## **2. Theory**

### *Anthropological theory and insights*

The anthropological literature on witchcraft in SSA is extremely rich and provides accounts on all its countries. It includes historical works and research on modern day witchcraft belief and practices. The extent of the available literature limits us to the provision of a very modest review focused on those aspects relevant to the current discussion only.

Referring to the evil eye or cursing, one form of witchcraft present in modern day Sierra Leone, Douglas (1970) mentions that the concept existed before Islam. Huntingford (1953) describes the evil eye as having “an innate quality which causes its possessor to harm others merely by looking at them, even though they may have no wish or intent to hurt” (cited from(Turner 1964)). LeVine, in his account on witchcraft in Southwestern Kenya, also mentions the belief in the possibility of unintentionally bringing harm to someone through the evil eye, “which can kill children without the conscious wish of its possessor” (1962). Many people in Sierra Leone still believe in the evil eye today.

During the Atlantic slave trade period of the 17<sup>th</sup> and 18<sup>th</sup> centuries, accusations and convictions of murder by shape-shifting into leopards or crocodiles in Sierra Leone termed ‘the witchcraft of the leopard’, provided chiefs and other leaders with a means to sell people into slavery (Shaw 2001). Although the chimpanzee is today’s most common predator, this form of cannibalism –people who disappeared from villages were believed to be eaten– still exists today. The dominant accusatory direction, however, changed over time. As a response to the disappearances, the late

19<sup>th</sup> century saw what Shaw terms the Human Leopard Scare, an increase in accusations of human leopards, crocodiles, and as said, chimpanzees, but this time leveled against chiefs more often than by them (2001).

Describing witchcraft under the Temne of Northern Sierra Leone, Shaw accounts that: “The most effective and deadly form of [witchcraft] is the use of the witch gun (*an-pinkar a-serso*), a weapon constructed out of such materials as a piece of papaya stalk (or other tube-like object), a grain of sand (or other tiny potential missile), and an explosive powder to activate it. A witch can take these objects and transform them into a piece of lethal artillery that can be used to shoot victims from considerable distances” (1997). The witch gun is most often associated with powerful men, ‘big persons’.

Countless accounts of expressions of witchcraft in Africa can be found, and many more varieties exist, but expressions are meaningless without the driving forces behind them. Jealousy is one of the most frequently mentioned causes of witchcraft accusations in the literature covering the modern period. For a compelling account of this refer to Platteau(2000). The following is a quote from this source and exemplifies the point particularly well.

A traditional healer [in the Gitarama prefecture, Rwanda] admitted to being increasingly approached in order to solve problems related to poisoning. According to him the increasing incidence of poisoning threats is due to ‘recent changes in economic conditions that arouses people’s spite since nobody accepts that someone else surpasses him in wealth’ (Migeotte, 1995).

In cases as these witchcraft is most often a leveling force with regard to the inequalities that modernization and economic development bring along. Fisiy and Geschiere (2001), in their account on witchcraft among the Maka in Cameroon, mention of *djambe*, congregating witches that fly off at night to offer one relative each to a cannibalistic feast. The victim then falls ill and, unless freed from the spell by a traditional healer, dies. “One of [*djambe*’s] basic expressions is closely linked to jealousy [and] since development clearly brought new inequalities, *djambe* was, indeed, seen as an acute danger to those who tried to profit from the new opportunities” (Fisiy and Geschiere 2001).

Chimpanzee cannibalism incidence in the Upper Guinean Forest is highest during “periods when villagers are especially preoccupied with urgent tasks to do

with their main forest staple crop, Upland Rice” (Richards 2000). The production of this staple, which is extremely labor intensive, especially during peak seasons, depends on a system of labor pooling that these low-density forest populations developed over centuries (Richards 1986). Commercialism threatens the collectivist values on which this labor pooling, and thus the production of the main staple crop, depends and as such triggers chimpanzee attack accusations directed at those who embody commercial advancement. However, an article from the economic literature, Bastelaer and Leathers’ work on trust and lending in Southern Zambia, provides a contrasting example where witchcraft undermines generalized trust and reduces labor pooling. “This prevalent belief in witchcraft may also help explain most respondents’ preference for farming alone over farming with another person (even if that arrangement led to potentially higher individual returns)” (2006).

Ferme (2001) signifies that in modern day Sierra Leone within a hierarchical social order, agents characterized by individualism and independence, as for example portrayed by husbandless women who have less at stake in the domestic group, easily become suspects of witchcraft. Wives in polygamous households, who are often seen to “contribute their co-wives’ children or their own children for consumption at the feasts of their witch credit association” share similar fates (Shaw 1997). Here social inequality leads to accusations of those perceived as threats to the coherence of a social group.

As we have seen, ‘big people’ are liable to be equally suspect, especially if they contain wealth for their own consumption instead of for the benefit of dependents. Richards (2000), in a period nearing the end of the civil war in Sierra Leone, explains that “cannibalism today remains in use as ‘a weapon of the weak’ [...] to express unease at rampant commercialism in a country where a political elite with access to diamonds exports wealth overseas without re-investing in basic institutions [...] that support the poor”.

Witchcraft as a pure anti-development force is, according to Fisiy and Geschiere however, an outdated view. “The rather simplistic, official version of witchcraft as a leveling force and as a barrier to development is no longer tenable [...] there are obvious leveling overtones, but they can easily acquire accumulative implications as well” (Fisiy and Geschiere 2001). *Ekong* or *famla*, new forms of witchcraft, are ‘witchcrafts of labor’, as they grant its possessor the power to turn its

victims into zombies that will work on his invisible plantations. These types of witchcraft are thus invariably associated with the nouveaux riches and not with the poor. This in itself still has potential for leveling accusations, but it is people's attitudes that bare admiration towards such new forms of 'get rich' witchcraft that distinguishes them from older forms (Fisiy and Geschiere 2001).

The overall impression is thus that of witchcraft as a leveling force that responds to social inequality and impedes commercial initiatives, but in more recent years has been adapting to new forms that legitimate individual wealth accumulation.

### *Economic theory and existing empirical results*

Two economic studies have provided evidence of the protrusive impact of negative income shocks on witchcraft accusations, convictions and killings.

"Between the thirteenth and the nineteenth centuries, as many as one million individuals in Europe were executed for the crime of witchcraft", are Oster's (2004) opening words to a paper in which she shows that bad weather, in the form of below average temperatures, during a period known as the 'little ice age' led to more witchcraft trials. In times of agrarian societies as those included in this multi country analysis, weather and economic output were closely related. Using two proxies for economic growth, the number of cities in a country with a population of more than 10.000 and country population density, Oster finds empirical evidence for the negative relation between both proxies for economic growth and the number of witch trials. An important implication of these results is "that even when considering events and circumstances [i.e. witchcraft] thought to be psychological or cultural, key underlying motivations [for the witchcraft trials] can be closely related to economic circumstances" (Oster 2004).

Research on Western Tanzanian regions dominated by the Sukuma ethnicity, which accounts for two-thirds of the national witch killings, shows "that income shocks are a key underlying cause of the murder of elderly women as "witches" (Miguel 2005). Extreme rainfall leads to large income drops and a doubling of witch murders<sup>1</sup>. Miguel juxtaposes this 'income shock theory' with the 'scapegoat theory', which suggests that any type of shock that has negative welfare consequences for households could instigate a search for and elimination of the causer of the misfortune

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<sup>1</sup> Extreme rainfall can either indicate extreme drought or extremely high levels of precipitation.

at hand, i.e. the scapegoat. Using disease epidemics as the alternative shock, Miguel shows empirically that these neither cause lower income, nor higher numbers of witch killings. It is thus income that distinguishes shocks that do or do not affect witchcraft accusations.

Although, in Miguel's study, the effects of extreme rainfall on witch murders do not significantly differ between villages characterized by various levels of incomes, education, households growing cash crops, or the total number of households and local women's groups, the striking fact that the Sukuma represent about two-thirds of all Tanzanian witch killings while only accounting for about one-eighths of the national population, signifies the influence of socio-cultural factors (Miguel 2005). This shows that here too, to use Oster's words, underlying cultural as well as economic circumstances are closely related to witchcraft.

