

This item is the archived peer-reviewed author-version of:

Risk, envy and magic in the artisanal mining sector of South Kivu, Democratic Republic of Congo

Reference:

Stoop Nik, Verpoorten Marijke.- Risk, envy and magic in the artisanal mining sector of South Kivu, Democratic Republic of Congo
Development and change - ISSN 0012-155X - Hoboken, Wiley, 51:5(2020), p. 1199-1224
Full text (Publisher's DOI): <https://doi.org/10.1111/DECH.12586>
To cite this reference: <https://hdl.handle.net/10067/1672460151162165141>

HOW TO CITE Stoop, N. and Verpoorten, M. (2020), Risk, Envy and Magic in the Artisanal Mining Sector of South Kivu, Democratic Republic of Congo. Development and Change. doi:10.1111/dech.12586

Risk, envy and magic in the artisanal mining sector

*Insights from South-Kivu, DR Congo*¹

Nik Stoop² and Marijke Verpoorten³

¹ The research was funded by FWO – Research Foundation Flanders (grants 1502318N & 30784531), and by CEGEMI – Centre d'Expertise en Gestion Minière. Permission to conduct the research was granted by the University of Antwerp's Ethics Committee for the Social Sciences and Humanities (nr. SHW_15_06), by the Congolese Ministry of Mines, the Congolese public Service for Assistance to Artisanal and Small-Scale mining, and by the local authorities in Kamituga. This research would not have been possible without the artisanal miners who offered their time to be interviewed, the enumerators who worked in challenging circumstances, and Janvier Kilosho who assisted with the field work. We offer them our sincere gratitude. We are grateful for comments received from Sara Geenen, Christian Kamala Kaghoma, Antea Paviotti and participants at the 2018 Congo Research Network Conference in Oxford.

² IOB – Institute of Development Policy (University of Antwerp), LICOS (University of Leuven). e-mail: nik.stoop@uantwerp.be

³ IOB – Institute of Development Policy (University of Antwerp), LICOS (University of Leuven). e-mail: marijke.verpoorten@uantwerp.be

Abstract

Scholars largely agree that witchcraft beliefs in sub-Saharan Africa remain virulent. The ‘modernity of witchcraft’ is said to thrive on a friction between the local moral economy and new socioeconomic realities. We focus on the appeal of witchcraft beliefs in the artisanal mining sector. We argue that the ‘do-or-die’, ‘zero-sum’ and ‘caught-in-the-middle’ context of artisanal mining provides fertile ground for witchcraft beliefs, and underlies the cross-cultural similarities of such beliefs as documented in the handful of studies on witchcraft in the artisanal mining sector. Whereas previous studies provided a thick description of witchcraft beliefs and practices, we rely on both qualitative and quantitative data from a sample of 469 artisanal miners in a mining town in South-Kivu. Our analysis confirms the ‘modernity of witchcraft’ thesis, but also nuances it, and provides further insight into the ‘rationale’ of witchcraft beliefs and accusations in the context of artisanal mining.

INTRODUCTION

A key aspect of African cosmology is the continuum between the visible and invisible world, and human agency herein. Invisible spirits and (deified) ancestors possess powers that can influence earthly life, and these powers can also be harnessed by humans through rituals, to do well or to inflict harm. Within this universe of diverse and ambiguous invisible forces, the term ‘witchcraft’ is generally used as a catch-all phrase for the manipulation of negative forces (Geschiere, 2013: 17; Vansina, 1990: 94–98). While widely used and understood in this way, the term remains controversial. According to Geschiere (2011: 233) ‘ “Witchcraft” (like sorcery, magic, sorcellerie, etc.) is a precarious translation – especially because of the pejorative implications of this Western notion – of African terms that often have much broader implications and might therefore be better translated by a more neutral term like “occult force” or even “special kind of energy”.’ Despite its reductionism and misleading connotations, even critics of the term continue to use it, largely because they acknowledge that ‘witchcraft’ has been so generally appropriated that it has become impossible to avoid its use (Comaroff and Comaroff, 1999; Geschiere, 1997; Moore and Sanders, 2001).

During much of the twentieth century, it was expected that, with so-called ‘modernity’, ‘traditional’ beliefs would make way for a more scientific, positivist, worldview. In the 1990s however, several anthropological studies put forward the ‘modernity of witchcraft’ thesis. Rather than disappearing over time, they documented that witchcraft beliefs continued to be of major importance in sub-Saharan Africa (SSA) and at times even gained vitality (Ashforth, 1996; Comaroff and Comaroff, 1999; Geschiere, 1997). This observation has been repeated in more recent years (Leistner, 2014; Platteau, 2009; van de Grijspaarde et al., 2013) and found empirical support in the 2009 Pew data collection project on spiritual life (Pew Research Center, 2010). In the Pew sample of 25,091 respondents from 19 SSA countries, 45.6 per cent mentioned believing in witchcraft.⁴ In line with the ‘modernity of witchcraft’ thesis, the data reveal that witchcraft beliefs are shared across generations and education levels. For instance, 42.5 per cent of the youngest age group (aged 18-24) and 39.6 per cent of those with post-secondary education reported believing in witchcraft. For the 1,302 respondents from the Democratic Republic of Congo (DRC), the

⁴ Beliefs were recorded as yes or no answers to the question ‘Which, if any, of the following do you believe in?’ followed by various categories such as witchcraft, the evil eye, evil spirits, heaven, hell, and angels.

respective percentages are 69.1 per cent (for the total sample), 70.4 per cent (for the youngest age group) and 64.9 per cent (for those with post-secondary education).

We study witchcraft beliefs and the role they play in the lives of artisanal miners in Kamituga, a town in South-Kivu, DRC. Kamituga is part of the historical homeland of the Lega people (also known as the Balega or Barega). Locally, ‘witchcraft’ is indicated by the terms *buganga* (in Kilega), *uganga* or *uchawi* (in Kiswahili), or *sorcellerie* (in French.) Our survey respondents generally understood it as ‘the practice whereby certain persons can launch a curse or spell that can provoke bad events’. Among our 469 survey respondents in Kamituga, 364 (78 per cent) report believing in witchcraft. Witchcraft beliefs are equally high (77 per cent) among the youngest miners in our sample (aged 18 to 24) and not much lower among those with higher secondary schooling (74 per cent).

That witchcraft beliefs persist is to some extent because they are difficult to falsify. But, non-falsifiability cannot explain why such beliefs originated in the first place, or why they vary across time and space, and sometimes even become more vibrant. To address these issues, one needs to study the rationale for witchcraft beliefs. Scholars across disciplines have proposed three broad categories of possible reasons underlying witchcraft beliefs (Case et al., 2004; Evans-Pritchard, 1937; Foster, 1976; Jensen, 2007; Keinan, 2002; Kohnert, 1996; Koning, 2013; Leistner, 2014; Platteau, 2009). First, by providing explanations and scapegoats for misfortune, witchcraft beliefs meet a human need to understand, predict, and control their environments. Second, witchcraft beliefs help to preserve peace and harmony in a community, because the accusations and trials serve to reveal and settle conflicts between members of the same community, preventing escalation. Third, witchcraft beliefs support certain norms and values that are essential for a society’s cohesion and survival. For instance, by enforcing a strong sharing norm, and keeping inequality in check, the beliefs safeguard a system of informal insurance. In short, it is argued that witchcraft beliefs exist (and persist) because they respond to a material or psychological need of individuals or communities.

Some roles of witchcraft in SSA applied to precolonial times, but have been overtaken. As such, it has been argued that witchcraft’s harmony-preserving role has declined, because of the erosion of precolonial witch-controlling institutions. Following such erosion and rapid socioeconomic reconfigurations, one finds ‘witchcraft on the loose’ or ‘wild sorcery’ (De Boeck, 1998: 791), with witchcraft taking unprecedented forms, roles and meanings. The literature on ‘the modernity of witchcraft’ has stressed that nowadays witchcraft beliefs are a critical commentary on, and serve to make sense of the invisible forces of the market that yield great richness for some and unfulfilled desires for others; and

that witchcraft accusations act as a levelling force for economically marginalized groups (Comaroff and Comaroff, 1999; Geschiere, 1997).

