White Rhino Horn:

A Case for the Legalization of Trade

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1: Introduction

1.2: Introduction to the CITES Ban

In 1975, CITES, Convention on the International Trade of Endangered Species, imposed a worldwide ban on the sale and trade of rhino horn in an effort to save a declining rhino population from extinction. It would seem like such a ban would be a logical first step towards saving the rhino. However, in 2011 the western black rhino of sub-Saharan Africa was declared extinct (York, 2013). Wasn't a ban on the trade of rhino horn supposed to prevent this from happening? To the casual observer, this seems like a sad and unfortunate loss of a species as a result of illegal hunting by malicious syndicates. To an economist, this can be boiled down to simple supply and demand: if an illegal good has a high price tag and there is a demand for that good, there will also be a supply. Unfortunately in this case, demand was fueled by a false perception of rhino horn as a medicinal cure-all in Asia and this misconception led to the extinction of one of the most magnificent animals on the planet.

1.1: Success of the Privatization of White Rhino Population

In the year 1900, there were only 20 southern white rhinos left on the planet, located in the Umfolozi Game Reserve in South Africa, and this species was on the verge of extinction ("Rhinoceros Interactive Timeline", 2014). Today, southern white rhinos number nearly 20,000. What happened? The South African government auctioned off the remaining southern white rhinos to ranchers and entrepreneurs, thus creating property rights over the animals and giving owners an incentive to keep the rhinos alive. Rhino owners realized that high potential revenue existed in this market and bred their rhinos for profit. Not only did this save the southern white rhino, but showed the world how assigning property rights could save a species on the brink of extinction.

Sadly, during this time, other rhino subspecies did not fare as well. Numbering over 100,000 in 1900 when the white rhino numbered only 20, the black rhino has seen a reversal of fortune (‘tSas-Rolfes, 2013). Compared to their counterpart, the white rhino, whose population is over 20,000, the black rhino’s population is under 5,000 (‘t Sas-Rolfes, 2013). Why is this? Unlike the white rhinos, the black rhinos were not treated as property. Driven by an insatiable demand for voodoo medicine in Asia, poachers devastated the black rhino population. Despite the 1975 ban on rhino horn trade, the demand for rhino horn remained and the price tag was inflated as a result of its illegality. What we can glean from this history lesson are two things: first, that a ban in the name of protecting the rhino will not save the species from extinction, but it will accelerate the process. Secondly, privatizing rhinos is a good first step in saving the species.

1.3: Why Privatization Alone is Not Enough to Save the Species from Extinction

We are advocating for the removal of the ban on rhino horn trade and the implementation of a solution to save the rhino from inevitable extinction. We believe that by both assigning property rights to rhinos and by legalizing trade of rhino horn, the rhino population will be able to flourish. This paper focuses on the effects to the white rhino population after trade legalization because the white rhinos are currently privatized and more data exists surrounding the species. However, the results are applicable to all African rhino species.

While assigning property rights and auctioning off white rhinos has played a huge role in the increase in white rhino population, we believe that even more could be done to help the species thrive. Poachers kill rhinos to extract their horns, but farmers can safely dehorn rhinos in a way that causes no pain or death (Save The Rhino, 2014). Legalizing the trade of rhino horn

would lead to a huge influx of supply into the market. Not only could farmers immediately dehorn their animals and sell the horn, but the horns would grow back (approximately 0.9 kg per year), leading to even more potential supply being put into the market. Because of the economic principle of supply and demand, an increase in supply leads to a decrease in price. According to Sam Wasser, a conservative biologist at the University of Washington and a leader in the worldwide effort to stop illegal horn trade, if the price per kg of horn could be reduced from $65,000 to a few hundred, poachers would have little incentive to continue to poach (York, 2013). We hypothesize that this could be done through the legalization of trade.

