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EXCERPTS

# The economics of agricultural and wildlife smuggling



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*This is an excerpt from a 35-page report based on data from random and targeted inspections of agricultural cargo from USDA's Animal and Plant Health Inspection Service, interdiction data from the U.S. Fish and Wildlife Service, and trade data from the U.S. Census Bureau.*

(...)

## Introduction

(...) Agricultural and wildlife imports (...) can introduce invasive species or disease-carrying pathogens and thus pose unique risks to the domestic environment and the agricultural economy. Furthermore, trade in certain wildlife goods places pressure on natural stocks abroad and can endanger the survival of animal and plant species, including elephants, exotic birds, and whales.

To mitigate these risks, regulators rely on trade restrictions allowed under the World Trade Organization's (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and the Convention for the Trade of Endangered Species (CITES). In many cases, specific commodities are restricted based on country of origin, destination within an importing country, and time of year (for seasonal pests). Enforcement of these restrictions is multifaceted. Infrastructure and logistical constraints make the complete physical inspection of all imported shipments impractical. Instead, inspection occurs at different rates (the percentage of shipments actually inspected) and intensities (the proportion of goods in a shipment actually physically observed). Even the most thorough enforcement process may fail to prevent all restricted goods from entering commercial trade.

Smuggling, defined as the illegal import of contraband goods, is an ancient activity. However, only with the emergence of modern pathology and the

progressive, environmental, and conservation movements since the late 19th century have trade restrictions been widely adopted for goods harming public health, agricultural productivity, and the environment. These trade restrictions and regulations may disproportionately harm some consumers by constraining consumption choices or artificially benefit some domestic producers if used to mask protectionist measures. International treaties and agreements constrain the extent to which the United States may ban agricultural imports without repercussion from trade partners. They also require that the United States ban certain wildlife goods. Smuggling circumvents those bans and, despite significant resources devoted to enforcement, banned and contaminated goods still appear in U.S. markets. Integrated global markets, lower transportation costs, and rising incomes have not only increased the levels of both total trade and imports but also allowed for the more rapid movement of exotic pathogens and plant pests across borders and ecosystems and increased the size of potential markets for limited wildlife resources.

The costs of agricultural and wildlife smuggling are difficult to quantify in specific terms. Interpol estimates that the value of the illegal global wildlife trade alone ranges between $7 billion and $20 billion annually and cites it as the second largest form of illegal trade (Interpol, 2006; 2008).[1]

No comparable estimate of the size of agricultural smuggling is available, but its consequences are acknowledged to be significant due to the large potential risk posed by very small amounts of biological material that may enter a country with the smuggled goods. For example, an outbreak of Exotic Newcastle Disease among poultry in California in 2003 is thought to have spread from smuggled game birds from Mexico. As a result, California poultry farmers incurred eradication costs of approximately $168 million. A 2005 shipment of 450 citrus cuttings carrying citrus canker was intercepted by U.S. Customs and Border Protection (CBP); if the disease had become established in the United States, potential costs to the U.S. citrus industry have been estimated at between $173 million and $890 million. For invasive species, the Office of Technology Assessment estimates the annual costs at $4.9 billion (OTA, 1993). During the 1990s, spending on emergency eradication programs for invasive species in the United States increased from $10.4 million to $232 million (Lynch and Lichtenberg, 2006). Moreover, the risks of wildlife and agricultural smuggling are interrelated as wild plants and animals are more likely to carry agriculturally significant pathogens than farm-raised animals or to become invasive themselves.[2]

Based on an analysis of data on shipment inspection and interdiction, this study examines the smuggling of agricultural and wildlife goods into the United States—including its specific characteristics and its responsiveness to economic factors.

[1] Exact sourcing of Interpol's reported estimates on this figure is unclear. Malik et al. (1997), for example, state that the total value of all trade in wildlife, not just illegal products, is $8 billion to $20 billion.