This article focuses on the appeal of witchcraft beliefs in modern times, within the artisanal mining sector in Eastern DRC. Following a largely functionalist approach, we argue that the ‘do-or-die’, ‘zero-sum’ and ‘caught-in-the-middle’ context of artisanal mining in Eastern DRC, and by extension in SSA, provides fertile ground for witchcraft beliefs and accusations. While yielding various valuable insights, the functionalist approach to witchcraft has also been critiqued, mainly because it reduces witchcraft to something that serves a societal purpose, thereby often relying on a single over-arching theoretical framework (Geschiere and Fisiy, 1994; Moore and Sanders, 2001). Hence, to induce new insights that are not part of an over-arching theoretical framework, we complement our functionalist approach and reliance on survey data with an exploration of narratives from our survey respondents. With our mixed methods approach, we aim to do justice to the particularities of *buganga*, and at the same time open up opportunities for systematic comparative research. In such comparative research, the artisanal mining sector merits attention. It is estimated that about 20 million people depend on artisanal mining in Africa (World Bank, 2009: 9); the DRC is home to the largest group of artisanal miners, with estimates ranging between 0.5 and 2 million people (World Bank, 2008: 56, 2009: 9).

MAGICORELIGIOUS BELIEFS⁵ IN SSA’S ARTISANAL MINING SECTOR

Previous studies

Few studies have specifically focused on magicoreligious beliefs and practices among artisanal miners in SSA: Bryceson et al. (2010) analyse miners’ magic in Tanzania; Sarpong (2017) writes about deific interventions in small-scale gold mining in Ghana; and D’Angelo (2014) studies the ‘occult economy’ of diamond mining in Sierra Leone.⁶ In the context of DRC, two studies on artisanal miners have also touched on magicoreligious beliefs. De

⁵ In this literature review, we mostly discuss witchcraft beliefs, referring to ‘the practice whereby certain persons can launch a curse or spell that can provoke bad events’ (the way it was defined in our study) but we also deal with literature on magicoreligious beliefs, that refer more generally to ‘magical practices by humans intended to cause a supernatural being to produce or prevent a specific result, *good or bad*’ (as defined in Alidou and Verpoorten, 2019).

⁶ There are also studies on magicoreligious beliefs in the artisanal mining sector in Papua New Guinea (Moretti, 2007) and Bolivia (Nash, 1989); and there is a study on witchcraft practices related to the Chad-Cameroon oil pipeline (Murrey, 2015).

Boeck (1998) writes about young Congolese who cross the border with Angola to dig or dive for diamonds; and Cuvelier (2011) describes the lives of artisanal miners in DRC's Katanga province.

A reading of these studies reveals particularities that suggest each case merits to be studied on its own terms, and that it may be more appropriate to talk about 'modernities' of magicoreligious beliefs (Moore and Sanders, 2001: 12). On the other hand, the case studies also share three noteworthy features. First, they share the belief that supernatural forces can be manipulated to amass fortune or to ward off misfortune. Second, the most powerful supernatural means are thought to emanate from human sacrifice of a family member or a fellow miner. Third, when production increases through spiritual means, it is believed to go at the expense of others' production, for example by magically drawing gold from other mining pits into one's own. Because of these beliefs, suspicions arise at the occasion of mining accidents or whenever a miner strikes lucky. The witch that is suspected of triggering the accident can be a miner, who wanted to increase his own gold production, or a jealous family member 'who cannot stand the idea that they [the miners] are making money for themselves, without sharing it' (Cuvelier, 2011: 183). Risk, envy and magic are thus intimately connected in the existing body of work

A cross-cultural 'rationale'

The commonalities between these cases justify a search for a cross-cultural 'rationale' for witchcraft beliefs, rooted in general properties of SSA's artisanal mining sector. Based on a review of relevant anthropological, economical and psychological literature, we articulate three such properties that may feed witchcraft beliefs and practices, and shape their common manifestations.

First, artisanal mining is a 'do-or-die' enterprise. Not only do miners face a high risk of potentially deadly accidents – such as tunnel collapses, flooding or oxygen deficiencies – they also take a financial gamble (Geenen, 2018; Kuhn, 2017). Depending on the location where miners start looking for minerals, they may amass great wealth or plunge into poverty. As argued by Keinan (2002) and Koning (2013), witchcraft beliefs help to make sense of the fine line between fortune and misfortune. When financial ruin or other calamities strike, explanations are sought as to why someone is affected, while others are not. This is reminiscent of a famous anecdote by Evans-Pritchard (1937). The story talks of a granary collapse in an Azande village in South-Sudan, killing a man who was sitting underneath it.

While the Azande knew the granary collapsed because termites had affected the wood, they evoked witchcraft to explain why it collapsed when that particular man was sitting underneath it. Similarly, artisanal miners who know *how* natural factors explain gold production and accidents, may seek answers as to *why* (bad) luck strikes at a certain time and place. In the ‘do-or-die’ context of artisanal mining there is plenty of occasion to raise this question, fuelling witchcraft suspicions and accusations.

Second, mining is in essence a ‘zero-sum’ game. As the quantity of minerals is fixed, minerals found by one mining team can no longer be found by another. A lucky strike by one team thus reduces the potential gain of others. This specific context of non-renewable resources reminds of the limited goods worldview that was described by Foster (1965) as an essential feature of traditional societies. According to this worldview ‘all people have the same fixed amount of life force or “cosmic good”, which cannot be increased other than by stealing that of another person’s through magical manipulation.’ (Leistner, 2014: 58). In the setting of artisanal mining, with its frequent occurrences of death and disease, the zero-sum situation feeds the collective imaginary that miners sacrifice family members or other miners – ‘steal others’ life force’ – in order to mobilize evil forces that magically translocate gold in return. As a result, a miner’s lucky strike frequently raises witchcraft suspicions and accusations.

Third, being neither ‘traditional’ nor completely ‘modern’, the artisanal mining sector is ‘caught-in-the-middle’. The rules of the game that apply are ambiguous, resulting from the interplay and competition between traditional communal relations and market forces. While the former try to preserve the patrimonial social order, market forces frequently turn it upside down. For instance, youngsters from modest background can amass great wealth seemingly overnight and outshine the elderly and traditionally prominent people. Witchcraft fears and accusations thrive on this clash between communal and market values. Miners only partially escape social control of the village: they feel haunted by sharing norms and fear spells sent by jealous relatives that they have left behind (Cuvelier, 2011). Witchcraft accusations also thrive in the melting pot of the mining community, where individuals of different cultural backgrounds meet, without sharing jointly recognized institutions of authority (‘modern’ or ‘traditional’) or a clear set of norms, rules and understandings. In a micro-empirical analysis of witchcraft manifestations in Sierra Leone, Van de Grijspaarde et al. (2013: 46) conclude ‘Witchcraft emerges in zones where institutional flux is highest and value systems compete. The witch is the product of normative ambiguity.’

In sum, drawing on the characterization of artisanal mining in the literature on the one hand, and a literature that describes the ‘rationale’ for witchcraft beliefs on the other, we conjecture that three stylized features of artisanal mining provide fertile ground for witchcraft beliefs: ‘do-or-die’, ‘zero-sum’ and ‘caught-in-the-middle’.

The super-natural is super-rational

The ‘rationale’ for witchcraft beliefs can also be studied through the lens of the ‘economics of superstition’ – a research line that proposes rational choice explanations for magicoreligious beliefs. The purpose is not to give a realistic description of an individual’s thought process. The ‘economics of superstition’ rather seeks to demonstrate that the seemingly irrational may be socially useful. As Leeson (2017: 10) puts it: ‘Practices that make people worse off aren’t likely to survive’. A recent example of this approach in the context of DRC is given by Nunn and Sanchez de la Sierra (2017). They show that it is socially optimal for local community defence groups to believe in protective spells, as it increases the audacity and effort of fighters, thereby overcoming a collective-action problem. Using a similar approach, one can make a case for witchcraft beliefs in the artisanal mining sector.