We composed a comprehensive literature review of the current problem facing the rhino populations and the proposed solutions to gain a basis for understanding and to expand our knowledge of the matter. We then collected current data regarding rhino characteristics, populations and black market horn prices to develop a model that shows the price and quantity of rhino horn that must enter the market by way of legalized farming, that would bring the value of rhino horn low enough such that the incentive to poach rhinos would be eliminated. The purpose of this project is to show by way of an economic model that legalizing trade, in combination with privatization, could reduce poaching and allow the white rhino population to thrive at nearly its natural growth rate. While others have reached this same conclusion, our research goes one step further by creating an actual model with current data to visualize and analyze the problem more precisely.

2: Literature Review

Much literature has been published regarding the issue of poaching that rhino populations face and various solutions have been proposed to amend the situation. In 1975, CITES imposed a

ban on the trade of rhino horns in an effort to save the species. However, due to the unavailable nature of the rhino horn as an illegal good, high prices and an extremely lucrative black market have provided large incentive to illegally hunt and dehorn African rhinos. Experts on the subject agree that the ban on rhino horn trade has been ineffective, if not detrimental to the preservation of the rhino species (Eustace, 2012 & 't Sas-Rolfes, 2012).

One of the proposed solutions to bring the price of rhino horn down and thus curb poaching is to extend rhino ownership to private actors. This was tried first in South Africa in the 1980s, when The Natal Park Board of South Africa decided to start treating rhinos as private property and sell them for a low fee. However, because the trophy prices greatly outweighed the price of a live rhino, the owners had a huge incentive to sell their animals as trophies instead of harvesting them (‘t Sas-Rolfes, 2012). In 1986, the Natal Park Board started to auction the rhinos, which ended up lessening the gap between the prices of a live rhino vs. a trophy. This provided ranchers with an incentive to breed the animals as opposed to kill and trophy them. In 1900, only 20 white rhinos were in existence (‘t Sas-Rolfes, 2011). Through the implementation of these new policies, that number has grown to over 20,000 (‘t Sas-Rolfes, 2012). Despite the success of the privatization, there is reason to believe that even more could be done to increase the white rhino population by lifting the trade ban.

Theoretically, trade bans are intended to reduce trade, but in actuality they increase the risks of trading, and subsequently the costs. Because consumers do not invariably follow the law, if demand is sustained, illegal supply will also persist. Since the demand for rhino horn seems to be price inelastic (high demand despite extremely high prices), reducing supply will exponentially increase the possible profits for poachers. Therefore, it seems that the ban is

having the opposite effect of its intent, and even more rhinos are being killed under the guise of protection (‘t Sas-Rolfes, 2013).

“Perspectives on Dehorning and Legalized Trade in Rhino Horn as Tools to Combat Rhino Poaching” convened by The Endangered Wildlife Trust and sponsored by The South African Mint Company is a collection of professional views and opinions on the matter of dehorning rhinos and legalizing the trade of horn. One of the contributors, Michael Eustace who is an investment manager, also contends that the 1970s CITEs ban on the selling of rhino horn has been detrimental to the rhino population. Eustace claims that the “60,000 rhinos of 1970 should have increased to 600,000 today” and suggests following this failed strategy is senseless and that rhino farming and legalized trade could be effective in reversing this downward trend. Eustace also projects the effects of supply and demand in the market given an influx of rhino horn from legalized trade. Eustace calculates that that 1200 rhino horns could be provided annually by South Africa alone, “without the need to kill one animal”, meaning a steady supply for the rhino horn market in the long term.

One way of providing this constant flow of supply would be by way of rhino farming. Although Eustace modeled the market for all rhinos and we chose to focus purely on white rhinos, his conclusions still provide valuable insight for our research. John Hume, the largest rhino farmer in the world, tells of his success in South Africa telling from experience that rhino farming and further legalization of trade will “encourage more people to breed rhinos..[increasing] the overall rhino population”. With this increased population, more horn can be harvested and injected into the market, bringing prices down and lowering the incentive to poach.

The current ban on rhino horn trade has caused the black market price of rhino horn to soar. As previously stated, this is giving poachers a large incentive to kill rhinos and sell their horns for massive profits. In our paper, we will propose a solution to this issue.

