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Slippery Fish

Enforcing Regulation under Subversive Adaptation

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Correcting market failures and improving economic efficiency often require curbing undesirable behaviors of market agents who act to maximize their private benefits. Examples include actions that affect ecosystems, such as deforestation, pollution, and overexploitation of natural resources; actions that affect community health, such as drunk driving and open defecation; or actions that undermine government performance, such as corruption and tax evasion. Enacting and enforcing regulations is the most direct strategy to deter such behaviors. Implementing this strategy requires strong institutions to enforce laws, plus sophisticated policing to track agents' reactions to enforcement so that rules are robust enough to curb the undesirable behavior even when regulated agents try to game the new system.

Effective enforcement is challenging precisely because the targeted agents will react to the new set of rules, finding loopholes that allow them to continue maximizing private benefits at the expense of others. In many instances, it is therefore insufficient to evaluate the effectiveness of enforcement activities based on their immediate, short-run effects before regulated agents have had a chance to adjust to the new regime. A more sophisticated evaluation will need to track the (sometimes unanticipated) strategies that targeted agents may deploy to circumvent the regulation.

Economic theory provides guidance on the design of optimal audit strategies when monitored agents can adapt. The literature on audits shows that when monitoring is costly and agents can hide their undesirable activity, a policy of random audits beats a policy of deterministic audits. Some studies go further to show that even when monitoring is costless, random audits are best because they dissuade cheating by the agents. These findings also present an important counterintuitive insight: in the short-term, the monitor could better deter fraud by reducing the frequency of audits. This occurs because each audit creates a learning opportunity for the agents about the nature of the audit technology. By lowering the frequency of audits, the monitor hinders the ability of agents to learn.

We test the empirical relevance of these insights by investigating the effects—and the limits—of enforcement in the

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context of illegal sales of the critically endangered South Pacific hake in Chilean markets. The government of Chile has instituted a ban on fishing and sales of hake during September each year, when the fish reproduces. Catching hake during that period is especially ecologically destructive. We implemented a randomized controlled trial in which government agents monitored and penalized vendors that sold illegal fish, while we secretly monitored vendors' reactions to that enforcement by deploying mystery shoppers to search for illegal hake in markets. Following the theoretical literature on optimal audit strategies, we also randomly varied the predictability and frequency of enforcement activities to study whether those variations are more effective in achieving the social goal in the presence of subversive adaptation by regulated agents. We find evidence consistent with previous recommendations of random audits and confirm our insights about low-frequency audits.

To guide policy, we also implemented a consumer information campaign, which we benchmarked against the effects of stricter enforcement. This kind of demand-side strategy can be easier for policymakers to implement. When it is difficult or expensive to enforce rules, less-direct strategies, such as information campaigns designed to change social norms associated with the undesirable behavior, marketing that appeals to people's sense of fairness, or the encouragement of third-party reporting, may be more reliable or more cost-effective. Our information campaign was designed to educate consumers about the environmental risk associated with the overfishing of hake and to discourage the consumption of illegal hake during the September ban period. This campaign could even complement the audit strategy: if vendors react to the enforcement by hiding their illegal hake sales, then informed consumers may be an important second line of defense. Our experimental design with enforcement, information, both, or neither can test for such complementarities.

Since we are tracking an illegal activity, our main outcome variables for the evaluation are collected through a mystery-shopper methodology. We sent trained surveyors who looked like typical shoppers to each market to pose as buyers and (try to) purchase fish during the ban. We collected data on whether it was possible to buy hake and its substitutes, documented fish prices, and recorded strategies vendors were employing to circumvent the ban. Vendors would have an incentive to hide illegal hake sales from enumerators, which is why this approach improves the credibility of our evaluation data.

We also conducted consumer surveys before and after the interventions to gather data on changes in demand for hake and other substitutes and to gather consumer knowledge about the hake ban. We mapped all regional and market relationships between vendors and fishermen to study potential effects on other markets. Finally, we surveyed the fishermen who supply these markets to explore whether interventions implemented downstream (at the point of sale from vendors to consumers) traveled upstream along the supply chain of fish. It is ultimately the fishermen who make the ecologically sensitive decisions in the seas. Our sample covers all major markets where most hake are caught, which allows us to report on outcomes such as changes in fishermen activities or the prices of hake substitutes. This produces a more comprehensive evaluation of the full range of effects up and down the supply chain.

We found that many vendors continued selling illegal hake during the ban, but both the enforcement treatment and the information campaign reduced their propensity to do so. Declines in hake sales in areas where the novel enforcement method was implemented during the ban period are twice as large as the decline in the control markets. Enforcement generates slightly larger reductions in hake sales compared with the information campaign. Our mystery-shopper data provide clear evidence that vendors react to enforcement activity by engaging in new practices designed to circumvent our attempts to levy penalties. Many vendors do not display the hake openly during the ban but are willing to sell our mystery shoppers hake that is hidden from plain view. They also start keeping the hake on ice while claiming that the hake on display were caught in August when it was still legal to do so. These reactions attenuate the effects of enforcement on the true availability of illegal hake in markets.

Our experiments varying the specific attributes of the enforcement policy yield new insights about how to design and implement more-effective audit strategies when regulated agents adapt to circumvent monitoring. First, monitoring vendors on a predictable schedule is relatively ineffective. Vendors find it easier to sell when the enforcement visits become predictable. We also tried increasing monitoring frequency to better contain spillovers into other days of the week or other nearby markets, but this strategy backfired.

Increased frequency evidently allowed fish vendors to learn the monitoring routines more quickly and react with greater hiding and freezing of illegal fish. In the locations where we sent monitors on unpredictable and less-frequent schedules, vendors were not able to learn and adjust as quickly, and this resulted in large reductions in hake sales, even accounting for the hiding and freezing response. These findings shed light on a larger amount of theoretical literature regarding subversive reactions to regulations.

We generate evidence on the real-world challenges to implementing an auditing scheme in one specific sector, but the sector and policy we study are globally relevant and important. The Food and Agriculture Organization of the United Nations in 2014 estimated that 31.4 percent of the world's fish stocks were overexploited to biologically unsustainable levels in 2013, up from 10 percent in 1974. Illegal fishing accounts for $10–$23 billion worth of fish each year. Fishing bans of the type we study in Chile are in effect in many countries around the world, including China, Fiji, India, Ghana, Bangladesh, Peru, and Myanmar. Some of these other policies are extremely similar in structure to the Chile hake ban, such as a 22-day ban on selling hilsa in Bangladesh during the fish's reproduction period and a 60-day ban on silverfish in Peru.

In summary, we first develop a strategy of data collection and evaluation that allows us to clearly document sellers' hidden illicit adaptation to enforcement. We then test predictions from the theory of optimal audits and show that random audits conducted at low frequency more effectively deter illegal activity. Finally, we show that an easier-to-implement consumer information campaign is almost as effective in curbing the illegal activity as direct monitoring.

NOTE

This research brief is based on Andres Gonzalez-Lira and Ahmed Mushfiq Mobarak, "Slippery Fish: Enforcing Regulation under Subversive Adaptation," Institute of Labor Economics Discussion Paper no. 12179, February 2019, https://ftp.iza.org/dp12179.pdf.