To do so, we introduce two economic principles: risk aversion and positional externalities. Consider first risk aversion: it has been extensively demonstrated that, when comparing various investments with the same expected return but different levels of risk, people have a tendency to prefer the least risky alternative (Holt and Laury, 2002). Second, it is also widely accepted that individuals do not only derive utility from absolute income or consumption, but also from relative income or consumption. Consequently, subjective well-being depends to a large extent on individuals’ relative position compared to peers, and social welfare is lower in a society with higher inequality (Kahneman et al., 1999).

A simplified thought exercise shows how these economic principles may feature in the lives of artisanal miners. Suppose there are two miners digging for gold. Suppose the mining site contains one gold nugget worth \$10,000, and each miner has a 50 per cent probability of finding the gold, and a 50 per cent probability of remaining empty-handed. The expected pay-off for each miner is then equal to the weighted sum $\frac{1}{2} * \$10,000 + \frac{1}{2} * \0 , i.e.

\$5,000. Assuming they are risk averse⁷, each miner would prefer to accept \$5,000 with certainty rather than risk the gamble. Moreover, because mining is a ‘zero-sum’ game, once the gold is found by miner one, it can no longer be found by miner two, whose expected income therefore decreases from \$5,000 to \$0. Thus, as a result of miner one’s lucky strike, miner two not only is left empty-handed, but also faces a highly unequal income distribution of (10,000; 0). Bearing in mind positional externalities, such unequal distribution represents a disutility to miner two, who would even prefer the situation in which both miners are left empty-handed (0; 0).

In a world without market failures, risk can be managed. The miners could write a contract, binding them to pool their efforts and share the benefits; or they could each obtain an insurance against a bad outcome. But in a world of freeriding, moral hazard, and lack of contract enforcement, these options are out of reach. To mitigate positional externalities, a government could step in and levy a tax on miner one to redistribute the tax revenue T (in cash or kind) to miner two, until he prefers the income distribution $(10,000 - T; 0 + T)$ over $(0; 0)$. Such a redistributive tax system is absent in the artisanal mining sector. Instead, a sharing norm exists. Since this norm is rarely fully internalized, especially when communities are ‘caught-in-the-middle’, it can be further enforced by the threat of witchcraft accusations (Platteau, 2009). Aside from urging miners to share, the threat of witchcraft accusations may result in miners hiding their gold production and refraining from visibly accumulating capital. Given negative positional externalities, this could be welfare-enhancing for other miners.

In sum, people tend to prefer a society in which risk is shared and physical assets are not visibly accumulated to a society in which both risk and visible inequality are very high. Witchcraft beliefs may thus be welfare improving if the threat of witchcraft accusations helps to enforce a sharing norm and discourages visible wealth accumulation. Obviously, this simplified example does not describe the thought process of individual miners, who are not making a society-level rational cost-benefit analysis. Nevertheless, the fact that a rational case can be made for witchcraft beliefs contributes to explaining why witchcraft beliefs persist and why they are especially vibrant in certain times and places (Leeson, 2017).

⁷ Risk aversion is a reasonable assumption, not just for the general population (Holt and Laury, 2002), but also for artisanal miners. Several authors have argued that the characterization of artisanal miners as risk-loving fortune-seekers is a misconception (Grätz, 2009; Heemskerk, 2003; Hilson, 2009): miners are not lured to mines because of their taste for risk, but rather because of lack of other income generating activities. We thus have to distinguish between the characteristic of the activity (risky) and the preferences of the actors (risk averse). In the data section below, we empirically demonstrate risk aversion in our sample of artisanal miners by means of an incentive-compatible game.

CASE & CONTEXT

In this section, we first provide background information on artisanal mining in Kamituga. We then describe the worldview of the Lega, Kamituga's largest ethnic group, in order to contextualize current witchcraft beliefs.

Mining in Kamituga

Kamituga is a town of about 190,000 inhabitants⁸ that belongs to the chiefdom of Wamuzimu, in the territory of Mwenga in South-Kivu province. It is the third largest city of South-Kivu, located at 180 kilometres of the provincial capital Bukavu (see Figure 1). South-Kivu is known for its mineral deposits, and was heavily affected by the two Congo wars (Stoop et al., 2016). Despite the formal end of the Second war in 2003, violence has continued. In 2015, the year of our interviews, more than seventy armed groups were active in Eastern Congo, and approximately 1.6 million people remained displaced (Stearns and Vogel, 2015).

- Figure 1 about here -

Kamituga has a long history of gold mining. Gold deposits were discovered in the 1920s and the Belgian company 'Minière des Grands Lacs Africains' started commercial gold exploitation in the 1930s (Kyanga Wasso, 2013). In the decades that followed independence – marked by Mobutu's disastrous economic policies, the instability of world mineral prices, and eventually the Congo wars – industrial production came to a halt, and artisanal mining got the upper hand. In 2002, a new chapter in industrial mining was announced, when the multinational Banro acquired the right to exploit minerals in Kamituga. Banro started exploration activities in 2011. Yet, at the time of our survey, an estimated 13,000 to 15,000 artisanal miners were still operating within its concessions (Kilosho Buraye et al., 2017). The rise, fall, and return of industrial mining – as well as the co-existence of artisanal and industrial mineral production modes – is emblematic for the general evolution of the mining sector in Eastern DR Congo (Stoop et al., 2019).

Despite its largely informal character, artisanal gold mining in Eastern Congo is a fairly well-organized activity (Geenen, 2014). There is a clear hierarchical structure. The

⁸ Interview with the local administrator of Kamituga, 2015.

mining site is divided in different zones that are headed by ‘zone managers’; the zones consist of several mining pits that are managed by ‘pit managers’ who have a number of miners working with them. The size of a team supervised by a pit manager may vary widely, roughly from 5 to 150 miners. Within this team, the function and associated tasks of each individual are well specified (Geenen, 2014).

Miners’ earnings are extremely volatile. Moreover, the production phase of a mining pit is preceded by a preparatory period, referred to as *souffrance* (‘suffering’) because little is earned. Pit managers take the biggest financial risk. They often invest several thousands of dollars in the preparation of a mining pit, without any guarantee of finding gold. Even if the initial investment eventually pays off, it may take several months and sometimes years before it does. Ordinary miners take a smaller financial gamble, but they put their life and health at stake, due to poor working conditions, and the risk of collapsing tunnels, oxygen deficiencies, and flooding.

Magicoreligious beliefs in ‘Legaland’

The territory of Mwenga is part of the historic homeland of the Lega. The Lega cosmology includes a God (*Kingunga*), a good force (*Kalaga*) and an evil force (*Kaginga*). The good forces are channelled by ancestors, while the evil force can be high-jacked by witches (*muganga*, pl. *baganga*), who are – in the case of the Lega – mostly women (Biebuyck, 1973). Healers (*mugila*, pl. *bagila*) make contact with the ancestors and the divine to obtain their goodwill and to direct the good forces, to provide for example protection against evildoers (Biebuyck, 1973: 52–4).

Particular to the Lega is the institution of the *Bwami*, which – in the absence of hereditary chiefs or a state-like centralized authority – was the most important social and political institution. The *Bwami* can be considered as a ‘secret society’ that preserves the moral and social code of the Lega. This code is transmitted through thousands of proverbs that teach solidarity, respect, marital fidelity, nonviolence, and cooperation (Biebuyck, 1973). It serves to harness good forces and neutralize evil forces. As such, according to Biebuyck, the *Bwami* can overcome witchcraft (*buganga*) by initiating the witch into its society. Biebuyck (1973: 136–137) explains: ‘Sometimes *bwami* is directly alluded to a countersorcery association ... *Bwami* neutralizes the agents and the effects of sorcery and witchcraft. Through induction [initiation], it transforms the sorcerer into a noble and gentle being’. Other authors contradict this, claiming instead that *Bwami* is the principal source of

witchcraft, and that – while all women are potential witches – the wives of the *Bwami* initiates effectively are (Mulyumba wa Mamba, 1977; N'Sanda Buleli, 2004).

DATA & METHOD

We interviewed a stratified random sample of 469 artisanal miners in Kamituga and presented them with closed and open-ended questions about witchcraft beliefs and practices. In addition, we collected secondary information on conflicts involving witchcraft.