3: Theoretical Model

3.1 Assumptions

As with any theoretical study, we had to make several key assumptions in order to construct our model. Collecting data on both black markets and wild animals can prove to be troublesome and often times produce inaccurate results. We assumed that the data we gathered from various sources regarding the sizes of rhino horns, population numbers and so forth are accurate figures. Further, we assumed that the markets for legal and illegal rhino horns are synonymous. We assume that the price and quantity would be the same in the legal market and the illegal market. We used the data from the illegal market to construct our model of both the legal and illegal market. This may not always be the case for various reasons, but we used this assumption to simplify our model. We also assume that when legal goods enter the market, the demand for the illegal good (poached rhino horn, in this case) will reduce. Another key assumption we made was that the market for rhino horn operates efficiently and demand is always equal to supply. In the short run, supply and demand may not always be equal, but we make this simplifying assumption because they will be equal in the long run.

Another crucial assumption that we made was that all farmers would immediately dehorn their rhinos if the ban on trade was legalized. We made this assumption because we expect that farmers would want to get the highest price possible for their horns. We presume that the farmers would be forward thinking and realize that legalization will eventually cause the price of horns to

decrease. If this were the case, they would have an incentive to immediately dehorn in an effort to sell the horn before the price drops dramatically.

3.2 Main Model

To begin our model, we created a function for the demand curve of rhino horn. We used the approximation of current black market price of $65,000 per kg and quantity of 2267.96 kg ('t Sas-Rolfes, 2012). We then chose an approximation of the elasticity of demand. There is much data to support the fact that demand for rhino horn is quite inelastic ('t Sas-Rolfes, 2012). What this means is that a large increase in price will not deter many consumers from purchasing the horn. We chose an elasticity of -0.5, which represents a moderately inelastic demand. Using those three numbers, we assume the function of demand has the form:

$Q= 578218.6148*P^{-.5}$

(see Figure 1 In Appendix)

This function shows the quantity of white rhino horn (Q) that consumers desire at any given price (P). We arbitrarily graphed a supply curve to intersect at the current market price and quantity. This is based on the assumption of efficiently functioning markets. This means that we assume that the quantity demanded will equal the quantity supplied at all times.

We then found that the current population of white rhinos is 20,405. Approximately 25% of those animals are privately owned, giving us an approximate figure of 5,101 white rhinos that are not in the wild ('t Sas-Rolfes, 2013). Fully developed white rhino horns can grow up to 6 kg. While poachers kill the rhinos in order to extract their horns, there is an alternative solution to removing the horns safely. Farmers can remove 90% of the males' horn and 93% of the females' horn without causing pain or inhibiting future horn regrowth ("Dehorning", 2014).

It is reasonable to assume that those rhinos that are privately held will have their horn harvested when it weighs between 2 kg and 6 kg. We assume that the legislative process to legalize the trade of horn could take up to two years (accounting for debate, lobbyists etc) and that all by the time the ban could be lifted, all rhinos that currently exist would have a horn that weighs between 2kg and 6kg. If the ban on rhino horn trade was lifted and every farmer immediately and humanely dehorned all its rhinos, approximately 18,650.26 kg of rhino horn would enter into the market. Shifting the supply curve out to meet the demand curve at 18,650.26 kg, the price per kg of white rhino horn would be $937 (see Figure 2). It is reasonable to assume that the vast reduction price from $65,000 to $937 would almost completely deter potential poachers from killing the rhinos to extract their horns (York, 2013).

3.3 Sensitivity Analysis

It is important to remember that these results are based on an estimate of the elasticity of demand of -0.5. While most economists agree that the demand is inelastic, it could be a value other than -0.5 ('t Sas-Rolfes , 2012). A good is defined as having inelastic demand if the elasticity is between zero and -1. The range of values that the final price could come to if the elasticity is between 0 and -1 is $0 and $7,864.01 (See Figure 3). We chose -0.5 since it is the middle point between the two. Even if the demand for rhino horn is not as inelastic as we assumed, the influx of horn into the market will still greatly reduce its price.

