Mongabay Series: Asian Rhinos

Is the rhino horn trade a cartel? Economic analysis suggests it works like one

by Abhaya Raj Joshi on 12 August 2019

- *Economist Adrian Lopes used data modeling to explore the links between rhino horn suppliers in India and South Africa.*

- *His findings suggest a market model in which suppliers in the two countries collude rather than compete, setting a quantity and price that maximizes profits all around.*

- *Lopes's research also indicates that stricter conservation laws can reduce the number of rhinos being killed, but that corruption and institutional instability can erode those gains.*

When economist Adrian Lopes read a recent report by the World Wildlife Fund (WWF), a question popped into his mind. The report, which described rhino poaching and counter-poaching measures, talked about the link between the countries where rhinos are found and countries where rhino horns were in great demand for their purported medicinal properties. The economic researcher in him thought there was another piece of the puzzle to explore.

"The report briefly mentioned South Africa, Asia and India as the main source countries for rhino horns, which made their way to China and Vietnam," says Lopes, an assistant professor at the American University in Sharjah, United Arab Emirates. "But it did not talk about the link between the source countries." Lopes decided to examine the issue in a paper recently published in the Australian Journal of Agriculture and Resource Economics.

Having previously researched the rise of poaching in India's Kaziranga National Park, he had an idea about where to start looking for answers. Of all the rhino range countries, only India and South Africa make available detailed, long-term and up-to-date records of poaching cases, he says. (Nepal also maintains detailed records, but poaching numbers there are too low to provide much data.)

Lopes's curiosity grew when he compared the graphs of poaching cases in the two range countries. "I noticed that when the number of poaching cases rose in South

Africa, a similar spike could be seen in India. Similarly, a fall in India would correspond to a fall in South Africa," he told Mongabay.

Since the illicit trade of rhino horn is, essentially, an international commodity business, Lopes had a hunch that analytical tools used by economists could help shed light on what was happening.

Looking at the trends in the data, he set out the objectives of his study. He wanted to see what the available data suggested about the relationship between suppliers in India and South Africa; to develop a model to explore the impact of factors such as the rule of law and corruption; and to see if he could find a model that would predict the black-market price for rhino horn.

A female black rhinoceros. About 5,000 members of the Critically Endangered species remain — still perilously low, but almost twice as many as were alive in the 1990s, after poaching and habitat loss drove the species to the brink of extinction. Photo by Rhett A, Butler/Mongabay.

Collusion between suppliers

While rhino horn is an internationally traded commodity, it isn't just an ordinary trade good. High barriers to entry — namely, the need for connections and resources to

smuggle an illegal commodity without getting caught — mean that rhino horn traders don't operate in an open market with perfect competition. On the other hand, horns are sourced from multiple countries in two continents, which means that a complete monopoly is also unlikely.

With this in mind, Lopes chose to test whether the available data on the rhino trade fit with a market model known as "collusive oligopoly." The most famous example of this type of market is OPEC, the Organization of the Petroleum Exporting Countries, effectively a cartel that decides together how much oil to make available on the global market, and at what price. Illegal drug cartels are believed to operate along these same lines, and studies have pointed to similar patterns in [the illegal trade of tiger parts](#) in China. "Similar is the case with rhino horns," Lopes says.

Lopes built his mathematical model with a few theories in mind. First, he hypothesized that if the rhino horn market did indeed function as a collusive oligopoly, South Africa would be the market leader due to its much larger population of rhinos (the same way Saudi Arabia has historically played the dominant role within OPEC). He also predicted it was unlikely that suppliers retained large stockpiles of horns, due to the inherent dangers and difficulties of storing illegal goods. Instead, he hypothesized that the number of rhinos killed in a given period most likely correlated to how many rhino horns suppliers believed they could sell during that time.

Further, he predicted that South African suppliers would set the optimum price and quantity to maximize profits, a calculation factoring in the costs of procuring rhino horns and smuggling them to Asian markets. In turn, Indian suppliers would adjust the quantity and price of the horns they supplied to those same markets, in line with the expectations set by South Africa.