Sampling, survey design and implementation

Our sampling procedure consisted of six steps: (1) we constructed a list of all 40 active mining zones within Kamituga; (2) we selected nine zones, seeking maximal variation in terms of geographical location; (3) we asked the zone managers of selected zones to provide us with a list of all pit managers; (4) we asked pit managers to provide us with a list of all pits and all miners working in them (yielding a list of 72 pits and 1,254 miners); (5) we randomly selected half of the pits in each zone; and finally (6) for each selected pit, we randomly selected ten to fifteen miners to be surveyed. The pit managers of selected pits were also surveyed. Our final sample comprises 430 artisanal miners and 39 pit managers.

All respondents were individually interviewed in May 2015. To design the questionnaire, we first conducted exploratory fieldwork, in June and December 2014, holding focus group discussions and testing our survey instruments. This allowed us to get a good understanding of the research context and applicability of our questions. In doing so, we could build on the extensive local network of our colleague Sara Geenen, who had been working with artisanal miners in Kamituga for over five years. Combined with our repeated visits, this allowed us to create the necessary trust and network to implement the survey.

Nevertheless, self-reported data is prone to measurement error and social desirability bias, certainly if some questions are sensitive. To elicit as much as possible truthful and accurate answers, we started each interview with a careful introduction in which we presented ourselves, the research and its purpose, and guaranteed anonymity as well as the option to refuse to respond to questions or abort the interview at any point. The survey was conducted in Swahili. All survey tools can be consulted online.⁹

⁹ <http://www.nikstoop.com/march-may-2015/>

Characterizing the sample respondents

The miners in our sample are all men. They are on average 33 years old, with ages ranging from 16 to 65 years. Nearly all miners (97 per cent) were born in the province of South-Kivu; and just over half (52 per cent) was born in Kamituga. The large majority (84 per cent) belong to the Lega ethnic group. Most miners report to be Catholic (48 per cent) or Protestant (35 per cent). In terms of schooling: 19 per cent of miners did not finish primary school while for another 15 per cent primary school is the highest educational level attained. The majority (54 per cent) quit school during secondary school. The average respondent in our sample has 11 years of experience in artisanal mining.

When asked about financial risks, 88 per cent of our respondents indicate that it is ‘very high’ for pit managers (on a five-point scale ranging from ‘no risk’ to ‘very high’ risk) – while only 12 per cent indicates that ordinary miners face a ‘very high’ financial risk. Miners do face a ‘very high’ physical risk according to 88 per cent of our respondents, while only 16 per cent indicates that this is the case for pit managers. Despite these high levels of risk, we find that the majority of miners is risk averse. In particular, we elicited risk preferences using an incentive-compatible ‘lottery game’, following the Eckel and Grossman (2002) method, and found that only one in five miners displayed risk-loving behaviour.¹⁰

To assess the relative income position of miners and pit managers, we asked respondents to situate themselves on a ‘ladder of life’. The ladder visualized, by means of drawings, nine standards of living, ranging from the poorest in Kamituga (level 1) to the richest (level 9). On average, miners situated themselves between step 3 and 4 (at 3.2) while pit managers situated themselves close to step 5 (at 4.9). Thus, the gap between miners and pit managers is 1.7, on average, but Figure 2 also reveals heterogeneity within both ‘classes’.

- Figure 2 about here -

¹⁰ Respondents were given a choice between six gambles. Each gamble involved a 50 per cent chance of winning either a low or a high payoff. Gamble one involved a sure payoff (4,000 Congolese Francs for both the low and high payoff). Moving to gamble five, the gambles increased both in expected payoff and risk. For example, in gamble five, the low pay-off was 2,400 CF while the high pay-off was 7,200 CF. From gamble five to six, only the variance (i.e. the level of risk) increased while the expected payoff remained the same. The pay-off for gamble six was (1,400; 8,200). About one in three miners (28 per cent) opted for the safe gamble (one). They are considered strongly risk-averse. Another 32 per cent of miners is moderately risk-averse, choosing a gamble between two and four. Gamble five is chosen by risk-neutral miners (20 per cent), going for the highest expected payoff. Only 20 per cent of miners (and 24 per cent of pit managers) displayed risk-loving behavior, opting for gamble six with the same expected payoff as gamble five, but a higher risk. The game was incentive-compatible, i.e. miners actually received the money they won. The average expected return was the equivalent of 5 US\$ at that time.

We previously built a rational case for the persistence of witchcraft beliefs, relying on the concepts of risk aversion and positional externalities. In that respect, the above descriptive analysis bears out a few noteworthy elements regarding Kamituga's mining sector. Artisanal mining is clearly perceived as a risky activity, rife with both physical and financial danger. Yet, behaviour measured in an incentive-compatible game demonstrates that most miners can be characterized as risk-averse. We further note substantial variation in perceived income positions, both among peers and when comparing miners to pit managers. Considering positional externalities, and the fact that mining is a zero-sum game, these inequalities may feed jealousy.

Survey questions on 'witchcraft'

The survey included a separate module on witchcraft. To get a sense of the proportion of miners who believe in witchcraft, we asked: 'Do you believe that certain persons can launch curses or spells that trigger bad events?' (Yes – No – Don't know). Some people may believe in witchcraft, but do not feel threatened by it. We therefore inserted witchcraft as a category in a question on various threats to mining activities. We asked: 'Which are, in your opinion, the factors that are most threatening to your activities as a miner? Please indicate the importance of following factors? (a) The activities of Banro; (b) The presence of armed groups; (c) The presence of the FARDC [the Congolese army]; (d) A lack of luck; (e) Jealousy; (f) Witchcraft.' (Not at all important – Very little important – A little important – Important – Very important). In an open-ended follow-up question we asked: 'Please explain why witchcraft is a [...] threat to your mining activities?'. We also asked about means of protection against witchcraft: 'In your opinion, which of the following ways can effectively protect against witchcraft?' (Prayer – Avoid conflicts – Share wealth – Seek protection of witch doctor – Other).

While witchcraft may be thought of as a threat, it may also serve as an explanation for 'luck', especially when this luck is persistent or exceptional. We therefore asked: 'Imagine that a group of miners reaches a large quantity of gold after a very short period of *souffrance*. According to you, such an event can be explained by (a) The experience of miners; (b) The quality of tools used by the miners; (c) Luck; (d) Witchcraft or the use of a fetish by the miners; (e) Prayer.' (Very Unlikely – Rather unlikely – Possibly – Rather likely – Very likely).

While witchcraft beliefs may evolve only slowly over time, alleged witchcraft cases and accusations may fluctuate over shorter time-horizons (Miguel, 2005; Oster, 2004). We therefore asked miners about the evolution of witchcraft cases: ‘According to you, have cases of witchcraft in Kamituga increased, decreased or remained constant in the past five years?’ (Increase – Decrease – Constant – Don’t know). We inquired about the reasons in an open-ended question: ‘According to you, what is the reason for this evolution of witchcraft cases in the past five years?’.

We further asked about actual events and behaviour. First, we asked whether respondents had been affected by witchcraft: ‘Have you already experienced cases of witchcraft that affected your mining revenue?’ and ‘Have you already experienced cases of witchcraft that affected your health?’ (No, never – Yes, once – Yes, more than once – Don’t know). ‘In those case(s), the witchcraft was sent by...’ (Someone of the family – Someone of the family in law – A neighbour – A friend – Another miner or PDG – A stranger – Myself¹¹ – Others (specify) – Don’t know).

We also asked factual information about witch doctors (*féticheurs*) and the use of their services: ‘How many witch doctors do you know in Kamituga?’, ‘Have you already made use of the services of a witch doctor?’ (Yes – No – Refuse to respond), ‘How many times have you used the services of a witch doctor?’ (Once – Several times – Often – Very often), ‘For what reason have you used the services of a witch doctor?’ (Increase chances in the mining sector – Protect against the physical dangers in the mining sector – Protect against witchcraft – Other). Finally, the enumerators listed additional observations made by respondents.