[2] Karesh et al. (2005) show that contact with animals in illegal markets substantially encourages transmission of wildlife-to-livestock, wildlife-tohuman, and wildlife-to-wildlife diseases, such as severe acute respiratory syndrome (SARS), avian influenza, (avian) paramyxovirus, monkeypox (in rodents), and chytriodiomycosis (in wild amphibians). Reed (2005) notes that illegally wild-caught boa constrictors are more likely to carry zoonotic diseases, such as *Salmonella* on hitchhiking ticks, and that wild species are also likely to be more invasive if accidentally released in the wild, as has happened with boa constrictors in the Florida Everglades. Endangered live plants (such as orchids, cacti, and cycads) are periodically wild-harvested and transported in native soils, which might themselves contain a variety of invasive species.

## The economics of agricultural and wildlife smuggling

According to Naim (2005, p. 239), illicit trade is driven by high profits and not low morals. At its core, smuggling is a market phenomenon, and trade bans, by their very nature, encourage smuggling. Taxes, tariffs, and trade restrictions create gaps between the price that sellers receive and the price that buyers pay, the difference of which is the return to smuggling. Illicit trade is self-reinforcing because reductions in smuggling increase its profitability.

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### Methods of smuggling

Small amounts of smuggled goods occasionally move over pedestrian and personal vehicle pathways, but commercial volumes of smuggled goods are likely to be transported through international shipping channels. To this end, cargo manifests can be falsified so that the product or country of origin is misrepresented or goods can be trans-shipped through countries that do not prohibit imports of the goods (APHIS, 2006). For example, Mexico allows grape imports from Chile as long as the grapes are free of fruit flies, but the United States requires imports of the same Chilean grapes to be fumigated with methyl bromide. However, U.S. imports of Mexican grapes can enter without treatment (Meissner et al., 2003, pg. 122). Trans-shipping of grapes would involve moving Chilean grapes through Mexico into the United States to misrepresent them as being of Mexican origin and avoid additional fumigation expenses. Similarly, nursery stock from China must remain in Canada for a year before it can be exported to the United States as a Canadian product. Trans-shipping would involve moving the foreign nursery stock into the United States via another country as a way to sidestep the waiting period. Hansen (2000, pp. 175–80) documents how collectors and researchers of rare orchids use trans-shipping to bypass CITES-based import restrictions.

More commonly, though, importers smuggle goods by incorrectly identifying contraband on cargo manifests. Prohibited agricultural goods may be relabeled as permitted goods, or endangered wildlife goods may be labeled as a nonthreatened species. For example, in 2004, APHIS found a prohibited shipment of frozen chicken feet from China that was labeled as frozen fish. CITES appendix I lists the entire orchid family and the parrot family, with the exception of three varieties, to help prevent the endangered family members from being "mismanifested" as similar looking but nonthreatened species (Roe et al., 2002, p. 27; Hansen 2000). Mismanifesting exploits the difficulties of physically inspecting cargo containers that are large and require space to unpack, especially if the cargo is refrigerated and labeled in a foreign language.

Whether goods are smuggled into the United States for commercial or personal purposes is directly relevant to the enforcement of trade regulations. Travelers smuggling goods for personal purposes may not readily recognize the extent of the trade prohibitions or the potential fines. Commercial importers, on the other hand, must submit manifests detailing the contents of shipping containers, interact more regularly with trade channels, and generally have obvious incentives to become knowledgeable with regulations. Criminal violations under the Endangered Species

Act, the Plant Protection Act, and the Animal Health Protection Act may be punishable by fines ranging from $1,000 to $50,000 per occurrence, a year in prison, and the loss of the cargo.