#### *What has been missing*

Economic shocks are a determinant of witch killing incidence and a rich anthropological literature shows that the protection of collectivist systems or at least the claim of such attempts while in fact jealousy is at work, provide other incentives to engage in witchcraft practices. An effect of witchcraft, according to the many accounts, is that people avoid suspicion by altering their behavior. What remains unclear however are the underlying dynamics between on the one hand concern about witchcraft, the reliance on witch finders and traditional healers, and the different expressions or varieties of witchcraft, and on the other hand how these three aspects of witchcraft are affected by and affect external factors. We do not imply to have all the pieces to this complex puzzle, but we do find relations that are essential to a basic understanding of the interaction between the three aspects of witchcraft just mentioned and of what witchcraft is affected by as well as what it affects externally (Section 3).

As said, the most pervasive incentives behind witchcraft accusations are, presumably, either securing collectivist systems and other social units such as households, or pure jealousy. The literature is rich in accounts that confirm this. However, the existence of these underlying incentives has never been tested quantitatively. Similarly, if the incentives are to safeguard social units or to reduce a sense of jealousy, then does witchcraft achieve these goals? Again there are accounts

of people that adapt by for instance moving out of their villages (Caldwell and Caldwell 1987), but this too has not yet been explored systematically. We can, unfortunately, not distinguish between safeguarding collectivism and jealousy, but it is of great interest to establish whether witchcraft does or does not affect behavior, to assess which decisions are affected and which not, and to confirm or falsify this quantitatively.

Hence we explore our main hypothesis that witchcraft in Sierra Leone plays a role in development. We approach this by further looking into whether: (a) the incentives to safeguard collectivism and alleviate feelings of jealousy is associated with increased witchcraft belief and the incidence of related practices, (b) income shocks and long-term impacts of war affect civic conflict expressed through witchcraft accusation, (c) witchcraft belief reduces community level investment in agriculture, and (d) undermines generalized trust and as such affects labor arrangements.

### **3. Study region and data**

Sierra Leone, one of Great Britain's first colonies, became independent in 1961. Two parties have ruled Sierra Leone since independence, the Sierra Leone Peoples Party (SLPP) and the opposing All Peoples Congress (APC), in 1971 it became a republic and in 1978 accepted one party rule and abandoned local government administration. The period that followed proved the breeding ground for the eruption of violence that turned into full-blown civil war in 1991. The two decades of one party rule formed a period of unbridled personal enrichment by the ruling elite, exploiting its natural richness in diamond resources and neglecting basic provisions as health care and education (Reno 1997). It was the growing discontent with these circumstances that lead to the insurgence of the Revolutionary United Front (RUF). In 2010, nearly a decade after the violent civil war ended in 2002, Sierra Leone holds position 158 on the Human Development Index, which includes 169 countries in total, still ranking it as one of the poorest countries in the world (United Nations 2010).

In 2010, about 62 percent of the Sierra Leoneans live in rural areas such as our research area surrounding the edge of the Gola Forest Reserve. Agriculture is the main source of food supply and income to these predominantly Mende regions. A mixture of subsistence farming and market-oriented production on upland farms

occupies an average village level share of about 50 percent of landholdings. Sifting cultivation, where land is cultivated for one or two years and then left fallow for periods up to 25 years, is the common practice on these dry lands. Swampland rice cultivation accounts for about 25 percent of land holdings. The remaining 25 percent constitute plantation land where cash crops such as palm oil and cocoa are cultivated.

We gathered the data we use in collaboration with the Gola Forest Program (GFP), the University of Cambridge and the University of Chicago. The reserve, a cooperative venture of the Royal Society for the Protection of Birds, the Conservation Society of Sierra Leone, and the Ministry of Agriculture’s Forestry Division, is managed by GFP and lies in the South East of the country. It includes nearly 75,000 hectares of tropical forest borders Liberia. In the research area GFP selected 182 villages based on biodiversity, spread across the seven chiefdoms that surround the forest edge on the Sierra Leonean side of the border. Table 1 provides descriptive statistics of sample area.

Table 1: Research area descriptives

Chiefdom	Villages   Surveyed	Share of Total
Barri	32	36%
Gaura	33	61%
Koya	18	35%
Makpele	24	36%
Malema	35	40%
Nomo	15	83%
Tunkia	25	23%

We conducted two surveys in the sample villages, the household level baseline and a village level community survey held under the village leaders and all others present. Household surveys were conducted with a representative of each sample household. From each village a maximum of 15 households, or so many as there were in each village smaller than 15 households, were randomly selected to participate in the baseline survey. All interview were conducted in private and anonymously. Questionnaires took about 2 hours to complete.

The research invested considerable effort to assure that the survey staff was well trained and that surveys were pretested in order to minimize potential biases, e.g. interviewer compliance bias. We nevertheless cannot rule out nonrandom underreporting on the possibly sensitive questions related to witchcraft. The variables

we employ in our analysis, which is outlined in Section 4, are summarized in Tables 2 and 3.

Table 2: Variable descriptives (excl. Panel Regressions)

Variable	Obs	Mean	Std. Dev.	Min	Max
witchcraft concern	175	1.629	.7982	0	4
civic cases	182	.4396	.4977	0	1
witch finder	182	.2088	.4076	0	1
upland soil investment	175	1.52	1.646	0	6
upland rotation labor	178	2.076	.3489	1	3
swampland labor rotation	176	1.963	.3692	.75	3
plantation labor rotation	176	1.85	.4125	.6	3
land gini	141	.3705	.1068	.15	.71
socioeconomic inequality	170	.8713	.3213	.23	1.99
war shock total	164	29.13	38.41	0	300
war shock proportion '90	162	.06948	.07587	0	.5
generalized trust	176	3.733	.639	2.067	5
sqrt land owned	172	26.07	19.28	0	102.5
plantation hired labor	176	2.156	.4837	1	3.667
log total nonagric income	170	12.02	.6577	10.17	14.94
stranger households	176	4.188	4.331	0	15
muslim proportion	173	95.74	7.955	50	100
polygynous proportion	171	.2105	.1303	0	.67
log population size	174	5.396	1.098	2.303	8.006
education chief	168	5.494	4.308	1	10
wives chief	174	1.891	1.155	0	7
land chief	159	46.56	149.7	0	1500
distance chiefdom town	154	5.331	1.673	1	8
distance gola	168	4.113	1.81	1	7
distance dry road	129	3.674	2.329	1	8

In our discussion of the concept of witchcraft it is important to distinguish between witchcraft belief and its expressions. Here belief and concern are used interchangeably and both indicate the village mean level of concern that expresses how much of a problem people perceive witchcraft to be (Table 2). To the question: “Do you feel that witchcraft is a problem in your village”, people could answer that they strongly disagreed, disagreed, neither agreed nor disagreed, agreed, or strongly agreed, with corresponding scores of 1 to 5. Witchcraft expressions, on the other hand, are tangible occurrences such as calling on a medicine man to resolve a poisoning threat. We distinguish between two categories of expressions, the reliance on witch finders medicine men and herbalists, also called traditional healers, and witchcraft related civic conflict, which is used interchangeably with witchcraft accusations. In relation to traditional healer dependence, survey respondents were asked to list all incidents where the village called a witch finder, medicine man, or herbalist, including dates, who was called, the reason and outcome, and the cost. Our witch finder dummy has a value 1 for each village that reported at least one incident. Reporting on civic cases was done in both the baseline and community surveys. Respective questions were: “Have you or your household been involved in any civil conflict in the past 10 years?” and a request to sum up: “All incidents with witches

over the past ten years”. Both include records of dates, people involved, and outcomes. Correlations between on the one hand concern and on the other witch finder reliance and accusations are -0.05 and 0.19 respectively. A dummy variable was created for witchcraft accusations, with value 1 for a minimum of one accusation per village. The association between the two expressions of witchcraft has a correlation coefficient of 0.4.