Secondary information on conflicts involving witchcraft

We asked the managers of a local mining cooperative (COKA) to provide us with a typology of conflicts that occur in Kamituga’s mining site. Ten types of conflicts were defined. Two types relate to witchcraft and are thus of interest: (1) Accidents allegedly caused by witchcraft, (2) Witchcraft accusations related to the production of a mining pit. Some of the conflicts – likely the most severe cases, i.e. those involving the loss of human lives – are brought to the attention of the cooperative and appear in their register. In this register, we found information on six witchcraft-related conflicts that took place in the period 2010-2015.

¹¹ The option ‘Myself’ was inserted to cover cases where miners relied on witchcraft to boost their own mining revenue.

Since COKA was only active in ten out of the forty mining zones, the cases they register are an underrepresentation of conflicts involving witchcraft. By means of key informants, we collected information on seven additional cases. We will highlight some interesting features of these thirteen cases.

WITCHCRAFT STATISTICS & NARRATIVES

Modernity of witchcraft

About 78 per cent of our respondents indicate to believe in witchcraft, 14 per cent report not believing, and 8 per cent remain agnostic. In line with the ‘modernity of witchcraft’ thesis, the belief in witchcraft is held almost equally high by miners from each age quartile (see Table 1). While witchcraft beliefs are highest among miners who did not finish primary school (85 per cent), they remain high among miners with more than two years of secondary education (74 per cent). There is no noteworthy difference between miners and pit managers.

- Table 1 about here -

Although 78 per cent of respondents report believing in witchcraft, 41 per cent indicate that witchcraft is ‘not at all’ an important threat to their mining activities. On the other hand, another 41 per cent categorize witchcraft as an ‘important’ to ‘very important’ threat (see Figure 3). It would thus be fair to say that the miners are very divided about this issue.

- Figure 3 about here -

That most miners believe in witchcraft, but less than half consider it as an important threat may seem like a puzzle. The reason for the U-shaped distribution of answers becomes clear when reading through the narratives that were given in reply to the question: ‘Please explain why witchcraft is a [...] threat to your mining activities?’. Consider for instance the narratives explaining why witchcraft is ‘not at all’ an important threat: ‘We pray every day before starting the work, and our pit manager is a pastor’ (miner, age 55), ‘If a sorcerer blocks [production], one has to constrain him through prayer because everything comes from God’ (miner, age 31). Hence the U-shaped distribution of answers: although most miners believe in witchcraft, almost half do not consider it a threat, because they believe to have an effective means of protection.

Among the 190 narratives explaining why witchcraft is ‘not at all’ an important threat, roughly one out of four expresses a positivist mindset. For instance: ‘There is no real proof [of witchcraft]’ (miner, age 34), ‘My brother finds gold without taking recourse to

witchcraft' (miner, age 35), 'Those who take recourse to witchcraft don't find a lot [of gold]' (miner, age 33), or simply 'nonsense' (miner, age 32).

In sum, while our data support the 'modernity of witchcraft' thesis, it also reveals that miners are deeply divided on the issue: witchcraft is part of a vivid imagination by some, but not taken seriously by others.

Witchcraft, gold production and 'accidents'

Figure 3 revealed that nearly half of miners (41 per cent) consider witchcraft an 'important' to 'very important' threat. In the associated 192 narratives, the word 'blockage' is used very frequently, for example 'Witchcraft blocks your luck' (miner, age 33) or simply 'Blockage' (miner, age 46). De Boeck (1998: 790) explains that, in the Zairean imaginary, 'blockage of flow' is a social negative that is associated with witchcraft; while 'flow' is 'understood to be necessary to make profits and maximize capital'. This resonates in several narratives: 'We found gold in our pit, but our neighbours have taken everything by means of witchcraft' (miner, age 38), 'Witchcraft takes away the luck of some, and gives it to others' (miner, age 27). Thus, in line with the zero-sum context, miners associate 'blockage' in one pit with large production in another.

To study this in a systematic way, we asked respondents to indicate the likelihood of various factors explaining why a group of miners may find a large quantity of gold after a very short period of *souffrance*. The answers are shown in Figure 4. Luck, prayer and witchcraft are mentioned as a 'likely' or 'very likely' explanation by 87 per cent, 60 per cent and 27 per cent of our respondents, respectively.

- Figure 4 about here -

Instead of studying self-reported perceptions, we now turn to self-reported behaviour, bearing in mind the caveat that under-reporting may be especially large for behavioural measures. Among our respondents, 14 per cent freely reported having used the services of witch doctors (13 per cent of miners and 15 per cent of pit managers). These 64 respondents gave in total 93 reasons for consulting a witch doctor, which are listed in Table 2. About half (28) indicated to have relied on a witchdoctor to increase their mining revenue.

- Table 2 about here-

The secondary data on witchcraft-related conflicts sheds further light on witchcraft practices intended to increase gold production. In most conflicts (8 out of 13), the accused allegedly sacrificed human lives to obtain gold. The 'evidence' lies in one case in the

discovery of human bones in the pit, and in the other cases in ‘miraculous’ or ‘sudden’ deaths of miners. For instance, in one case, two miners, working at night, died because they allegedly saw naked men and women in the pit. These were said to be spirits (*fantômes, esprits*) who were helping the pit manager to divert gold from a neighbouring pit to his own. The contact between the visible and invisible world was supposedly mediated through the use of fetishes, amulets (*gris gris*), red candles, and a cooking pan with herbs. These tools are provided by witch doctors and, in combination with human sacrifice, are believed to invoke the help of spirits. Our respondents’ narratives (in response to the ‘witchcraft is a threat’ question) provide information along the same line: ‘Friends enter with fetishes in the pit’ (miner, age 46), ‘Witchcraft happens through sacrifices that pit managers make in order to have the gold’ (miner, age 35).

Taken together, our findings indicate that witchcraft plays a role in explaining (mis)fortune in gold production, and that both the ‘zero-sum’ and ‘do-or-die’ context of artisanal mining feed the imaginary that witchcraft brings about the (mis)fortune by taking away the life force of others. At the same time, this imaginary is not the only, or even most important, explanatory model. Most miners also stress the (even greater) importance of other factors: prayer, and more earthly factors such as ‘experience’, ‘quality of material’, or simply ‘luck’. When exactly witchcraft is evoked and who are the accused then become interesting questions to study.

Witchcraft accusations

When asked about personal experiences, 124 respondents (26 per cent) indicated their mining revenue or health had ever been affected by witchcraft. The proportion is considerably higher among pit managers, at 36 per cent. Table 3 provides an overview of alleged suspects. One third of respondents suspected that witchcraft was sent by another miner or pit manager (clubbed together in a single answer category). Other primary suspects were family members (mentioned by 29 per cent) and neighbours or friends (27 per cent). Fellow miners, pit managers, and family members are part of the inner circle of people with whom miners live and work – whom they have to trust. That these people may become particularly dangerous, and thus raise fears about witchcraft, is the central thesis of Geschiere's (2013) book ‘Witchcraft, Intimacy, and Trust’.

- Table 3 about here -

Also our respondent's narratives suggest that witchcraft suspicions and accusations arise within one's intimate circle. For instance, in the 'witchcraft is a threat'-narratives, family members are often mentioned as suspects: 'One can only be cursed by members of his family' (miner, age 30), 'My family can 'block' me if some of them are witches' (miner, age 40), 'A friend has been cursed by his mother, and he is the only one in our pit not finding gold' (miner, age 21). That close relatives are suspected also relates to the fact that a sharing norm predominantly applies among relatives. It is within this inner circle that fear of witchcraft accusations can most effectively enforce such norm. Indeed, 12 per cent of our respondents indicated that 'distributing one's wealth' is an effective means to protect oneself against witchcraft. In addition, the intimacy of witchcraft is in line with the importance of positional externalities, which matter most for comparisons one makes with peers.

Many narratives explicitly point to pit managers as suspects: 'A lot of pit managers take recourse to witchcraft' (pit manager, age 54), 'Many pit managers use witchcraft and they even make human sacrifices' (miner, age 35), 'We had gold in our pit, but a neighbouring pit manager used witchcraft and the gold in our pit disappeared' (miner, age 28). That pit managers, next to kin, are at the centre of accusation should not surprise. First, they have the highest potential to amass great wealth and thus exacerbate positional externalities. Second, focusing on pit managers may be a risk-management tool in the hands of miners, or their families, to seek compensation for accidents.

