CHAPTER 3

RHINO HORN AND THE ECONOMICS OF WILDLIFE TRADE: RISKS AND UNCERTAINTIES

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1. THE UNCERTAINTIES

In the aftermath of the current poaching crisis, lifting the ban on international rhino horn trade has been proposed as a means to fight illegal trade. This proposal is based on the premise that a legal supply of rhino horn can make illegal trade economically unviable and thereby reduce poaching to a significant degree. In this note we assess this policy recommendation from the point of view of market analysis.

The uncertainties surrounding current market conditions in the rhino horn market make a strict policy evaluation impossible. But we can assess the premise in terms of the necessary and sufficient conditions under which market processes can be expected to deliver the mentioned result. A robust policy would be one that has the expected effect under a broad range of plausible conditions. In this case, these conditions include a range of assumptions about agent's behavior and market configurations. The underlying economic theory, that is, the relationships linking causes to effects in the workings of market processes, is also a key component of this assessment exercise.

As we will show in this note, the case in favor of removing the trade ban as a policy to reduce poaching is not robust: it only makes sense under highly restrictive and implausible assumptions about agents' behavior, market conditions, and economic relationships. Once any of these assumptions is removed and we consider more plausible factors (like demand expansion, laundering of horn, the existence of market power strategic behavior), the introduction of a legal flow of trade is unlikely to reduce poaching significantly.

The argument in favor of legal trade is based on the premise that illegal markets and poaching activities are a consequence of the scarcity of rhino horn produced by the trade ban itself. The demand for rhino horn is assumed to be large, stable, and relatively insensitive to price movements, meaning that the quantity demanded will persist even at very high prices. Under such conditions of demand, the artificial scarcity produced by the ban stimulates the illegal market, as the existence of very high prices more than compensate the costs and risks of trafficking. Therefore, the argument concludes that introducing a legal trade flow will reduce prices and make illegal supply and poaching not profitable. Trade legalization offers additional benefits, like making changes in quantities and prices easier to monitor. More importantly, a legal trade will generate a source of revenue that can de re-invested to improve security and conservation.

2. THE FLAWS IN TRADE PROPOSALS

The proposition that trade legalization can reduce poaching, has been presented in a series of papers, reports and articles related to a series of endangered species. Although this literature exhibits various degrees of quality, our review has found three major flaws. First, the argument is carried upon poor knowledge and command of economic theory. It relies on highly restrictive assumptions about behaviour and market interactions, suppresses the complexities of price-formation mechanisms, the role of economic structure in determining agent's behavior, and the importance of dynamic phenomena. For example, the main causality mechanism underlying the premise is that the quantity demanded of a good reacts in an inverse way to price movements. However, this type of reaction does not necessarily hold for all markets, all consumers, and all time. As economic theory showed 40 years ago,

even if that type of reaction to price movements is verified for individual consumers, the aggregated reaction of consumers may not necessarily add up to the same result. In addition, other factors like income effects and speculative value can produce that both prices and demand increase simultaneously, *au contraire* to the argument in favour of trade.

Second, the literature in favour of trade is not rigorous in the need to support assertions with hard data. It fails to provide information of market conditions like market size, potential demand, the sensitivity of demand to price movements (or demand *elasticity*), or the prices at which poachers and illegal traders will choose to abandon the market. The value of these variables and parameters is key to the argument, for even in the case where economic relationships prove to be similar to those assumed, a legal trade may still fail if, for example, demand is too large with respect to the legal supply. Based on poor theory and weak on data, the literature in favour of trade tends to be rich in opinions that carry no scientific weight.

A third flaw is the ignorance of the social, economic and institutional context in which trade would take place. Economic decisions involve much more than simple reactions to prices. They also depend heavily on preferences, the range of alternative choices and on the environment created by established rules and norms. For these reasons, market outcomes cannot be forecasted or even understood if the decision environment is ignored.

In our review, we found a small but significant set of scientific literature on the issue of wildlife trade and the effects of legalization on poaching published in specialized, peer-reviewed economic journals. In most part, these papers are comparative statics exercises based on partial equilibrium analysis, a branch of economic analysis. They focus on wildlife species in general, although some of them do include specifications adapted to rhino horn trade. The general conclusion in these papers is that when known risks and conditions are considered, a legal flow of supply may fail to out compete the illegal market and may actually increase poaching.

This literature has identified three types of market configurations under which trade legalization fails to reduce poaching. First, if legalization reduces the social stigma associated with the consumption of illegal products, the legalization of wildlife trade can bring in new consumers and expand the quantity demanded to an extent that poaching is not reduced.[1]

3. THE RELATIONSHIP BETWEEN LEGAL AND ILLEGAL MARKETS

A second problem involves the relationship between legal and illegal markets. The trade solution relies on a strict separation of legal and illegal supply of rhino horn. However, when illegal products can be laundered and passed as legal, traffickers can access the market without engaging in dangerous and costly distribution activities. A series of papers have shown that if the costs and barriers to market access for illegal supply are reduced as a result of legalization, the introduction of a legal supply will fail to reduce the level of poaching.[2] A similar outcome will result if the demand for wildlife products has characteristics that preserve a market niche for illegal supply that the legal supply cannot fulfil, as when products are differentiated. This will be the case of distinct preferences for wild product (against farmed product) or for full rhino horns as opposed to small pieces or grinded horn.