The complete witchcraft structure consisting of these three components can be imagined as a triangle with witchcraft concerns taking the top spot and the positions at the two bottom end corners occupied by each of the expressions. The negative relation between witchcraft concern and witch finder reliance functions much as common law enforcement that relieves social anxiety, in our case witchcraft concern<sup>2</sup>. The data show that, out of 52 reported instances, a witch was in fact found in 42 cases, resulting in 33 of them being cured, while 8 were punished and 1 was killed. In 9 of the cases no witch was found and in the remaining case the solution is unknown. Comments from the community survey indeed support this high success rate and exuberate relief. Someone in Semabu told us that “Sellu Kovoma is a witch finda and [that] he has proof so many witches in this village” or a villager speaking of a traditional healer named Mariama Kpaka: “The names of the above [...] herbalist have greatly assisted us in Kamasu”<sup>3</sup>. The second vertical relation, that between concern and civic conflict is most likely mutually reinforcing, as it makes intuitive sense that more accusations lead to more concern as well as the other way around. Similarly, the positive horizontal relation between witch finder reliance and accusations runs in both directions. Accusations can be made by anybody (Kohnert 1996; Niehaus et al. 2001; Reminick 1974). Legitimization of an accusation, however, this is finding the witch by the process of divination, is done through a diviner or witch finder who can also take the stand as a court witness (Ashforth 2001). The availability of such services in turn encourages witchcraft accusation as it provides an enforcement mechanism. The distinction between witchcraft belief (top) and its expressions (bottom) is important because only witchcraft concern is related to economic decision-making (Sections 5 and 6).

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<sup>2</sup> We have done a more extensive analysis on the interrelatedness of the different witchcraft components that, despite its small correlation coefficient, shows that this is a statistically significant relation.

<sup>3</sup> Available at the Development Economics Group, Wageningen University, The Netherlands

The household level witchcraft concern data, in the top of the triangle, contain 2423 observations, which, aggregated to the village level, constitute 175 villages. Of the first expression, witch finder reliance, our data contain 52 incidences and of the second 160, summing up to a total of 212 recorded witchcraft expressions. The 52 callings on witch finders, medicine men and herbalists were collected during the community survey, whereas the 160 conflict cases come from both the baseline and the community surveys, with counts of 110 and 50 respectively. The 212 witchcraft expressions recorded in total are distributed over 86 villages, 16 that reported witch finder incidences only, 49 that only mention of civic cases, and 21 with reports of both.

Traditional healer reliance should be expected to be relatively high, as it is common practice in Sierra Leone. No questions were included in the baseline survey in this respect, which is reflected by the relatively low incidence recorded. Considering the sample size of 2463 households for the baseline, one must assume substantial underreporting on civic cases too. In case underreporting adheres to certain patterns biases may influence our results.

Proxies for conceived threats to collectivism and the notion of jealousy that we use to explore these relations are, in no particular order, two measures of inequality, a village level land gini and a socioeconomic inequality index based on asset holdings. Respondents were asked to mention how many pieces of a list of assets they own, as well as to indicate certain characteristics of their home. The list includes assets such as beds, tables, chairs and other furniture, tools, shot gun or chain saw, Bible or Koran, and a mobile phone. Home characteristics are: pan roof, mud and stick walls, cement walls, earth floor wooden floor, concrete floor, electricity and a private toilet. Adding ownership of each asset as a separate variable and then using principal component analysis for the entire set yields a socioeconomic status indicator for each household, i.e. the first component. Household level scores are then used to calculate village means and corresponding standard deviations. To obtain the socioeconomic inequality index the measure of variance within each village, i.e. the standard deviation of each village is divided by the variance within the entire sample, represented by the eigenvalue of the first component in the initial analysis (McKenzie 2005; Vyas and Kumaranayake 2006).

To account for war shocks we employ two proxies that are measures of village level war impacts. The first is the total number of deadly casualties in the village, whereas the second is a village mean by 1990 population size.

Proxies for economic behavior are soil investment and labor rotation distinguished by one and three land types respectively, i.e. upland only for investment and upland, swampland and plantations for labor rotation. The investment variable is based on a baseline survey question enquiring whether farmers had made any investments either to improve soil or in soil protection. Respondents could answer: 1) none, 2) used organic fertilizer, 3) used chemical fertilizer, or in response to the question on soil protection: 1) none, 2) dug trenches, 3) planted bushels. The ‘none’ scores were changed into values zero. The application of chemical fertilizer is a bigger investment than that of organic fertilizer and scores used in the soil quality variables reflect this, values are 1 for organic and 2 for chemical fertilizer. Digging trenches and planting bushels both are assigned a value 1 in the soil protection variables. Village level mean scores then constitute the variable.

The variables for labor rotation on swampland and plantations are aggregated replies to the household level questions: “How often did you *hire* a worker on your farm”. With respect to rotational labor on both soil types respondents were offered a choice between answers ranging from 1 to 4. In the variables used in our analysis scores run from 0 to 3 for never, rarely, partially, and mostly respectively.

In the analysis below, generalized trust is the village mean level of trust villagers stated to have towards strangers in the village. Referring to either household members, members of the extended family, neighbors and friends, and strangers in the village, the question posed in the questionnaire is: “How much do you trust these people?” The five possible replies range from “not at all” to “completely”. Trust towards household and extended family members, as well as to friends in the village show little variance, i.e. everybody appears to trust everybody. This leads to the assumption that villager’s responses when asked how much they trust strangers in their village provides a measure of generalized trust.

Table 3: Variable descriptives (Panel Regressions)

Variable	Obs	Mean	Std. Dev.	Min	Max
civic cases	885	.06441	.2634	0	2
drought	847	.5336	.4992	0	1
too much rain	802	.3329	.4716	0	1
crop disease	854	.8244	.3807	0	1
low yield	842	.5998	.4902	0	1
very high yield	822	.3151	.4648	0	1
war shock total	820	29.13	38.32	0	300

In regard to our panel analysis (Table 3), to account for witchcraft expression we employ the witchcraft conflict variable mentioned above, now with the inclusion of dates. The panel ranges from 2005 to 2009, covering five years. We use income shock data for three types of shocks: drought, too much precipitation, and crop disease, as well as two yield variables, one for low yield and one for very high yield years. Long-term war shock is accounted for by the inclusion of the total number of war casualties per village, i.e. the first war shock variable in relation to our cross sectional data.

The triangular structure of witchcraft discussed above is the basis to understanding witchcraft, what it is affected by and which effects it has on economic behavior. Factors that are external to witchcraft codetermine it, by affecting either one or multiple of its three components, level of concern, civic conflict, and traditional healer incidence. The next section discusses our empirical approach to analyzing the internal and external effects related to witchcraft.

#### 4. Empirical strategy

This section briefly discusses our empirical analysis aimed at acquiring a better understanding of the role of African witchcraft belief in development. The accounts discussed in the introduction to this paper are however indicative of the complexity of witchcraft. As we have seen for example, West African witchcraft belief is in part historically determined by the Atlantic slave trade period. This and potential other determinants of witchcraft are not included in our models describing the three components of witchcraft, resulting in lower overall predictive power. Moreover, despite efforts to avoid omitted variable bias, this risk cannot be eliminated completely.

The determinants external to the triangular structure of witchcraft as discussed in the previous section is the first point of attention. In three village level cross

sectional analyses we explore the likelihood that witchcraft is determined by efforts to protect collectivism and/or acts of jealousy. We continue with an analysis of income shocks and their effect on witchcraft. We conclude the analysis by considering effects of witchcraft on economic behavior. We explore two pathways, the direct effects on investment in agriculture and labor arrangements, as well as the indirect via trust.

The first cross sectional analysis addresses the determinants of witchcraft concern, the second explores those of witch finder and traditional healer reliance, and the third is an analysis of witchcraft related civic conflict. The three *Logit* models are practically identical. The specifications used are:

$$W_j^* = constant + \beta_1 I_j + \beta_2 WS_j + \beta_3 X_j + \beta_4 C_j + \beta_5 FE_k + \varepsilon_j \quad (1)$$

with dependent variables  $W_j^*$  for witchcraft concern, witch finder reliance and witchcraft accusations. The main explanatory variables are our proxy for the protection of collectivist agrarian systems or jealousy, village level socioeconomic inequality  $I_j$  and long-term effects of the civil war in Sierra Leone  $WS_j$ , represented by the number mortal casualties to 1990 village population size. Vector  $X_j$  contains wealth and income, included as total land ownership and total nonagricultural income. Our asset based inequality index captures that inequality expressed by the ownership of certain consumer durables such as furniture, cooking utensils and mobile phones, as well as home quality, exemplified by having, among other things, a cement floor or a pan roof, but it does not capture social inequality in other respects. To account for the possibility that social cohesion affects witchcraft accusations we add total number of stranger households, the proportions of polygynous households and Muslims in the population to vector  $X_j$ . Controls for population size and geographic characteristics, distances to respective chiefdom towns and the boundary of the Gola forest reserve constitute vector  $C_j$ , we control for regional differences by including chiefdom fixed effects  $FE_k$ .