The latter is illustrated by the secondary information on conflicts. All 13 cases feature pit managers: as the plaintiff against a witch doctor (in two cases), or as the accused party – by another pit manager (in three cases), or by his miners or the family of a deceased miner (in eight cases). To solve conflicts, cases are brought before the 'custom keepers' (*gardeurs de coutumes*, most likely the *Bwami*), the police, and the tribunal of Kamituga. To appease the situation, the accused often have to pay a compensation. For instance, in one case the custom keepers decided that the pit manager should build a house for the widow of a worker who died and buy her a goat and drinks. This suggests that witchcraft accusations can be used as a levelling force, by the relatively deprived, in order to obtain social and economic justice.

In sum, looking at who is accused, we find that accusations are mainly directed at family members and pit managers, both of which belong to a miner's intimate circle. The accusations amidst family often occur in the context of tensions over income sharing, while those directed at pit managers are used by the relatively deprived to seek social and economic justice.

The evolution of witchcraft

Opinions are divided regarding the evolution of witchcraft. About 39 per cent mention that cases of witchcraft increased over the past five years, 27 per cent mention a decrease, 13 per cent say it remained unchanged, and 22 per cent reply not knowing. The wide distribution of answers suggests that the perception is highly subjective, thus likely related to individual-level factors.

Among the 182 narratives that explain an increase in witchcraft, many refer to greed or envy. For instance: [Witchcraft is on the rise] ‘because people want to gain more than they produce’ (pit manager, age 46), ‘because of the search for wealth and the jealousy towards the other persons’ (miner, age 28). In many cases, reference is made to migration and the related overpopulation and diversity of ethnic groups. For instance: [Witchcraft is on the rise] ‘because of the increase of the population, certainly those coming from different villages’ (miner, age 31), ‘because of the multiplication of ethnicities and overpopulation’ (miner, age 44), ‘because the population has increased and cultures have changed’ (miner, age 33). So, rather than merely referring to an enlarged population, the narratives are concerned with the diversity of people and cultures. This may relate to the observation that witchcraft thrives in settings characterized by competing value systems and normative ambiguity (Van de Grijspaarde et al., 2013), i.e. places that are ‘caught-in-the-middle’.

Scarcity is also mentioned as an important factor; both in itself and in combination with the competition for scarce resources. For instance: [Witchcraft is on the rise] ‘because the pits are not as productive as before’ (miner, age 23), ‘because she [the witchcraft] evolves in the opposite direction as the gold: the more gold becomes rare, the more the miners use witchcraft to have more [gold] and they use it against each other’ (miner, age 23). Thus, as the size of the pie in the ‘zero-sum’ game shrinks, competition is on the rise, in tandem with witchcraft suspicions.

The ‘do-or-die’ aspect, and the belief that powerful witchcraft needs human sacrifice, also surface. For instance, respondents mention an increasing number of deaths and illnesses as a sign of an increase in witchcraft: [Witchcraft is on the rise] ‘because of the appearance of many illnesses such as poisoning, anaemia, epilepsy’ (miner, age 50), ‘because the children die at any moment’ (miner, age 43), ‘because of the search for power and means of enrichment, which leads to death in the mining pits’ (miner, age 44).

In sum, we find that the perceived evolution of witchcraft is highly subjective, and that miners' explanations of an increase in witchcraft very much resonate the importance of the do-or-die, zero-sum and caught-in-the-middle context of artisanal mining.

DISCUSSION

We started this article by reiterating that witchcraft beliefs are not a relic of the past and set out to study the 'modernity of witchcraft' in South-Kivu's artisanal mining sector. As a point of departure, we reviewed the literature on magicoreligious beliefs and practices in sub-Saharan African artisanal mining. This review revealed commonalities that hinted at a cross-cultural 'rationale'. Based on these commonalities and a reading of the literature across disciplines, we conjectured that the image of the selfish, accumulating, and life-force stealing witch flourishes on the fertile ground created by the sector's 'do-or-die', 'zero-sum' and 'caught-in-the-middle' setting. In this setting, witchcraft beliefs and practices serve to meet both a psychological and material need, allowing miners to cope with the fine line between fortune and misfortune. One can even make a rational case for the persistence of witchcraft beliefs: by encouraging income sharing and hiding, witchcraft beliefs and accusations may help in managing idiosyncratic risk and constraining visible wealth accumulation, thus reducing the disutility associated with risk exposure and positional externalities.

Our data confirm the modernity of witchcraft thesis in the artisanal mining setting, but also nuance it. While witchcraft beliefs are widespread and shared by miners from all age groups and levels of education, a considerable number of miners dismiss magical explanations. Among the believers, however, a substantial fraction indicates that witchcraft is an important threat to their activities. In line with our conjecture, their narratives prominently feature the 'do-or-die' and 'zero-sum' setting. Deadly mining accidents are attributed to witchcraft by jealous family members who expect more income sharing, or by greedy pit managers who seek to divert gold from others' pits into their own. The former is in line with Geschiere's (2013) 'dark side of kinship' thesis: witchcraft accusations often take place in the intimate circle of relatives where the pressure of sharing is mostly felt. That accusations are also frequently directed at pit managers emerged in a more inductive way from the narratives and secondary data on witchcraft-related conflicts. Pit managers are also part of the intimate circle: when working in the mining pit miners have to trust them, literally, with their lives. While accusations against pit managers may be explained by the managers' potential to accumulate great wealth and exacerbate positional externalities, the accusations also emerged

as a tool in the hands of the relatively deprived to seek social and economic justice. This finding, flowing from the strongly entrenched hierarchy between miners and pit managers, may be more pronounced in relatively sedentary mining sites like Kamituga.

When analysing miners' narratives regarding the evolution of witchcraft in Kamituga, we again found clear references to the three stylized aspects of the artisanal mining context. The 'do-or-die' aspect surfaces in narratives that blame witchcraft for a perceived increase in deadly accidents and illnesses. Regarding the 'zero-sum' aspect, the competition for scarce and difficult-to-access gold deposits is mentioned as an important factor for a perceived increase in witchcraft cases, motivating some to magically divert gold from one pit to another. Other narratives suggest a role for the normative ambiguity of a world in movement, literally, with an influx of migrants that have different ethnic and cultural backgrounds – thus describing a setting that is 'caught-in-the-middle'.

Witchcraft beliefs and accusations have mainly been studied with an ethnographic approach. Our analysis complements this approach, by pragmatically applying methods and mental models from different disciplines. With the quantitative data and qualitative narratives that we presented, we assessed the perceived relative importance of witchcraft (in comparison to other factors such as luck and prayer) in the artisanal mining sector, and revealed how magic serves to cope with risk and envy in a situation of institutional flux. Our findings suggest that as long as the 'do-or-die', 'zero-sum' and 'caught-in-the-middle' context remain central to artisanal mining, witchcraft beliefs and practices are likely to continue to thrive and influence miner's behaviour in terms of income sharing, (in)visible wealth accumulation, and conflict settlement.

Future ethnographic research could further unearth the targeting of pit managers in witchcraft accusations – a finding that emerged inductively from the narratives of our respondents. It could also shed more light on the potential role of witch doctors as brokers in the conflicting relations between miners and pit managers. Finally, a number of dynamics in Congo's artisanal mining sector could also be studied through the lens of witchcraft accusations and practices; for instance, the crowding out of artisanal by industrial mining (creating more uncertainty and scarcity) and the transition from artisanal to small-scale mining (involving visible wealth accumulation for a subgroup of miners). The study of witchcraft may provide a window through which one could grasp the impact of these changes on social relations and miners' lived experiences.