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[1] Fisher (2004).

[2] Abbott and van Kooten (2011), Bulte and Damania (2007), Bulte and van Kooten (1999).

4. SUPPLY STRUCTURES

A third problem is related to the form in which supply structures are organized. Typical factors in determining the structure of supply are the number and nature of agents involved in the extraction, distribution, and selling of rhino horn, the way in which they compete or cooperate, and their alternative ways of behavior. These factors are crucial determinants of the process by which prices are formed. They have been however completely ignored in the literature that favors trade. It has been shown that in the presence of market power (which means that suppliers are not passive price-takers but that can to some extent impose, bargain, or collude to influence, market prices) legalization will likely fail to attain its goal even if it succeeds in reducing prices, because illegal traders could increase poaching to compensate for profit loss, or even outcompete farmers if the costs of poaching are lower that the costs of farming.[3] Laundering of wildlife products has been documented over a range of regulatory regimes, and for the cases of tigers, ivory, porcupines, green pythons, vicuña, and orchids.[4] Even the highly regulated U.S. ivory market was shown to operate with as much as 30% of ivory from illegal sources.[5]

5. THE PRECAUTIONARY APPROACH

This literature recommends a precautionary approach to trade in rhino horn. However, all above mentioned papers, both formal and informal, are based on a specific branch of economic analysis that relies on a deeper set of assumptions about the nature and behavior of market forces. This theoretical approach also has important limitations that must be considered when informing policy design.

6. THE EQUILIBRIUM APPROACH

The equilibrium approach is based on the examination of equilibrium conditions, that is, the values of prices and quantities at which individual agents manage to match their goals in a coordinated way. Somewhat surprisingly to non-economists, this theory does not actually describe market *processes*, but conditions for individual maximization. So to speak, it is as if all the adaptation involved in matching the agent's plans and goals would happen instantaneously, without mistakes or ignorance, in the heads of agents. This theory however, cannot say anything significant about how such equilibrium or coordination arrangements are actually arrived at. Also surprisingly, this theory only works in one-commodity worlds; once more goods are introduced relative prices are problematic. The theory can only examine supply chains actually in a highly simplified way and is fundamentally incompatible with features of modern commercial organizations like the pursuit of new forms of operation, new products, and new markets. Finally, key issues like the existence of uncertainty about market conditions and about other agents' behavior, o the influence of historical developments and cumulative effects, are also incompatible with the formal building of the theory.

In order to more fully assess the possible effects of rhino horn legalization on poaching and illegal activity the dynamic aspects of the market process must be taken in to account. One of such factors is the potential endogenous growth of demand patterns that respond to conspicuous consumption. While the canonical trade argument considers the demand for rhino horn to be stable, taking as a reference small and occasional uses of

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[3] Damania and Bulte (2007).

[4] Hemley and Mills (1999), IFAW (2006), Brooks, Roberton, and Bell (2010), Lyons and Natusch (2011), Phelps, Carrasco and Webb (2014).

[5] Stiles and Martin (2008).

horn regulated by traditional Chinese medicine, there is increasing information that current demand is also driven by values of prestige, ritual codes for gift, and social imitation, particularly in the Vietnamese market. These features describe consumption patterns governed by social emulation, with relative independence of changes in quantities and prices. If this is the case, the dynamics of demand are likely to exhibit so-called endogenous network or cumulative effects, whereby consumption preferences increase as the size of the market does.

7. MARKET DEVELOPMENT

A second aspect to consider is market development, or the emergence of new uses, new products, and new distribution networks. This feature also is supported by emerging evidence of carved rhino horn being manufactured in Vietnam for the Chinese market. Such changes in the features of retail markets have the effect of accelerating demand expansion through the creation of new markets for illegal products.

8. DYNAMICS OF THE SUPPLY SIDE

Finally, dynamic aspects on the supply side are of key importance. The literature in favor of trade fails to consider the crucial fact that illegal trade is carried on by criminal organizations, which hardly respond to the features of standard, price-taking economic agents. As indicated by the information on seizures of illegal transactions, the illicit organizations that trade poached rhino horn also trade in a range of wildlife products. Their operations will be rather similar to what is known in the economics as multi-product firms. These types of firms reduce their unit costs by utilizing common assets in the production of a set of different products. Moreover, the commercialization of their products depends on assets like detailed regional information networks, which cannot be readily developed or acquired. Such advantages will not be readily accessible to legal sources of rhino horn, reinforcing the position of illegal agents at the consumer-end of the market.