Before analyzing how witchcraft belief affects economic activity and thus development we turn to the response of one of witchcraft's expressions to income and long-term war shocks. We explore panel data of all civic cases that revolved around witchcraft accusations over the five-year period ranging from 2004 to 2009. Our economic shock data include extreme rainfall as in too much rain or drought, crop disease, and two yield variables for either low or extremely high yields over the same period. The long-term war shock impact variable is composed of the number of lethal

casualties per village during the civil war period. The random effects model is specified:

$$WA_{jt} = constant + \beta_1(IS_{jt} + WS_j + FE_k) + \alpha_j + \varepsilon_{jt} \quad (2)$$

such that village level income shocks  $IS_{jt}$  and time invariant war shock impact  $WS_j$  determine the count outcome variable for witchcraft accusations  $WA_{jt}$ . The *Poisson* specification captures both within and between variance. Robustness checks are done by the inclusion of chiefdom fixed effects  $FE_k$ . Results show that both positive and negative income shocks have an impact on witchcraft accusations. The signs are, as could be expected, opposing.

Now turning to the effects of witchcraft belief on economic behavior, we regress upland soil investment  $USI_j$ , i.e. organic and chemical fertilizer use as well as soil protection measures such as digging trenches and planting bushels, on main regressand witchcraft concern  $WC_j$ . Using OLS we specify the following:

$$USI_j = constant + \beta_1 WC_j + \beta_2 GT_j^* + \beta_3 X_j + \beta_4 C_j + \beta_5 FE_k + \varepsilon_j \quad (3)$$

where other predictors  $X_j$  are inequality, here expressed by a land gini, total non agricultural income, other input use in the form of hired labor to be employed on plantation land, and village chief characteristics. Village chiefs may wield an influence over various issues, especially those involving communal lands, land disputes, or the landless (Boserup 1989). Moreover, some chiefs own substantial amounts of land themselves thus affecting village level soil investments. Population and geographic controls  $C_j$  as well as chiefdom fixed effects  $FE_k$  are distances to chiefdom towns and roads accessible during the dry season. Generalized trust  $GT_j^*$  is included in an additional estimation to explore one possible channel through which the interrelatedness of soil witchcraft and investment may run. The OLS results in support of our proposition that witchcraft is related to economic behavior are discussed in Section 5. Moreover, we find strong implications of causality, which we present –accompanied by the necessary cautionary notes– in the Encore, i.e. Section 6.

To explore both the direct and the indirect relation between witchcraft and labor pooling we employ witchcraft concern as a predictor in the next OLS specification:

$$LP_j^* = constant + \beta_1 WC_j + \beta_3 X_j + \beta_4 C_j + \beta_5 FE_k + \varepsilon_j \quad (4)$$

where dependent variables are village mean labor rotation for plantations and swampland farming  $LP_j^*$  respectively. Vector  $X_j$  consists of total land owned, log total nonagricultural income, proportion of polygynous households and Muslims tot population size, as well as village chief characteristics. We resort to the familiar sets of controls  $C_j$  and finally  $FE_k$ . The interpretation of the results is presented in Sections 5 and an encore is given in Section 6.

## 5. Results

### *Determinants of witchcraft*

The following discussion focuses on the determinants of witchcraft and its three components: concern, accusations and traditional healer reliance (Tables 4 to 8).

Interestingly our main proxy for the incentives to secure collectivism and/or pure jealousy, asset holdings based socioeconomic inequality, is negatively and significantly related to witchcraft concern (Table 4). An explanation for this is that inequality is related to more frequent use of witch finders, which as we have seen reduces concern. We tested this by adding witch finder reliance to estimations in Table 4, rendering socioeconomic inequality non-significant while witch finder reliance is negatively and significantly related to concern, confirming the expected channel through which this indirect relation is maintained.

Table 4: Witchcraft concern (Ordered Probit)

-----				
witchcraft concern				
-----				
	(1)	(2)	(3)	(4)
-----				
socioeconomic inequality	-0.574* (0.293)	-0.613* (0.351)	-0.721** (0.349)	-0.670* (0.355)
war shock proportion '90	2.077 (1.396)	2.247 (1.400)	1.971 (1.548)	2.141 (1.572)
sqrt total land owned	0.00180 (0.00477)	0.00284 (0.00531)	0.00551 (0.00592)	0.00532 (0.00597)
log total nonagric inc	0.237 (0.169)	0.213 (0.183)	0.0743 (0.181)	0.101 (0.188)
stranger households	0.0372* (0.0210)	0.0464* (0.0247)		0.0225 (0.0372)
polygynous poportion	-0.258 (0.718)	-0.645 (0.757)	-0.102 (0.908)	-0.0916 (0.919)
muslim proportion	0.0102 (0.0104)	0.0179* (0.0103)	0.0203 (0.0126)	0.0220* (0.0130)
log population size		0.188* (0.112)	0.179 (0.112)	0.221* (0.119)
distance chiefdom t		-0.136** (0.0573)	-0.150*** (0.0573)	-0.142** (0.0584)
distance gola forest		-0.190*** (0.0571)	-0.177*** (0.0577)	-0.183*** (0.0598)
chiefdom fe's	no	no	yes	yes
-----				
N	149	125	126	125
pseudo R-sq	0.0377	0.0913	0.136	0.136
-----				

Standard errors in parentheses  
 \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Other results are that stranger households appear to have a weak positive relation to concern but it does not pass robustness checks. Concerning other measures of social homogeneity, village level proportions of Muslims have a locally distinct but weak positive relation to witchcraft concern. Larger village populations are more concerned about witchcraft. Chiefdom towns as administrative centers are larger and socially more diverse than villages, and are thus associated with more concern about witchcraft. Being closer to the Gola forest reserve is also positively related to such concerns, which should come as no surprise since witchcraft, especially cannibalism, is strongly associated with forests and the creatures they harbor (Richards 2000).

Widening our perspective, we note that witch finder reliance significantly and positively correlates with inequality (Table 5). That inequality is associated with a higher incidence of witch finder and traditional healer calls should not be surprising. The average cost of a visit is well over Le180,000 (c. US\$40), ranging from Le10,000 (c. US\$2.30) to Le1,500,000 (c. US\$350). Putting this in perspective, average non-skilled wage earnings in Sierra Leone are about US\$1.25 per day. That the high costs of witch finder services are leading in this respect is supported further by the positive

correlations between the reliance on these services and both land ownership and total nonagricultural income, which show up significant. An alternative explanation for this significant result for land ownership is land conflict. Number of stranger households appears significantly in the run with chiefdom fixed effects (4) but this is most likely due to collinearity and should not be interpreted as a result. Larger populations show a positive correlation with witchcraft finder reliance.

Table 5: Witch finder & traditional healer reliance (Logit)

	reliance on witch finders and traditional healers			
	(1)	(2)	(3)	(4)
socioeconomic inequality	1.518* (0.833)	1.959* (1.033)	2.672*** (0.966)	2.967*** (1.032)
war shock proportion '90	-0.0493 (3.918)	0.122 (4.659)	1.688 (4.588)	2.246 (4.124)
srqt total land owned	0.0396*** (0.0149)	0.0459** (0.0219)	0.0533* (0.0285)	0.0566* (0.0305)
log total nonagric inc	0.654* (0.380)	0.662 (0.472)	1.164** (0.529)	0.886 (0.574)
stranger household	0.0124 (0.0527)	-0.0133 (0.0640)		0.307** (0.125)
polygynous proportion	-2.229 (2.010)	-2.346 (2.323)	-1.959 (2.519)	-3.562 (3.118)
muslim proportion	-0.0615* (0.0330)	-0.0446 (0.0292)	-0.0461 (0.0335)	-0.0248 (0.0420)
log population size		0.391 (0.289)	0.600* (0.329)	0.768** (0.372)
distance chiefdom t		0.0425 (0.188)	0.0450 (0.186)	-0.0344 (0.180)
distance gola forest		-0.0370 (0.180)	-0.0154 (0.193)	-0.0672 (0.207)
chiefdom fe's	no	no	yes	yes
N	124	103	104	103
pseudo R-sq	0.223	0.268	0.326	0.371

Standard errors in parentheses  
\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Going back to the results in Table 4 on witchcraft concern and the interpretation of its negative relation to inequality, we can take the result from Table 5 as further support for the motivation that this is due to services provided by witch finders, i.e., concern is in fact not directly related to inequality but indirectly through witch finding.