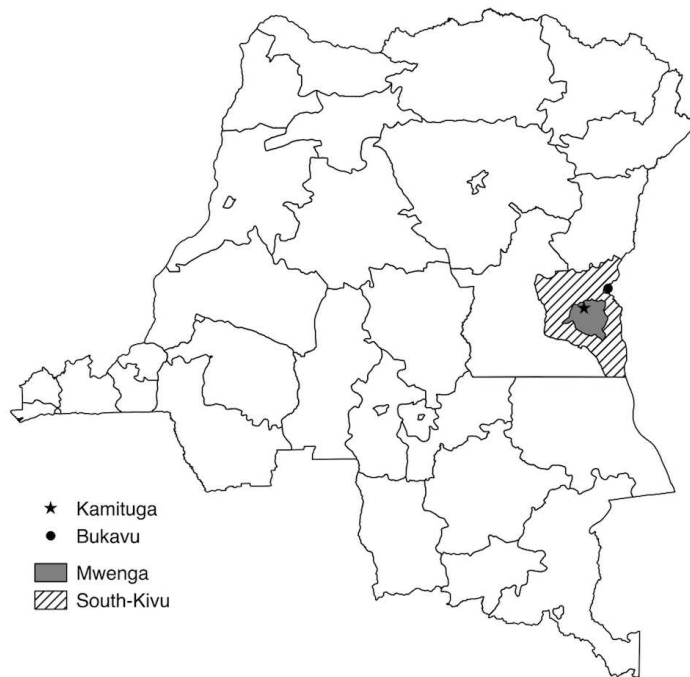
REFERENCES

- Alidou, S. and M. Verpoorten (2019) 'Only Women Can Whisper to Gods: Voodoo, Menopause and Women's Autonomy', *World Development* 119: 40–54.
- Ashforth, A. (1996) 'Of Secrecy and the Commonplace: Witchcraft and Power in Soweto', *Social Research* 63(4): 1183–234.
- Biebuyck, D.P. (1973) *Lega Culture: Art, Initiation, and Moral Philosophy Among a Central African People*. Berkeley: University of California Press.
- Bryceson, D.F., J.B. Jønsson, and R. Sherrington (2010) 'Miners' Magic: Artisanal Mining, the Albino Fetish and Murder in Tanzania', *The Journal of Modern African Studies* 48(03): 353–382.
- Case, T.I., J. Fitness, D.R. Cairns, and R.J. Stevenson (2004) 'Coping With Uncertainty: Superstitious Strategies and Secondary Control', *Journal of Applied Social Psychology* 34(4): 848–71.
- Comaroff, J. and J.L. Comaroff (1999) 'Occult Economies and the Violence of Abstraction: Notes from the South African Postcolony', *American Ethnologist* 26(2): 279–303.
- Cuvelier, J. (2011) 'Men, Mines and Masculinities: The Lives and Practices of Artisanal Miners in Lwambo (Katanga Province, Dr Congo)'. Ghent University. Department of third world studies.
- D'Angelo, L. (2014) 'Who Owns the Diamonds? The Occult Eco-Nomy of Diamond Mining in Sierra Leone', *Africa* 84(02): 269–293.
- De Boeck, F. (1998) 'Domesticating Diamonds and Dollars: Identity, Expenditure and Sharing in Southwestern Zaire (1984-1997)', *Development and Change* 29(4): 777–810.
- Eckel, C.C. and P.J. Grossman (2002) 'Sex Differences and Statistical Stereotyping in Attitudes Toward Financial Risk', *Evolution and Human Behavior* 23(4): 281–95.
- Evans-Pritchard, E.E. (1937) *Witchcraft, Oracles, and Magic Among the Azande*. Oxford: Oxford University Press.
- Foster, G.M. (1965) 'Peasant Society and the Image of Limited Good', *American Anthropologist* 67(2): 293–315.
- Foster, G.M. (1976) 'Disease Etiologies in Non-Western Medical Systems', *American Anthropologist* 78(4): 773–82.
- Geenen, S. (2014) '*Qui Cherche, Trouve* the Political Economy of Access to Gold Mining and Trade in South Kivu, DRC.
- Geenen, S. (2018) 'Underground Dreams Uncertainty, Risk and Anticipation in the Gold Production Network', *Geoforum* 91: 30–8.
- Geschiere, P. (1997) *The Modernity of Witchcraft: Politics and the Occult in Postcolonial Africa*. University of Virginia Press.
- Geschiere, P. (2011) 'Witchcraft and Modernity: Perspectives from Africa and Beyond', *Sorcery in the Black Atlantic*. Chicago: University Of Chicago Press.
- Geschiere, P. (2013) *Witchcraft, Intimacy, and Trust: Africa in Comparison*. Chicago; London: University Of Chicago Press.
- Geschiere, P. and C. Fisiy (1994) 'Domesticating Personal Violence: Witchcraft, Courts and Confessions in Cameroon', *Africa: Journal of the International African Institute* 64(3): 323–41.
- Grätz, T. (2009) 'Morality, Risk and Rules in West African Artisanal Gold Mining Communities: A Case Study of Northern Benin', *Resources Policy, Small-Scale Mining, Poverty and Development in Sub-Saharan Africa* 34(1): 12–7.
- Heemskerck, M. (2003) 'Risk Attitudes and Mitigation among Gold Miners and Others in the Suriname Rainforest', *Natural Resources Forum* 27(4).

- Hilson, G. (2009) 'Small-Scale Mining, Poverty and Economic Development in Sub-Saharan Africa: An Overview', *Resources Policy* 34(1–2): 1–5.
- Holt, C.A. and S.K. Laury (2002) 'Risk Aversion and Incentive Effects', *American Economic Review* 92(5): 1644–55.
- Jensen, G. (2007) 'Explaining Witch Hunts: Sacrifice, Persecution, and Scapegoat Theories', *The Path of the Devil: Early Modern Witch Hunts*. New York: Rowman & Littlefield Publishers, Inc.
- Kahneman, D., E. Diener, and N. Schwarz (eds) (1999) *Well-Being: Foundations of Hedonic Psychology*. Russell Sage Foundation.
- Keinan, G. (2002) 'The Effects of Stress and Desire for Control on Superstitious Behavior', *Personality and Social Psychology Bulletin* 28(1): 102–8.
- Kilosho Buraye, J., N. Stoop, and M. Verpoorten (2017) 'Defusing the Social Minefield of Gold Sites in Kamituga, South Kivu From Legal Pluralism to the Re-Making of Institutions?', *Resources Policy* 53: 356–68.
- Kohnert, D. (1996) 'Magic and Witchcraft: Implications for Democratization and Poverty-Alleviating Aid in Africa', *World Development* 24(8): 1347–55.
- Koning, N. (2013) 'Witchcraft Beliefs and Witch Hunts: An Interdisciplinary Explanation', *Human Nature* 24(2): 158–81.
- Kuhn, E. (2017, November) 'Mining for the Future: Dynamics of Artisanal Gold Mining Practice and Governance in the Balan-Bakama (Mande, Mali)'. Thesis.
- Kyanga Wasso, A. (2013) *Sominki En Liquidation: Aide-Memoire Sur L'evolution De La Societe À Kamituga [Sominki in Liquidation : Memorandum on the Evolution of the Company in Kamituga]*.
- Leeson, P.T. (2017) *WTF?! An Economic Tour of the Weird*. Stanford University Press.
- Leistner, E. (2014) 'Witchcraft and African Development', *African Security Review* 23(1): 53–77.
- Miguel, E. (2005) 'Poverty and Witch Killing', *The Review of Economic Studies* 72(4): 1153–72.
- Moore, H.L. and T. Sanders (2001) *Magical Interpretations, Material Realities: Modernity, Witchcraft and the Occult in Postcolonial Africa*. Routledge.
- Moretti, D. (2007) 'Ecocosmologies in the Making: New Mining Rituals in Two Papua New Guinea Societies', *Ethnology* 46(4): 305–28.
- Mulyumba wa Mamba, I. (1977) 'La Structure Sociale Des Balega-Basile' ['The Social Structure of the Balega-Basile']. PhD thesis, Université Libre de Bruxelles.
- Murrey, A. (2015) 'Invisible Power, Visible Dispossession: The Witchcraft of a Subterranean Pipeline', *Political Geography* 47: 64–76.
- Nash, J. (1989) 'Cultural Resistance and Class Consciousness in Bolivian Tin Mining Communities', in S. Eckstein (ed.) *Power and Popular Protest: Latin American Social Movements* (First edition.). Berkeley: University of California Press.
- N'Sanda Buleli, L. (2004) 'Le Bwami Des Lega: Dynamique Interne Et Fondement Du Pouvoir' ['The Bwami of the Lega : Internal Dynamics and Foundation of Power'], in C.K. Djungu-Simba (ed.) *Le Bulega Face Aux Défis De La Modernité*. Huy, Belgique: Les Editions du Pangolin.
- Nunn, N. and R. Sanchez de la Sierra (2017) 'Why Being Wrong Can Be Right: Magical Warfare Technologies and the Persistence of False Beliefs', *American Economic Review* 107(5): 582–7.
- Oster, E. (2004) 'Witchcraft, Weather and Economic Growth in Renaissance Europe', *Journal of Economic Perspectives* 18(1): 215–28.
- Pew Research Center (2010) *Tolerance and Tension: Islam and Christianity in Sub-Saharan Africa*.