Lopes ran a series of statistical analyses on this collusive oligopoly model. He found the data were a good fit, indicating that his hypotheses were valid. What emerged from the data was a picture of a complex, intertwined model in which suppliers in South Africa set the price, while suppliers in India acted in concert to maximize profits all around.

But Lopes has a word of caution: his research is limited to fitting data points into a model and doesn't provide any insight into what form such collusion might take. He says he doesn't intend to suggest, for example, that rhino horn traders from around the world hold regular in-person meetings to hammer out details. "Given the clandestine nature of rhino poaching, all one can do is theorize and try to find empirical evidence to support the theory," he says. "One cannot presume to know exactly how a syndicate runs its criminal operations."

A greater one-horned rhino in India's Kaziranga National Park, home to the world's largest population of greater one-horned rhinos. A recent economic analysis suggests that rhino horn traffickers in India and South Africa collude rather than compete. Photo by Udayan Dasgupta for Mongabay.

Rule of law vs. corruption

Lopes also aimed to explore how external factors such as law enforcement and corruption, as well as shifting demand, have an impact on the number of rhinos killed for their horns.

His next step was to attempt to control for these factors within his model. Previous research suggested that the key factor in the demand for rhino horn was the income of potential consumers in the major markets of Vietnam and China (price, by contrast, had been shown to have relatively little impact on demand, a familiar pattern for luxury goods). Accordingly, Lopes factored in data about economic activity per capita in these countries. Similarly, to control for corruption and governance, Lopes used World Bank indices on institutional quality such as corruption control, rule of law, and political stability. To control for conservation

policy, he plugged in data about penalties imposed on poachers in the two source countries.

Even after controlling for these factors, poaching in India was found to be positively and significantly related to South African poaching. In particular, there was a strong association between the number of rhinos killed for their horns in South Africa in a given year, and the number killed the following year in India.

While dealing with the control factors, Lopes observed that as corruption and institutional instability increased, so did poaching. By contrast, stricter environmental protection laws and higher penalties for violating them were associated with a decline in rhino killings. The interplay of these various factors can be complex. In India, for example, he observed that although conservation policy has become stricter over time, the impact of corruption and instability remains so large that it consistently outweighs the positive effects of conservation policy.

Lopes also sought to retrace and predict black-market prices of rhino horns. To do that, he used the data he had collected about income in Vietnam and China (as a proxy for demand) and a reference price of $65,000 per kilogram of rhino horn in 2012, drawn from a study by economist Michael 't Sas-Rolfes. The model came up with a figure of $69,454 to $77,548 per kilo of rhino horn by 2022.

A white rhinoceros grazes in South Africa's Kruger National Park. The country is home to

around 80 percent of the world's rhinos and has also been the hardest hit by poachers, with losses reaching a high of 1,215 animals in 2014. Photo by Rhett A. Butler/Mongabay.

Applying the findings

Even within the field of economics, debate rages over when and how data models can be used to explain and predict real-world phenomena. And applying such research to conservation policy can be even more controversial. "As an economist, I see that the people involved in conservation are divided over this work," Lopes says.

Still, he says he hopes his work can provide law enforcement officials and conservationists with fresh insights and a useful analytical framework.

Conservation policy has traditionally focused on demand reduction and improving anti-poaching strategies. "However, given the increasing interconnectedness of trade and information flows across borders we propose that conservation policy also focus on the possibility that endangered species trade might be coordinated across borders — from source to final consumer," Lopes writes.

He says he has been invited to several conferences to talk about his findings, and that this encourages him to do similar work in the future. "I have seen an increasing amount of dialogue between conservationists and economists. Questions are asked from both the sides and an increasing number of economists are getting to work on panels related to conservation."

CITATION:

- Lopes, A. A. (2018). Transnational links in rhino poaching and the black-market price of rhino horns. Australian Journal of Agricultural and Resource Economics, 63(1), 95–115. https://doi.org/10.1111/1467-8489.12286

Banner image: A white rhino in South Africa's Kruger National Park, by Rhett A. Butler/Mongabay.