In relation to witchcraft accusations our main predictor for the intensity of experienced war sufferance is significant and positively contributes to the likelihood that witchcraft related conflict arises (Table 6). Witchcraft accusations are not related

to our other main explanatory variable, socioeconomic inequality, an interesting finding that contrasts with expectations based on anthropological literature. Other relations to witchcraft concern are those to total land ownership, polygynous proportion of households, and population size. We see that, despite the significantly positive relation to land, income levels are unrelated to witchcraft conflict. This makes intuitive sense as anyone can accuse someone free of charge. The influence of land ownership may again be due to land disputes expressed by means of witchcraft accusations. As a side note, it isn't uninteresting to see that although people fear living close to chiefdom towns and the Gola forest edge, these fears do neither relate to a higher reliance on witch finders nor to more witchcraft conflict.

Table 6: Witchcraft civic conflict (Logit)

	witchcraft conflict			
	(1)	(2)	(3)	(4)
socioeconomic inequality	-0.0504 (0.359)	-0.0712 (0.415)	0.170 (0.446)	0.181 (0.446)
war shock proportion '90	2.008 (1.509)	2.531 (1.736)	4.142** (1.734)	4.268** (1.753)
sqrt total land owned	0.0164*** (0.00585)	0.0156** (0.00628)	0.0152** (0.00672)	0.0148** (0.00679)
log total nonagric inc	0.0509 (0.190)	0.0678 (0.198)	0.292 (0.234)	0.266 (0.233)
stranger households	0.0710*** (0.0269)	0.0586* (0.0309)		0.0355 (0.0487)
polygynous proportion	-1.837** (0.912)	-2.494** (1.008)	-1.758* (1.021)	-1.858* (1.025)
muslim proportion	0.0146 (0.0147)	0.0229 (0.0162)	0.0314 (0.0205)	0.0339 (0.0211)
log population size		0.229* (0.128)	0.252* (0.130)	0.268** (0.134)
distance chiefdom t		0.0115 (0.0739)	0.0148 (0.0789)	0.00811 (0.0801)
distance gola		-0.127* (0.0671)	-0.0911 (0.0774)	-0.0980 (0.0797)
chiefdom fe's	no	no	yes	yes
N	148	124	125	124
pseudo R-sq	0.103	0.132	0.207	0.205

Standard errors in parentheses  
 \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

The economic literature on witchcraft focuses on one element of witchcraft, witch killings, its most detrimental expression, and as one of its main determinant finds income shocks. Our data show that in Sierra Leone accusations and witch findings are much more frequent than killings (Section 3). The analysis here is not focused on witch killings but aims to place witchcraft belief in its social context,

assessing both its determinants and its effects, especially on economic behavior. It is thus of interest to explore whether income shock affects witchcraft belief in Sierra Leone. We do this by focusing on witchcraft accusation (Table 7) that as we know positively relates to witchcraft concern.

Table 7: Income and War shocks  
(Random effects - Poisson Regression)

	civic cases		
	(1)	(2)	(3)
drought	0.374 (0.292)	0.376 (0.288)	0.229 (0.307)
too much rain	0.161 (0.293)	0.0259 (0.289)	-0.110 (0.310)
crop disease	0.879 (0.539)	0.882* (0.533)	1.172* (0.611)
low yields	-0.0521 (0.311)	-0.105 (0.310)	-0.220 (0.331)
very high yields	-0.721** (0.362)	-0.712** (0.363)	-0.621* (0.374)
war shock total			0.0122** (0.00505)
chiefdom fe's	no	no	yes
N	748	738	678

Standard errors in parentheses  
\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

We find effects of one income shock and of one yield variable, crop disease and high yield years respectively. The coefficients for the negative income shock are larger than for the high yield years while significance levels are the same after the addition of chiefdom fixed effects. Income shocks do thus not only affect witch killings, but also accusations, leading to more concern and more frequent reliance on witch finders. That not all shocks show significant effects may be an indication that weather during the years covered by our panel did not see extended periods with extreme weather, either droughts or heavy rainfall. An interesting addition to this result would be to know whether shocks were evenly or unevenly distributed within villages, and what the effects of such potential inequality would be, if it arises at all.

Cross sectional analysis has already shown the impact of war shock intensity on witchcraft concern, our panel specification confirms this positive effect, although it is not significant without the inclusion of chiefdom fixed effects. Controlling for the differences in sufferance from war violence across chiefdoms however, shows that within these administrative areas war shock intensity does significantly relate to

witchcraft accusations. It is unclear whether war sufferance is exogenous to witchcraft accusations. Bellows and Miguel (2009) argue that war violence in Sierra Leone was mostly random. Archibald and Richards (2002) however mention that: “RUF attacks were often then designed to generate patterns of damage invoking memories of old quarrels. Fighters might, for example, burn only the houses of one party in a village land dispute, or they might attack one village and spare its rival, where political influence had led to facilities being developed in one place and not the other”. People engaged in conflict situations, potentially including those related to witchcraft, were targeted differentially, thus suggesting that war shock is endogenous.

Summarizing our main results, socioeconomic inequality has so far not presented itself as a major underlying factor of the existence and persistence of witchcraft in Sierra Leonean rural societies. It can even be argued that villages with more inequality are characterized by less witchcraft concern and that this is in part due to the ability of one or a few rich individuals to hire witch finders when presumed necessary. A history of war violence is significantly associated with a higher likelihood of witchcraft conflict. Finally, positive as well as negative income shocks affect witchcraft accusations.

#### *Relatedness to investment behavior*

We proceed with what we consider one of our greatest contributions, an examination of two pathways to possible effects of witchcraft belief on economic behavior: the direct and indirect relations between witchcraft and both investment in agriculture, and labor pooling. Leaving causality issues for what they are, we first look at witchcraft’s relation to soil investment (Table 8). We find that witchcraft is negatively associated with soil investment, in both quality and soil protection. This relation is, however, only significant for investment related to upland farms. Test results for plantation and swampland investments returned insignificant relations to witchcraft<sup>4</sup>. A further specification is that neither of the witchcraft expressions, civic conflict and traditional healer dependence, are significantly related to soil investment. The results in Table 8, thus show that upland soil investment is negatively related to witchcraft concern and that this relation is statistically significant.

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<sup>4</sup> Results omitted.

Table 8: Soil investment (OLS)

	upland soil investment			
	(1)	(2)	(3)	(4)
witchcraft concern	-0.446*** (0.165)	-0.649*** (0.243)	-0.545** (0.250)	-0.441* (0.234)
generalized trust				0.653+ (0.441)
land gini	-3.297*** (1.084)	-2.322 (1.881)	-2.067 (1.845)	-1.825 (1.815)
hired labor plantation	-0.762*** (0.287)	-0.402 (0.377)	-0.344 (0.390)	-0.319 (0.403)
log total nonagric inc	0.529** (0.213)	0.435 (0.301)	0.175 (0.267)	0.448 (0.352)
land chief	-0.00261** (0.00126)	-0.00371* (0.00220)	-0.00238 (0.00240)	-0.00403 (0.00277)
education chief	-0.0327 (0.0332)	-0.103** (0.0513)	-0.0797+ (0.0486)	-0.0915* (0.0488)
wives chief	0.261** (0.122)	0.292 (0.232)	0.186 (0.248)	0.153 (0.242)
log population size		0.0984 (0.191)	0.148 (0.185)	0.188 (0.189)
distance chiefdom t		-0.00792 (0.112)	0.000449 (0.111)	-0.0763 (0.133)
distance dry road		0.0148 (0.0994)	-0.00757 (0.119)	0.0351 (0.117)
chiefdom fe's	no	no	yes	yes
N	123	72	71	71
R-sq	0.310	0.310	0.360	0.384

Standard errors in parentheses  
+ p<0.15, \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

In the light of these findings, it is of interest to provide some further background on the main land cultivation systems in Sierra Leone and to acquire an understanding of why investments in upland soil are related to witchcraft concern, while plantation and swampland investment is irresponsive.