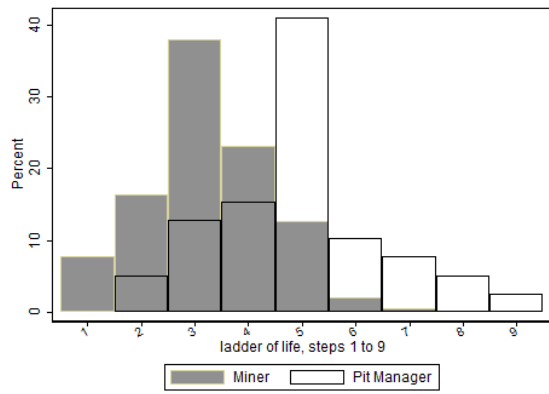
- Platteau, J.-P. (2009) 'Institutional Obstacles to African Economic Development: State, Ethnicity, and Custom', *Journal of Economic Behavior & Organization* 71(3): 669–89.
- Sarpong, S. (2017) 'Sweat and Blood: Deific Interventions in Small-Scale Mining in Ghana, Sweat and Blood: Deific Interventions in Small-Scale Mining in Ghana', *Journal of Asian and African Studies* 52(3): 346–62.
- Stearns, J. and C. Vogel (2015) 'The Landscape of Armed Groups in the Eastern Congo', Congo Research Group, Center on International Cooperation.
- Stoop, N., J. Kilosho, and M. Verpoorten (2016) Relocation, Reorientation, or Confrontation? Insights from a Representative Survey Among Artisanal Miners in Kamituga, South-Kivu, *IOB Working Paper* 2016.09.
- Stoop, N., M. Verpoorten, and P. van der Windt (2019) 'Artisanal or Industrial Conflict Minerals? Evidence from Eastern Congo', *World Development* 122: 660–74.
- Van de Grijspaarde, H., M. Voors, E. Bulte, and P. Richards (2013) 'Who Believes in Witches? Institutional Flux in Sierra Leone', *African Affairs* 112(446): 22–47.
- Vansina, J. (1990) *Paths in the Rainforest: Toward a History of Political Tradition in Equatorial Africa*. Madison: University of Wisconsin Press.
- Vlassenroot, K. and T. Raeymaekers (2004) *Conflict and Social Transformation in Eastern DR Congo*. Gent [Belgium]: Academia Press Scientific Publishers.
- World Bank (2008) *Congo, Democratic Republic of - Growth with Governance in the Mineral Sector*.
- World Bank (2009) *Mining Together. Large-Scale Mining meets Artisanal Mining: A Guide for Action*.

Figure 1. Location of Kamituga



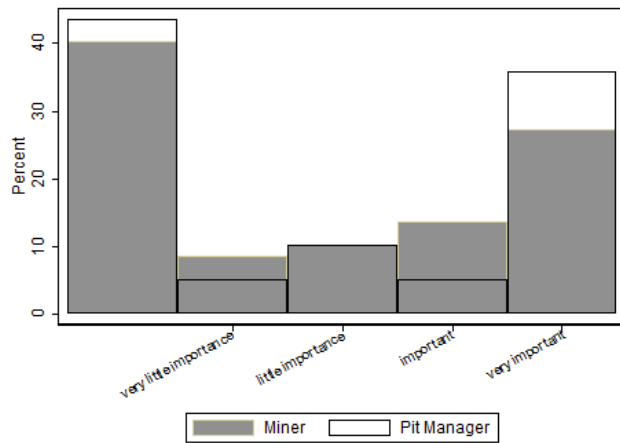
Note: own compilation in ARCGIS

Figure 2. 'Ladder of Life'



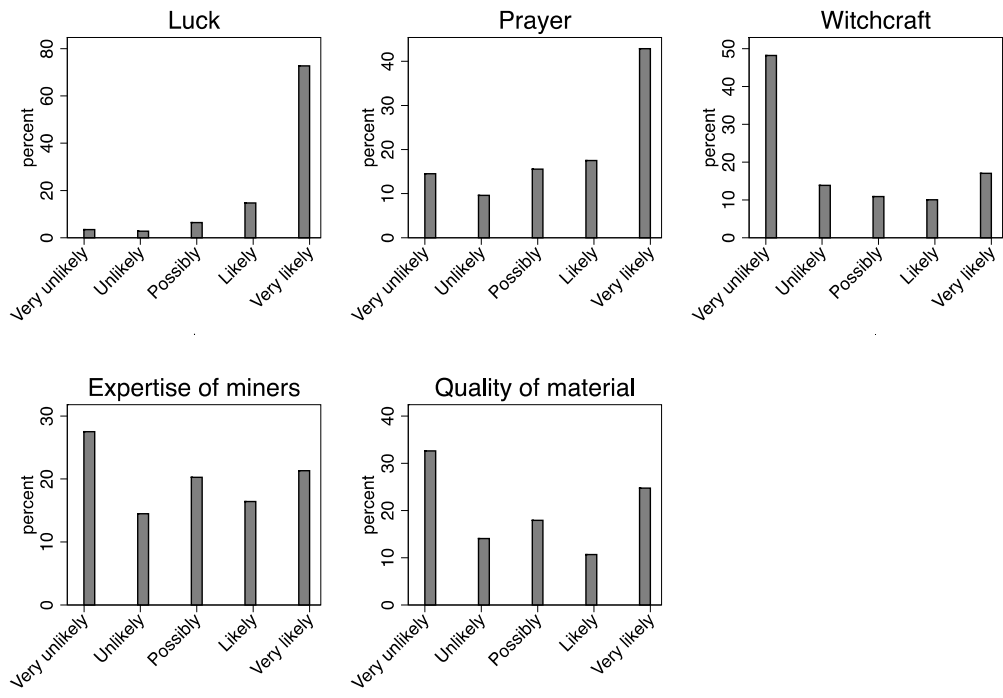
Notes: Calculations are based on the full sample of 430 miners and 39 pit managers.

Figure 3. To what extent is witchcraft a threat to your mining activities?



Notes: Calculations are based on the full sample.

Figure 4. Explanations for quickly finding a large quantity of gold



Notes: Calculations are based on the full sample.

Table 1. Modernity of witchcraft

	Share of witchcraft
Age quartiles	
Miners aged 16-24	77.0%
Miners aged 25-30	76.7%
Miners aged 31-39	78.0%
Miners aged 40-65	78.5%
Highest level of schooling	
Less than primary	85.1%
Primary	79.2%
Lower secondary (years 1-2)	77.3%
Higher secondary (years 3-6)	73.8%
'Class'	
Miner	77.7%
Pit manager	76.9%

Notes: Calculations are based on the full sample.

Table 2. Reasons to use the services of a witch doctor

	Frequency
Increase mining revenue	28
Protect against witchcraft	18
Protect against physical risk	20
Other (open answers)	27
Total	93

Notes: The reasons were given by 64 respondents who indicated to have used a witchdoctor's services. Multiple answers were possible. The category 'Other' includes 'Cure an illness', 'Find lost or stolen objects', 'Win a football game', and 'Find out cause of death'.

Table 3. Alleged senders of witchcraft that affected respondents' mining revenue or health

	Frequency
Miner or pit manager	43
Family member	40
Neighbor or friend	36
Unknown person	16
Myself	7
Total	142

Notes: The alleged senders were reported by 124 respondents who indicated their mining revenue or health had ever been affected by witchcraft. Multiple answers were possible.