9. EVIDENCE FROM OTHER ILLEGAL WILDLIFE MARKETS

Empirical evidence from other illegal wildlife markets show that the supply of these products is undertaken by a multi-layered chain of agents, with different degrees of specialization and bargaining positions. Retail prices of these products are formed through a series of exchanges that add value to the product according to the agent's ability to set prices and control the market. While poachers and illegal hunters normally obtain between 10 and 20% of the final market value, wholesale and retail traders tend to retain between 60 and 70% of the total value of the chain. These are the agents that actually control the illegal wildlife markets. The proponents of trade have simply ignored the need to elaborate on the trade mechanisms by which a legal flow of rhino horn would actually enter the market. Intangible assets based on information networks and market positioning are likely to be retained by the agents that currently dominate the illegal trade; given their advantageous position, these agents are more likely to continue dominating wholesale and retail markets. The legal supply of African rhino horn is thus unlikely to determine and control market conditions and influence retail prices.

Finally, the possibility that a legal supply can reduce prices depends critically on its relative size to demand. Official estimates calculate that South Africa's potential sustainable supply of rhino horn (obtained from natural deaths, de-horning, and broken horn collection) could offer between 2.6 and 3.9 tons of horn annually for 2014 (Department of Environmental Affairs, 2014, p. 73). The few estimates on demand indicate that potential supply is

unlikely to clear the market at low prices.[6] And here emerges what is probably the main contradiction of the argued trade solution. If demand exceeds supply, the price set by legal horn traders will need to increase in order to reduce the market for illegal products. But by doing that it will fail to achieve its main goal, which is precisely to reduce prices and incentives to poaching. Even when assuming that all the above mentioned factors (stigma reduction, laundering, product differentiation, market development, and competitive advantages on the side of illegal traders) can be controlled in one way or another, an excess demand of a large magnitude will make useless any trade mechanism.

10. CONCLUSION

- The claim that legalization will make illegal trade un- profitable is not robust (its positive effects will not hold for a wide range of plausible conditions)

- Effects of legalizing rhino horn trade are uncertain, but many possible consequences are dangerous and most likely will prevail over positive outcomes

- Under many market configurations, legalization can be expected to preserve and reinforce illegal trade and poaching

REFERENCES

Abbott, B., & van Kooten, G. C. (2011). Can domestication of wildlife lead to conservation? The economics of tiger farming in China. *Ecological Economics*, *70*(4), 721–728. doi:http://dx.doi.org/10.1016/j.ecolecon.2010.11.006

Brooks, E. G. E., Roberton, S. I., & Bell, D. J. (2010). The conservation impact of commercial wildlife farming of porcupines in Vietnam. *Biological Conservation*, *143*(11), 2808–2814. doi:http://dx.doi.org/10.1016/j.biocon.2010.07.030

Bulte, E. H., & van Kooten, G. C. (1999). Economic efficiency, resource conservation and the ivory trade ban. *Ecological Economics*, *28*(2), 171–181. doi:http://dx.doi.org/10.1016/S0921-8009(98)00048-2

Damania, R., & Bulte, E. H. (2007). The economics of wildlife farming and endangered species conservation. *Ecological Economics*, *62*(3–4), 461–472. doi:http://dx.doi.org/10.1016/j.ecolecon.2006.07.007

Department of Environmental Affairs. (2014). *The viability of legalising trade in rhino horn in South Africa* (pp. 1–108). Pretoria, South Africa.

Fischer, C. (2004). *The complex interactions of markets for endangered species products. Journal of Environmental Economics and Management* (Vol. 48, pp. 926–953). Washigton, D.C. doi:http://dx.doi.org/10.1016/j.jeem.2003.12.003

Hemley, G., & Mills, J. (1999). The beggining of the end of tigers in trade? In J. Seidensticker, S. Christie, & P. Jackson (Eds.), *Riding the tiger*. Cambridge: Cambridge University Press.

IFAW. (2006). *Ivory Market in China -China Ivory Trade Survey Report- International Fund for Animal Welfare*.

Lyons, J. A., & Natusch, D. J. D. (2011). Wildlife laundering through breeding farms: Illegal harvest, population declines and a means of regulating the trade of green pythons (Morelia viridis) from Indonesia. *Biological Conservation*, *144*(12), 3073–3081. doi:http://dx.doi.org/10.1016/j.biocon.2011.10.002

Martin, E., & Stiles, D. (2008). *Ivory markets in the USA* (p. 122). Kingsfold, West Sussex and London.

Phelps, J., Carrasco, L. R., & Webb, E. L. (2014). A framework for assessing supply-side wildlife conservation. *Conservation Biology : The Journal of the Society for Conservation Biology*, *28*(1), 244–57. doi:10.1111/cobi.12160

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[6] TRAFFIC's most recent demand survey in Vietnam applied to a random sample of 600 people in two main cities produced a figure of 5% of users and a personal average consumption rate of 1 gram of rhino horn every two weeks. This estimation is hardly representative, but provides at least an idea of the order of magnitude of demand. Considering only a population range of people above 15 years (in order to exclude children) in Vietnam's four largest cities (Hanoi, Ho Chi Mihn City, Haiphong and Da Nang), the potential consumption would reach 4.5 tons a year with a consumption rate of 2% and 9 tons with one of 4%.