This brief description of agriculture in Sierra Leone, which is mostly subsistence farming, traditionally only on upland but nowadays also on wetland or swampland farms, leans heavily on the discussion of rice farming systems in Sierra Leone by Johnny *et al.* (1981). Upland farming is first and foremost the production of the main staple crop Upland Rice, but is also characterized by intercropping. In Mende territory that sees more precipitation than the Northern province of Sierra Leone predominantly inhabited by the Temne, upland farms may produce as many as twenty food crops apart from rice. Upland Rice is considered to taste better than Swampland Rice and is thus the preferred variety for consumption. Surpluses of both Upland Rice and other food crops are marketed.

Upland plots are cleared by burning. After harvesting the land is left fallow for periods varying from a few to twenty-five years, depending on how much pressure on land there is. Planning burns, brushing land, the planting of different crops and harvesting all require particular skills and attention to timing, especially because these activities require large labor forces. To meet peak labor demand this form of agriculture is heavily dependent on rotational labor. Soil quality is primarily managed by assuming these fallow periods in between productive years allowing soil organic matter to restore naturally, then to be complemented by the remnants of burns. This is however not included in our soil investment variable.

Plantations require constant care, for the many tasks such as guarding fences and weed and pest control. Patrons are thus always in need of labor power. Of course ownership and labor are separated here. The related pattern of land ownership is very unequal by nature. These traditional patterns, however, do not necessarily relate to witchcraft.

In contrast, swampland farming is less complicated. It is less weather dependent than upland farming and timing of e.g. burns is thus not an issue. Moreover, swampland is only suitable for commercial wetland rice cultivation, further reducing the required skill set and planning capabilities of farmers. Yet another positive aspect of this farming type is that weed control is not necessary, a characteristic especially beneficial to households with fewer wives or villages with lower incidence of polygyny, as weeding is a task traditionally carried out by women. A disadvantage of swampland agriculture is that it only produces one crop, a lower quality rice, making it more of an activity additional to upland farming than a solitary enterprise. Moreover, the initial preparation of a swampland farm may require high levels of labor input, depending on topographic variations. For some time it was thought that Swampland Rice cultivation, conditional on the choice of variety, would be more productive than that of Upland Rice, this is however not the case as the cultivation of improved seed varieties requires additional labor input outweighing yield benefits.

Property rights on swampland are ill defined. Often all land in the swamps belongs to the village chief. He may give villagers usage rights, upon which they can invest in creating a farm. Although most farmers 'own' upland as well as swampland farms, other people that are granted rights on swampland may be "on the one hand a

wealthy trader, perhaps only irregularly resident in the village, or at the opposite end of the spectrum a person marginal to the main power networks in village societies, e.g. a widow, but who can nevertheless raise, by saving or entering into debt, the cash to pay for the work to be done” (Johnny et al. 1981). Ownership patterns of swamp versus plantations and upland farms thus differ.

Due to these characteristics swampland rice cultivation is less collectivist than upland farming. Reaping returns from swampland farming is thus less noticeable. Moreover, for most farmers it is a supplementary activity that generates a little extra cash income in good years and functions as a risk coping strategy in low precipitation years. Those farmers that do cultivate swamps as their main agricultural activity are, as mentioned, either absentee landowners or socially marginalized villagers. The prior are unlikely to alter their investment strategy due to witchcraft concern in a village they visit from time to time only, whereas the prior are a vulnerable group in this respect but have little impact on average village level investment. Hence we find a relation between soil investment and witchcraft concern for upland cultivation only.

As formulated in our hypotheses, a negative correlation between concern about witchcraft in the village and generalized trust is expected to exist. Our results show that one of the channels of this negative relation is indeed via generalized trust, as indicated by the smaller coefficient and lower significance level for witchcraft concern in estimation (4) in Table 8. Part of its correlation is absorbed by generalized trust, which is significant, although at the 15 percent level. This result is of importance to development as it shows that witchcraft belief in Africa is indeed associated with behavioral changes, it is related to reduced levels of investment with respect to soil quality and protection on the farm type most important to subsistence in Sierra Leone.

#### *Relatedness to labor pooling choices*

If witchcraft belief is related to differential patterns of behavior in regard to investment decisions, there is a strong possibility that other spheres of economic behavior do too. The second strand of evidence related to differential behavioral patterns concerns labor pooling or rotational labor. As we will see, the concept of rotational labor implies different things within the contexts of each of the three farming systems: plantations, upland and swampland.

In addition to the result on soil investment we find that behavior with respect to labor pooling in villages with high mean witchcraft concern significantly differs from that where such levels are lower. These results, which we consider our other main contribution, show that a bigger reliance on labor rotation is associated with more witchcraft concern, with respect to both plantation (Table 9) and swampland farming (Table 10).

Table 9: Labor pooling Plantation (OLS)

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plantation labor pooling			
	(1)	(2)	(3)
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witchcraft concern	0.0786* (0.0450)	0.0971* (0.0525)	0.0922* (0.0515)
sqrt total land owned	0.00509*** (0.00186)	0.00359* (0.00212)	0.00372* (0.00212)
log total nonagric inc	-0.0243 (0.0584)	-0.00188 (0.0642)	0.000879 (0.0658)
polygynous proportion	-0.0248 (0.282)	-0.143 (0.312)	-0.142 (0.304)
muslim proportion	0.00169 (0.00461)	0.000372 (0.00508)	0.00116 (0.00517)
education chief	0.00440 (0.00829)	0.00700 (0.00975)	0.00360 (0.00986)
wives chief	0.0145 (0.0314)	0.00609 (0.0348)	0.00352 (0.0341)
land chief	-0.000236 (0.000223)	-0.000255 (0.000233)	-0.000187 (0.000240)
log population size		0.00332 (0.0404)	0.0151 (0.0391)
distance chiefdom t		-0.000728 (0.0236)	0.00832 (0.0247)
distance gola		0.00405 (0.0219)	0.0244 (0.0223)
chiefdom fe's	no	no	yes
-----			
N	143	123	123
R-sq	0.0933	0.0888	0.238
-----			

Standard errors in parentheses  
 \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

To explain why the relation between labor pooling and witchcraft concern in Sierra Leone is relevant in the contexts of plantation and swampland cultivation but not in the of upland agriculture, we build on the background provided to the discussion on soil investment. We have seen that given the complexity of upland farming rotational labor must be highly organized. In Sierra Leone, inter-household work groups –formed by the contribution of one male member per household– carry out group labor on farms of households that participate in the group, one day in each

period that requires rotational labor input. Unallocated days are rented out to work group participants with larger farms or to outside farmers. The latter pay much higher rates, even above that daily wage labor. Work group laborers are, due to high levels of coordination and routine, more efficient than the average non-work group day laborer. Some groups even plan one day per week for outside contracts, revenues are equally divided and a limited number of groups make their own investments, e.g. in swampland farms (Johnny et al. 1981). The relevance of this in the context of the current discussion is that rotational labor in Sierra Leonean upland farming should not be mistaken for reciprocity based exchange labor that is common in many developing countries.

Table 10: Labor pooling Swampland (OLS)

swampland labor pooling			
	(1)	(2)	(3)
witchcraft concern	0.191*** (0.0366)	0.209*** (0.0409)	0.204*** (0.0407)
sqrt total land owned	0.00428*** (0.00151)	0.00254 (0.00165)	0.00248 (0.00168)
log total nonagric inc	0.0108 (0.0475)	0.0383 (0.0501)	0.0270 (0.0520)
polygynous proportion	-0.0939 (0.229)	-0.183 (0.243)	-0.198 (0.240)
muslim proportion	0.00165 (0.00375)	0.00136 (0.00396)	0.000988 (0.00409)
education chief	0.0131* (0.00675)	0.0129* (0.00760)	0.0114 (0.00780)
wives chief	0.0448* (0.0256)	0.0322 (0.0271)	0.0287 (0.0270)
land chief	-0.000343* (0.000181)	-0.000419** (0.000182)	-0.000402** (0.000190)
log population size		0.0149 (0.0315)	0.0206 (0.0310)
distance chiefdom t		-0.0141 (0.0184)	-0.00331 (0.0196)
distance gola		0.0291* (0.0171)	0.0427** (0.0177)
chiefdom fe's	no	no	yes
N	143	123	123
R-sq	0.269	0.333	0.426

Standard errors in parentheses  
\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Planning of the highly weather dependent and multifaceted tasks of upland farming requires a swift expedition of activities when respective timeframes present themselves. These characteristics make that upland farming heavily relies on

rotational labor, sometimes for up to fifty percent of all farm tasks (Johnny et al. 1981). Or in other words, the labor market fails in this specialized and highly organized segment of labor demand, resulting in the emergence and sustenance of alternative institutions, i.e. the rotation labor work groups.

