

Institutional Innovations for Environmental Governance when Monitoring is Limited

The Case of Small-Scale Gold Mining

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Abstract: Small-scale mining is an important economic option for many rural poor in the developing world. It involves tradeoffs, however, in terms of equity as well as both health and environmental impacts. Management that balances gains with negative side effects is a challenge given limited governance, as the current formal rules for mining are inadequate for the conditions of small-scale gold mining. Thus, we explore alternative institutional governance arrangements for small-scale gold mining to mitigate its negative effects by improving monitoring's effectiveness based on how miners: (1) commercialize their gold production; and (2) partake in local public goods. As producers, miners sell 'up the value chain' to buyers who are larger and thus may well be easier for the state to monitor and thus to regulate. The larger actors, in turn, could induce environmental compliance from small miners by sharing more surplus in bargaining in exchange for shifts in miner behavior that lessen larger actors' regulatory liabilities. As consumers, small-scale miners value public goods such as improved property rights and local infrastructure. Therefore, they might be willing to monitor each other's individual compliance if the level of public goods provided rises with total regional compliance. Our proposed method for exploring potential new institutions is artefactual field experiments complemented by qualitative field work on gold mining in two field sites within Colombia.

1. Introduction

Small-scale mining is an important economic activity in many places within the developing world, including for many poor households. Yet it is controversial, given distributional and environmental tradeoffs. Though perceived by many rural poor as their best option, it can lower quality of life, as mining can be a hazard for workers and local communities while leaving little of the surplus for miners (Hilson 2003; Hinton 2005). Though small-scale mining has a long history as a livelihood strategy (Cremers and de Theije 2013; Hirons 2011; Siegel 2012), there is much debate about its net contribution to local and to regional development (e.g. Hilson 2003, Hinton 2005).

Small-scale gold mining (SSGM) in particular is said to involve 15 million people worldwide and is the world's largest mercury polluter, putting 100 million people at risk of poisoning (Wade 2013). Despite potential gains from regulation, SSGM has been poorly considered in legal frameworks that apply command-and-control designed for large companies to small miners – despite states' lack of ability to enforce this on scattered and migratory actors (Jonsson and Bryceson 2009; Shoko 2003; Hinton 2005) and ignoring potentially different goals for states' interventions at smaller scales. This approach has yielded chaotic, open-access, unregulated and poorly organized mining (Shoko 2003) that functions outside rural development and poverty reduction strategies (Hinton 2005, IIED 2002).

State response to this problem has oscillated in general from failed attempts to formalize small-scale miners to punitive measures such as destroying machinery of miners without concessions; the latter did not reduce SSGM but instead increased the intensity of social unrest (Cremers and de Theije 2013). Technical attempts to improve mining performance have had limited impact due to low adoption. Since below-ground resources belong to the state in many countries and SSGM is not properly recognized in legal frameworks, it is understandable that small miners would not invest in costly technologies; lacking rights, they face legal and economic insecurity (Hinton 2005).

Improved governance can generate welfare gains because more of SSGM's significant rent could remain local while environmental and health damage could be reduced. Yet limited regulatory capacity is a glaring constraint. That fact motivates exploring alternative institutional arrangements for beneficial SSGM governance to achieve efficiencies and share them for local and external gain. Therefore, given this background, I explore alternative institutions to improve environmental performance of SSGM by addressing monitoring and enforcement difficulties within this sector. My empirical settings are two gold production regions within Colombia, a country that accounts for the highest per capita mercury emissions in the world (Siegel 2013). Using artefactual field experiments (Harrison and List 2004) and qualitative tools I explore the potential behavioral responses of small-scale gold miners regarding environmental rules compliance under alternative institutional arrangements with the purpose of improving the governance of this sector.

2. Background: Small-Scale Gold Mining in Colombia

Colombia like other developing countries modified its tax and mineral policies in the last decade in order to attract outside investment. Alongside rising prices for minerals, this led to a sharp increase in the mining permits requested and granted and in the area devoted to mining (Fierro 2012; Rudas

2010).¹ Informal mining sector has grown with the formal sector, while the government's regulatory capacity clearly has not. According to the Colombian Mining Census (2010-2011), 63 percent of the productive units in mining do not even have a mining title from the state and among the 37 percent with a title, 47 percent do not have an environmental license, which is the environmental 'requisite' to operate mining activities.

The gold sector is worse. Colombia has about 180,000 small gold miners (Cremers and de Theije 2013) who generate 50-70% of nation gold production and the highest per capita mercury emissions in the world (Siegel 2013). Choco and Bajo Cauca produce about 80% of the gold and in these key regions over 90% of the productive units are informal – lacking a mining title (Mining Census 2011; Giraldo and Munoz 2012). Choco, in the Pacific region, is the poorest area of Colombia (DANE 2013), one which is inhabited mainly by Afrocolombian communities who own collective land titles that are managed by community councils. SSGM is the main economic activity for many of these communities, one that in some cases is contested by migrants (Sarmiento et al. 2013). In contrast, Bajo Cauca has a mainly mestizo population, who arrived in mining rushes, and individual land rights are predominant, while local governance is weak. Large mining companies with legal concessions co-exist with smaller-scale miners and are part of trying to formalize them (per local officials, summer 2013). Thus, SSGM is central to ongoing development in these distinct regions within which institutional, social and cultural differences should influence local governance.