It is also crucial to realize that our results are based on the assumption that all farmers immediately dehorn their animals. While this assumption is reasonable (as detailed above), it is possible that not all farmers will immediately dehorn. If only 25%, 50%, or 75% of farmers dehorn, the resulting price per kg of horn would be approximately $15,000, $4,000, or $2,000 respectively (See Figure 4). Over time, however, the price would likely continue to reduce even

further. Even if not all farmers immediately dehorn, as long as a fraction of them do, the price could be significantly reduced. This would still result in a smaller incentive for poachers.

3.4 White Rhino Population Estimates

Currently, white rhino populations are being poached at an exponential rate. During the past couple of years, poaching has increased by around 50% each year ("Stop Rhino Poaching Now!", 2014). According to our model, which assumes that poaching continues to increase at 50% each year and the population grows at 6% each year, the white rhino could be extinct by the year 2022 (see Figure 5). While this number may not be an entirely accurate prediction of the future, it does show the immediate threat that poaching poses to rhino populations and proves that current policy to protect the rhino is failing miserably.

If policy is implemented to legalize rhino horn trade and facilitate rhino farming on a wider scale, the drive towards rhino species extinction has the potential to be completely reversed. Because the price decrease of white rhino horn could nearly eliminate poaching, we can assume that the white rhino population would begin to grow at its natural growth rate of around 6% per year (Eustace, 2012). According to our model, instead of becoming extinct by the year 2022, the white rhino populations would nearly double to 38,597 (See Figure 5).

4: Conclusion

The purpose of our model was to show that lifting the ban on rhino horn trade could lead to a decrease in rhino poaching and subsequently an increase in the white rhino population. While other economists have come to the same conclusion, we have actually built a model with current data to show how and why it could happen (Eustace, 2012 & 't Sas-Rolfes, 2012). We have used the current market data of price and quantity, along with estimates of elasticity of demand to set up an equation for the demand. That being said, one drawback of our model is that

relies heavily on our estimation of elasticity. Economists agree that the demand for rhino horn is inelastic, so our estimation of elasticity of -0.5 is plausible ('t Sas-Rolfes, 2013). However, if the elasticity were different, our model would be dramatically affected. Regardless of what the true elasticity is, the added horn into the market through the legalization of trade is almost certain to bring down the price (and therefore incentive to poachers) significantly. While our model is quite optimistic in that we assume that legalizing trade would sufficiently reduce the price enough to nearly eliminate poaching, an even a less drastic price reduction would have an affect on poaching. The results still provide valuable insight.

According to our model, there are currently enough white rhinos that are owned by farmers that simply dehorning these animals one time would lead to enough horn entering the market to reduce the price from around $65,000 to a few hundred. This does not even consider the long-term increase of supply due to the horn regrowth (which grows at a rate of 0.9 kg per year) or the increase in population, and subsequent horn, over the years. This means that over time, the price could potentially fall even further. This price reduction would act as a disincentive for poachers to illegally destroy and dehorn the rhinos. If the white rhinos were able to grow at their natural rate without poachers prematurely taking their lives, their population would be allowed to thrive. According to our model, in which we assume that poaching continues to grow at its current rate of 50% if nothing changes, white rhinos will be extinct in around 8 years. By simply lifting the trade ban, we predict that the population will not become extinct any time soon, but will actually revert to growing at its natural rate.