The importance of labor pooling in swampland cultivation and on plantations thus appears to have low incidence. Our data show however that labor pooling on swamp, plantation and upland farms differs little with respect to mean usage (Table 2). The variation however does differ between the three. The standard deviation for labor rotation use on plantations, the highest of the three land systems, is 18 percent larger than that for upland farming, which has the smallest. Working on a swamp farm may not be as physically exhausting as upland farm work, but it cannot be done alone, especially during planting and harvesting. Swampland rice cultivation requires fewer organizational skills making it an unsuitable employer for the well organized and relatively expensive work groups. Moreover swampland labor is not in large supply out of fear to be bitten by disease carrying insects, something that is reflected in the significant and positive relation between swampland labor rotation incidence and distance to the Gola forest edge (Table 10). Plantation farming also has its own distinct labor requirements. More importantly, its ownership –determined by lineage– is very different, which defines the relationship between plantation owners and workers. Dependency is very distinct from that among upland farmers who all rely on each other to be able to do all the work required on an upland farm. For plantations, the labor market substitutes for labor pooling, whereas it does not for upland work. The availability of a choice between labor rotation work groups and day workers for plantation owners, is reflected in the higher variance in the reliance on labor pools. This implies that we see two distinct types of labor pooling. The first is that for upland farming with well-defined institutions, and the second, a more traditional reciprocal form related to swampland cultivation. Plantations may hire upland labor pools, hire day laborers, or both, depending on their production systems and relevant wage rates.

In the light of this background our findings are not at all surprising. The general implication that new institutions arise where markets fail is hardly new. In the case of upland farming this institution is that of work groups, in the case of swampland it is a more reciprocal form of exchange labor, and on plantations it is mix

of both hired and reciprocity based labor. The institutional quality, expressed by self-reinforcing mechanisms, determines the need for external reinforcement. The mutual dependence and high levels of organization within work groups contrast in this respect with uneven systems of plantation and swampland ‘ownership’ and their related interdependencies. It is thus not surprising that more traditional reciprocity based labor arrangements require extra enforcement. One of those enforcement mechanisms is witchcraft. This constitutes a major finding, the second incidence of a relation between witchcraft and differential patterns of economic behavior.

## **6. Encore**

The relations found between witchcraft concern and economic behavior with respect to soil investment and labor arrangements immediately raise the question of causality. We therefore first repeat the OLS analyses in Tables 8 to 10 and then continue with the use of instrumental variables to take a step towards determining causal relations.

### *Soil investment and causality*

Caution is required with respect to potential endogeneity of the instruments. In the analysis in Table 11 we first reestablish OLS results from Table 8 where we regressed upland soil investment on witchcraft concern. In 2SLS specification (2) we proceed with the inclusion of distances to chiefdom towns and dry season roads as instrumental variables, and in (3) we add controls by including chiefdom fixed effects. Although significance falls to the 10 percent level, our OLS results that lower levels of soil investment relate to more witchcraft still stand, implying that more concern causes reduced investment. This however depends on the exogeneity of our instruments.

Table 11: Soil investment

-----			
upland soil investment			
	(1)	(2)	(3)
	OLS	2SLS	2SLS
-----			
witchcraft concern	-0.649*** (0.243)	-0.586* (0.328)	-0.565* (0.323)
land gini	-2.322 (1.881)	-2.488 (1.912)	-2.008 (1.824)
hired labor plantation	-0.402 (0.377)	-0.413 (0.320)	-0.342 (0.341)
log total nonagric inc	0.435 (0.301)	0.436 (0.275)	0.172 (0.232)
land chief	-0.00371* (0.00220)	-0.00351* (0.00182)	-0.00247 (0.00178)
education chief	-0.103** (0.0513)	-0.101* (0.0529)	-0.0803* (0.0484)
wives chief	0.292 (0.232)	0.299 (0.202)	0.186 (0.208)
log population size	0.0984 (0.191)	0.0882 (0.175)	0.152 (0.163)
distance chiefdom t	-0.00792 (0.112)		
distance dry road	0.0148 (0.0994)		
instruments		d. dry road d. chf town	d. dry road d. chf town
chiefdom fe's	no	no	yes
-----			
N	72	72	71
R-sq	0.310	0.310	0.360
Partial F test		17.25	17.66
Hansen J P-val		0.9494	0.9521
-----			
Standard errors in parentheses			
* p<0.10, ** p<0.05, *** p<0.01			

Distances to chiefdom towns and dry roads are suitable instruments for witchcraft concern because of the theoretically plausible relations between them. The large, socially and economically diverse, and dynamic chiefdom towns relate to more anxiety among villagers in regard to witchcraft. This relation is significant at the highest level as can be seen from the first stage results<sup>5</sup>. Smaller distances to dry season roads relate to lower levels of witchcraft concern as roads provide a means to escape witchcraft accusations or their consequences. Departures from villages are, as we have seen, quite common under the circumstances just described. This too is a highly significant relation (Appendix).

With respect to endogeneity the prior instrument casts little doubt. A village's position relative to its respective chiefdom town is quite unlikely to determine upland soil investment, although one could argue for the opposite. Distance to dry season

<sup>5</sup> For first stage results refer to Table A.11 in the Appendix.

accessible roads is the instrument that is somewhat more likely to be endogenous, as villagers themselves maintain these roads. Of course, the question remains whether or not labor arrangements significantly influence such maintenance. Our data show that these relations that would cause endogeneity do not exist, p-values for distances to chiefdom town and those to dry roads in the OLS estimation in Table 11 are 0.944 and 0.882 respectively. We therefore take the IV-results as a strong indication of an existing causal relation that runs from more witchcraft concern to reduced upland soil investment, further adding to the social significance of these findings.

#### *Labor arrangements and causality*

Estimations (1) in both Table 12 and Table 13 correspond to OLS results in Tables 9 and 10 for labor pooling on swampland and plantations respectively. Looking at swampland labor arrangements first, we show that OLS results for our main determinant –witchcraft concern– do not change when distances to the Gola forest edge are replaced by our instrument distances to dry season roads, i.e. when comparing Table 9 estimation (2) to Table 12 estimation (1) results for witchcraft concern do not change.

Another addition to the specification of the model is our war shock variable, in estimation (2), which is necessary to establish the required joint significance of the included instruments in the following instrumental variable regressions. The OLS results in Table 13 show that none of the instruments significantly relate to the dependent variable for swampland labor pooling<sup>6</sup>.

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<sup>6</sup> First stage results can be found in Table A.12/13 in the Appendix.

Table 12: Labor pooling

swampland labor pooling				
	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	2SLS
witchcraft concern	0.234*** (0.0485)	0.219*** (0.0500)	0.188*** (0.0502)	0.301*** (0.0814)
war shock total		0.00120 (0.00126)	0.000931 (0.00119)	0.000562 (0.000929)
sqrt land owned	-0.000617 (0.00256)	-0.00168 (0.00278)	-0.00113 (0.00273)	-0.00102 (0.00271)
log total nonagric inc	-0.0274 (0.0568)	-0.0213 (0.0581)	-0.0495 (0.0603)	-0.0350 (0.0477)
polygynous proportion	-0.324 (0.279)	-0.268 (0.306)	-0.349 (0.287)	-0.420* (0.230)
muslim proportion	-0.00276 (0.00559)	-0.00477 (0.00589)	-0.00481 (0.00621)	-0.00747 (0.00640)
education chief	0.00434 (0.00980)	0.00488 (0.0110)	0.00889 (0.0104)	0.0101 (0.00864)
wives chief	0.0408 (0.0359)	0.0424 (0.0370)	0.0212 (0.0357)	0.0424 (0.0266)
land chief	-0.000159 (0.000192)	-0.000136 (0.000198)	-0.000137 (0.000192)	-0.0000819 (0.000148)
log population size	0.00157 (0.0396)	-0.0249 (0.0447)	-0.00914 (0.0440)	-0.0223 (0.0404)
distance chiefdom t	-0.0226 (0.0227)	-0.0181 (0.0233)	-0.0258 (0.0232)	
distance dry road	0.0111 (0.0182)	0.0152 (0.0190)	0.0120 (0.0195)	
instruments				d. dry road d. chf town
chiefdom fe's	no	no	yes	yes
N	123	81	81	81
R-sq	0.333	0.369	0.531	0.492
Partial F test				14.26
Hansen J P-val				0.7593

Standard errors in parentheses  
\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Without repeating the discussion on the suitability of the instrumental variables, but with the same cautionary note, we thus provide further support of causal effects of witchcraft belief on economic behavior.