3. Conceptual framework

What makes people follow the rules is a question with important policy implications. Theoretically, compliance depends on factors including the expected revenue of the alternatives, the probability of getting caught and the severity of punishment (Becker, 1986), moral costs (Funk 2005; Ibanez and Martinson 2013), informal monetary and non-monetary sanctions (Noussair and Tucker 2005; Fehr and Gaechter 2000), the legitimacy and perceived fairness of the state (Tyler, 1990) and risk and intertemporal preferences (Ibanez and Carlsson, 2010). Institutions, how they evolve and shape the incentives faced by the actors involved in a situation have been identified as underlying factors determining human behavior and society outcomes (e.g. North 1990; Ostrom 1990). Therefore, institutions as “the rules of the game in a society, the humanly devised constraints that shape human interaction” (North 1990) are determinant in the governance of natural resources as the literature in

¹ The area in mining titles rose from 1.05 million hectares in 2002 to 8.4 million hectares in late 2009 (Rudas 2010)

collective action and common-pool resources has demonstrated (Ostrom 1990, 2005; McKean 1992; Agrawal 200).

Institutional transformations can arise as endogenous processes within communities but also can be driven from outside as a consequence of, for example, national policies or global markets behavior. Policy designs to improve the provision of environmental services within watersheds through an improvement in effective monitoring in the small-scale gold mining sector could be achieved through enhanced monitoring schemes in mining production chains or inducing cross monitoring among miners. Since miners sell 'up the value chain' to buyers who are larger and thus may well be easier for the state to monitor and thus to regulate (Giraldo and Munoz 2012). The larger actors, in turn, could induce environmental compliance from small miners by sharing more surplus in bargaining in exchange for shifts in miner behavior that lessen larger firms' regulatory liabilities. Thus, by improving regulation at upper levels of the value-chain, a state may induce compliance and improve distribution of gains. Shifting to their interests as consumers, small-scale miners value public goods such as improved property rights and local infrastructure. Therefore, they might be willing to monitor each other's individual compliance if the level of public goods provided rises with total regional compliance.

These ideas are consistent with the literature on collective action and common-pool resources. Since the monitoring and transactions costs can be enormous for the state, some argue customary institutions should play governance roles (Shoko 2003) and we know that local rules and monitoring have been central in some successes in the governance of common-pool resources (Ostrom 1990). Per the idea of miners cross-monitoring, such work has pointed out how decentralized monitoring can result in lower transaction costs and thus greater effectiveness (Ostrom 1990). Concerning other forms of direct state monitoring, the example of joint contracts in microcredit emphasizes that small actors are 'within the reach of their neighbors' and attempts to provide incentives through joint liability (Armendáriz and Morduch 2007). Certification programs (Childs 2008), global value-chains governance (Gereffi et al 2005) or direct state monitoring of gold buyers instead of the small miners (Giraldo and Muñoz 2012) are consistent with the production approach. Concerning production chains, in which larger firms who buy from small miners are much more 'within the reach of the state', vertical alliances are claimed to be a vehicle to improve conditions (Fedesarrollo, 2011).

4. Research methods

In-depth interviews with local miners, gold buyers and local and national authorities in Colombia, in addition to secondary information, indicate how locally distinct negotiations – alongside formal national regulations – are shaping the 'SSGM landscape' in the country. In Choco, the local authorities are crafting rules to regulate SSGM, including concerning revenue sharing between miners and communities. In Bajo Cauca, one large mining firm is ceding part of its title to an association of small miners who, in exchange, must comply with environmental and other rules. If supported by national policy, such local agreements could result in both economic and health gains for the rural poor. The state, in turn, is hoping that more appealing formalization policy will permit the regulation of SSGM's negative impacts such as mercury pollution (part of its commitment to international agreements such as the Minamata Treaty). Nevertheless, without a deeper understanding of the incentives faced by small-scale miners and their potential responses, it is difficult to predict the local outcomes of policy efforts.

Therefore, in this study framed-field experiments (Harrison and List 2004²) are going to be used to explore the individual behavioral responses of miners to potential changes in the rules governing SSGM, combined with surveys to collect information about socio-economic characteristics and perceptions, social interactions, compliance and risk attitudes. Experiments are motivated by potentially strategic and 'behavioral' responses of miners to both bargaining and the fact that their best actions can depend upon expectations about other miners. Then, based on previous fieldwork information on how miners: (1) commercialize their gold production; and (2) partake in local public goods, I study the role of alternative monitoring schemes using framed-field experiments. The alternative monitoring schemes proposed are:

- Facing larger buyers in the production chain with costs based on small-scale behaviors, leads larger actors to use their contact with small-scale to shift incentives for the latter.
- Facing miners with the removal of a public good that was provided conditional on action that generates fewer externalities, in particular removal based on the actions of everyone

² According to Harrison and List's typology, a framed field experiment is the same as an artefactual field experiment but making use of the specific field context in the commodity, the task, or information set that the subjects can use. An artefactual field experiment is the same as a conventional lab experiment but with a non-standard subject pool.

Given the state's different roles, we approach it through two models of state's direct interactions with small miners. In the first, the state monitors and punishes individual miners or alternatively larger actors in the value-chain who bargain with miners for prices and compliance. In the second, the state provides a public good conditional on group's compliance, then the state monitors individuals to assess total compliance and when compliance is below a threshold the public good is removed. Generally, artefactual field experiments can help to explore institutions that do not yet exist, and so cannot yet be observed in the field, or that may exist already but are hard to study empirically. They have been used to test institutional alternatives in settings like this where the other empirical alternatives to examine effects of institution are not available (Cardenas, Rodriguez and Johnson 2011, 2012; Janssen, Andreis and Cardenas 2011). Experiments help to go beyond theory when other-regarding preferences or surplus-sharing are involved, as in bargaining, and expectations formation is critical, as in strategic situations – such as whether to comply if others do or do not.

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