The leaders of CITES believe that they are helping the rhino population by enforcing the trade ban, yet problem lies in the enforcement of that ban. Ideally, a ban would nearly eliminate trade. However, in 2013, only 23% of rhino poaching resulted in the arrest of the poacher (“Stop

Poaching Now", 2014). This means that poachers have nearly a 75% chance of getting away with criminal activity and earning a large cash reward. Further, many poachers who are arrested only face limited consequences. While the punishment for poaching varies by country, in Mozambique, poaching is simply a misdemeanor (Dell'Amore, 2014). On the other hand, punishment in some African countries, such as South Africa, are quite severe and "there's new evidence that poachers are using neighboring Mozambique as an operational base, both for entering South Africa to kill the animals and for smuggling out their horns" (Dell'Amore, 2014). The combination of the low risk of being caught, loose enforcement of punitive action, and the high monetary payoff of rhino horn gives poachers ample incentive to continue to poach. While well intentioned, the CITES ban on rhino horn trade has had devastating consequences on rhino populations across Africa. The legalization of trade could solve this problem without the need to kill a single rhino. Enough horn could be humanely harvested from the current rhino population to satisfy demand and bring the price of horn down to the point that the incentive for syndicates to continue poaching would be nearly eliminated.

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6. Appendix

Figure 1

Figure 2

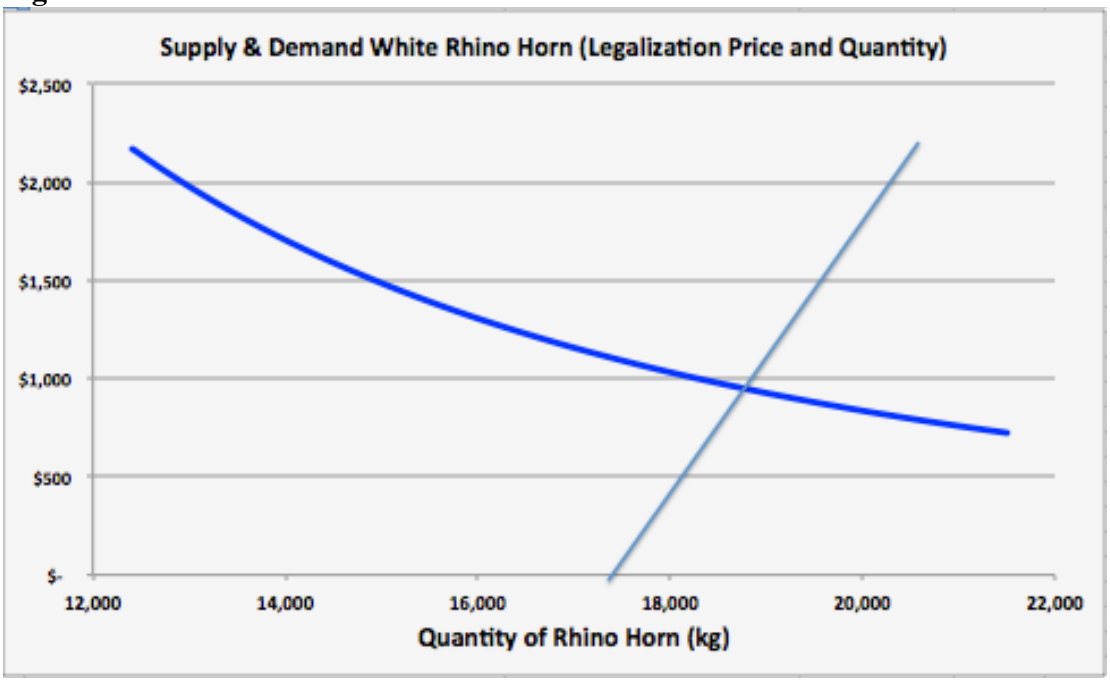


Figure 3

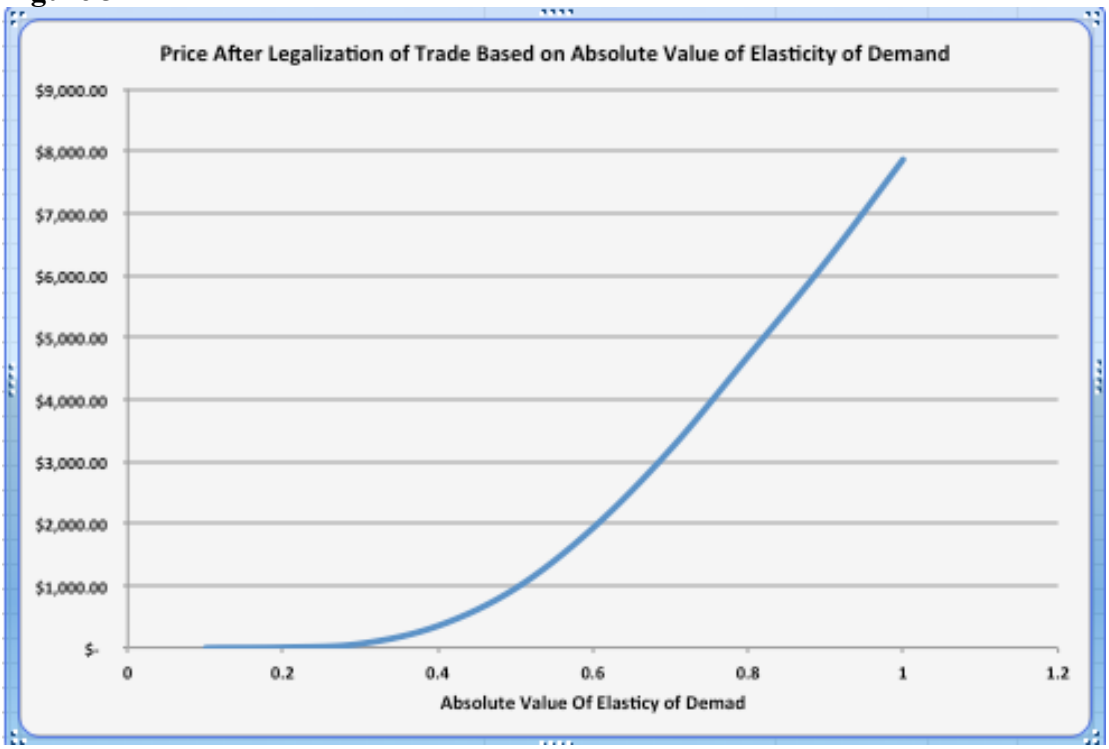


Figure 4

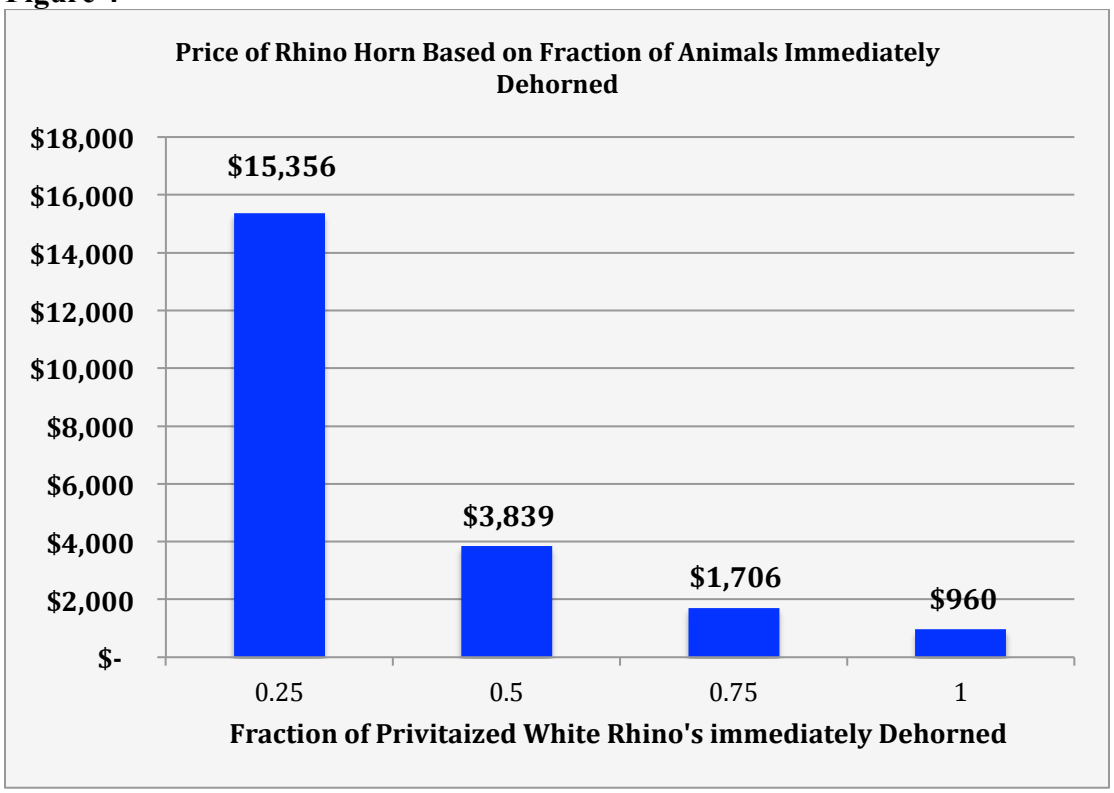
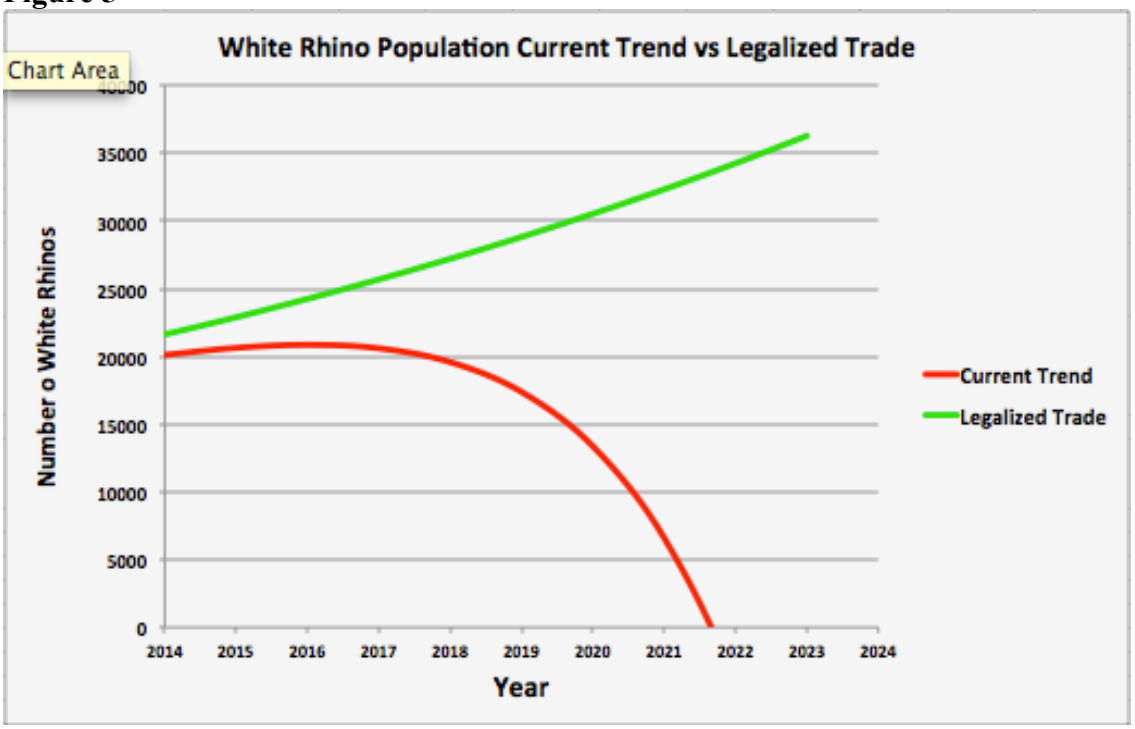


Figure 5


White Rhino Population Current Trend vs Legalized Trade
Chart Area
Number o White Rhinos
35000
30000
25000
20000
15000
10000
5000
0
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Year
Current Trend
Legalized Trade