As said, the procedure for plantation related labor pooling (Table 13) is identical to that for swampland. Estimation (1) is a copy of the OLS estimation in Table 10, with the exception that distances to the Gola forest reserve have been replaced by our instrumental variable: distances to dry season roads. In (2) we add war shock, and in (3) and (4) we instrumentalize witchcraft concern with distances to chiefdom towns and dry roads, first without and then with the inclusion of chiefdom fixed effects. Results for main predictor witchcraft concern are essentially unaltered

in comparison the OLS results, but do carry the additional implication of a causal effects of witchcraft concern on plantation labor rotation.

Table 13: Labor pooling

-----				
plantation labor pooling				
	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	2SLS
-----				
witchcraft concern	0.161*** (0.0600)	0.147** (0.0623)	0.107+ (0.0648)	0.208** (0.105)
war shock total		0.00167 (0.00157)	0.00130 (0.00154)	0.000988 (0.00111)
sqrt land owned	-0.00172 (0.00317)	-0.000991 (0.00346)	-0.000314 (0.00352)	-0.000215 (0.00300)
log total nonagric inc	-0.0281 (0.0703)	-0.0357 (0.0723)	-0.0587 (0.0777)	-0.0478 (0.0609)
polygynous proportion	-0.109 (0.345)	-0.167 (0.381)	-0.201 (0.370)	-0.272 (0.329)
muslim proportion	-0.00412 (0.00692)	-0.00322 (0.00733)	-0.00186 (0.00801)	-0.00429 (0.00745)
education chief	-0.00938 (0.0121)	-0.00334 (0.0136)	-0.000476 (0.0134)	0.00131 (0.0114)
wives chief	0.00312 (0.0444)	-0.00862 (0.0461)	-0.0212 (0.0460)	-0.000953 (0.0313)
land chief	0.0000671 (0.000237)	0.0000459 (0.000246)	0.0000884 (0.000248)	0.000138 (0.000210)
log population size	-0.0126 (0.0490)	-0.0412 (0.0556)	-0.0141 (0.0567)	-0.0260 (0.0490)
distance chiefdom t	-0.0147 (0.0281)	-0.0153 (0.0290)	-0.0254 (0.0299)	
distance dry road	0.00964 (0.0225)	0.00808 (0.0237)	0.00770 (0.0251)	
instruments				d. dry road d. chf town
chiefdom fe's	no	no	yes	yes
N	86	81	81	81
R-sq	0.185	0.187	0.352	0.325
Partial F test				14.26
Hansen J P-val				0.6581
-----				

Standard errors in parentheses  
+ p<0.15, \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Explicitly stressing the possible endogeneity of the instrumental variables used, we feel that our econometrically sound IV-results strongly suggest three causal effects of witchcraft concern on various indicators of economic behavior. This suggested causality further contributes to the weight of our main finding that economic decision-making is related to levels of witchcraft concern.

## **7. Discussion and Conclusions**

We have shown that witchcraft belief in Sierra Leone relates to differential patterns of behavior with respect to economic decision making, a result that confirms our main hypothesis that witchcraft plays a role in development. Moreover, we find strong support for causality in these relations, such that witchcraft concern determines economic behavior. The areas of decision-making affected are upland soil investment and labor rotation on both plantations and swampland.

These results can be generalized to the larger context of West and potentially all of Sub Saharan Africa. Witchcraft craft practices vary widely, but underlying patterns are very similar. We see witchcraft in relation to changes in economic performance everywhere. Accounts of villagers safeguarding collectivism and of jealousy expressed through are countless and come from all countries in the region. We have shown that the actual expressions do not matter in relation to behavioral differences, it is the belief that counts. We see no reason to assume that this should be any different in other SSH African countries.

The actual behavior that relates to witchcraft concern may however differ per country or most likely even more locally. Variations will be based on the distinctive characteristics of local markets for goods and inputs and levels of development of and characteristics of substitute institutions in relation to the locally relevant cultivation systems.

We thus confirm the relation between witchcraft and community level investment and labor arrangements articulated in our hypothesis. The role to play by generalized trust was unexpectedly associated with investment, providing the indirect channel its relation to witchcraft concern, and not with labor arrangements.

Other results are that income shocks lead to and long-term effects of war sufferance relate to differential levels of witchcraft accusations, which in turn relate to more witchcraft concern. The hypothesis that incentives to safeguarding collectivist systems and/or pure jealousy are associated with increased witchcraft belief and the incidence of related practices proved more difficult to confirm. The empirical approach of cross sectional analysis may be the determining factor in this respect. Anthropological accounts concerning marketization of traditional communities often refer to relative social status changes as the underlying trigger of witchcraft

accusations. Our results on income shocks support this, as such shocks are never perfectly covariate (Ray 1998).

The main policy implication is to work towards market development in rural areas. The market provides the most effective deterrent of witchcraft belief as it provides alternatives to those who are currently locked in to relations of interdependence that may or may not be very unequal.

Further research can be aimed at the dynamics of witchcraft belief on the household and individual levels. To determine unambiguous causality, panel data on accusations, witch finder activity, and corresponding changes in witchcraft concern would be a great plus. Similar reasoning holds for inequality changes and changes in investment and labor arrangements. Health issues may play an important role. The weak are easily suspected to be possessed and lack the financial means to acquire proper medical treatment, thus sustaining their position as potential hazards to the communities they inhabit. The inefficiency of witchcraft as an enforcement and associated losses to society would be of great interest too, especially with the boom of the get rich witchcraft 'sector' in many African countries. Finally, it is not unthinkable that witchcraft constitutes a poverty trap.

## Appendix

Table A.11: Soil investment (First Stage)

-----			
witchcraft concern			
	(1)	(2)	(3)
-----			
land gini		2.328** (1.008)	1.988* (1.023)
hired labor plantation		0.118 (0.171)	0.0781 (0.189)
log total nonagric inc		0.0386 (0.131)	0.0798 (0.153)
land chief		-0.00254*** (0.000637)	-0.00185** (0.000761)
education chief		-0.0442* (0.0245)	-0.0392 (0.0264)
wives chief		-0.141* (0.0841)	-0.104 (0.0925)
log population size		0.154* (0.0912)	0.0968 (0.0998)
distance chiefdom t		-0.197*** (0.0553)	-0.223*** (0.0584)
distance dry road		0.180*** (0.0332)	0.172*** (0.0336)
-----			
N		72	71
R-sq		0.443	0.476
-----			
Standard errors in parentheses			
* p<0.10, ** p<0.05, *** p<0.01			

Table A.12/13: Swampland labor pooling (First Stage)

-----				
witchcraft concern				
	(1)	(2)	(3)	(4)
-----				
war shock total				0.00348 (0.00245)
sqrt land owned				-0.000858 (0.00574)
log total nonagric inc				-0.148 (0.141)
polygynous proportion				0.551 (1.059)
muslim proportion				0.0231* (0.0127)
edu chief				-0.00369 (0.0253)
wives chief				-0.173** (0.0663)
land chief				-0.000473* (0.000276)
log population size				0.115 (0.129)
distance chiefdom t				-0.203*** (0.0517)
distance dry road				0.137*** (0.0315)
-----				
N				81
R-sq				0.493
-----				
Standard errors in parentheses				
* p<0.10, ** p<0.05, *** p<0.01				

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