## Estimating the size of smuggling with inspections data

Smugglers seek to avoid discovery, which severely complicates any estimation of the size of smuggling and its responsiveness to regulatory policy. In theory, smuggling is revealed by inspection if three conditions are met. First, all cargo must enter the country through known, legal channels; second, all cargo must be inspected; and third, inspections must reveal perfectly whether imports are illegal. Because smuggled agricultural goods earn only modest markups and are difficult to transport, only a small portion are likely to arrive in noncargo conveyances that circumvent inspection points. This may not be the case for some wildlife goods (e.g., exotic parrots), which earn large returns. Agricultural smuggling is likely to go undetected owing to weaknesses in inspections involving the second and third conditions. Regulatory agencies can inspect all cargo entering the United States comprehensively, but it is prohibitively costly to do so. Comprehensive inspection may require several hours to unpack cargo containers (which may be refrigerated) and overwhelm the capacity of inspectors to process cargo (CBP, 2007b). Thus, some unregulated cargo is not inspected.[3] Moreover, even inspected cargo may contain unrevealed smuggled goods. The intent to smuggle goods may be unclear when goods are imported as when the documentation of a wildlife good's origin or an agricultural good's phytosanitary certificate is missing. More significantly, inspections occur with different levels of intensity. Less rigorous inspections may not always detect smuggling, especially when oriented toward detecting pest infestations rather than smuggling, and may involve only sampling or a visual inspection.

Despite these shortcomings in the inspection process and the potential for biases, this study's estimation of the size of smuggling is based in large part on data gathered in the inspection process (...) (P)roducers ship goods to a foreign port of disembarkation. Entry of these goods into the United States may require certification of a particular production process. For example, meats shipped from countries that have experienced outbreaks of BSE require a certificate of origin and a health or inspection certificate; wildlife sales may require similar certificates of origin and nondetrimental harvest. On average, international agricultural shipments require 46 separate documents (AMS, 2004, p. 16).

For U.S. imports, regulated cargo must be inspected for pest risk in the United States or abroad before being released. Goods found with pests are treated, destroyed, or re-exported to another country. When inspectors find a prohibited good or a good containing a pest, they issue an Emergency Action Notice (EAN) to legally document the pest and mitigating actions as well as inform other ports of the potential risk. Goods released for sale in the United States are then entered into customs data, and importers pay applicable duties. Having cleared CBP, the first line

[3] Generally, regulated agricultural cargo must be inspected for pest risk to enter the United States, whereas unregulated cargo and cargo entering under the National Agricultural Release Program does not. Obviously, cargo that would be prohibited can be mismanifested as unregulated cargo.

of U.S. inspections, the goods may undergo further inspection by FWS (in the case of wildlife goods), the U.S. Food and Drug Administration, or other regulatory agencies.

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In addition to undergoing targeted inspections, goods are inspected randomly under the Agricultural Quarantine Inspection Monitoring Program (AQIM). Inspections data, covering both random and targeted inspections, represent the most comprehensive source of information on illegally imported goods. Other sources of data include the Pest ID data system, which records how pests found in shipments were identified, and the EAN database, which documents the alerts issued for the detection of prohibited goods or goods with pests. In all, four separate databases—PPQ 280 (USDA's record of agricultural cargo inspections outcomes), AQIM, Pest ID, and EAN—along with the Work Activities Data System (WADS) make up the Agricultural Quarantine Activities System (AQAS). This system is the primary tool for analysis of the risk posed by agricultural imports. USDA and CBP collect and share the data in real time.

## Analysis of agricultural and wildlife smuggling

Most analyses of illegal trade suffer from incomplete data, and, therefore, estimates of the size of illegal agricultural trade are subject to a great deal of error. For example, a TRAFFIC[4] source in Roe et al. (2002, pp. 10–12) writes:

> Any effort to describe the international wildlife trade must unfortunately begin with the recognition that this cannot be done with any accuracy.

and

> The true size of the illegal (wildlife) trade is anyone's guess.

Similarly, FWS (2005, p. 2) writes that:

> . . . though enforcement personnel know a great deal about what illegal trade activities occur locally, there is less understanding of illegal trade activity nationally, or what might be occurring at other ports that could influence how interdiction efforts could be improved locally.

USDA has no official estimate of the total scope of agricultural smuggling. Severe methodological challenges complicate the estimation of illegal agricultural and wildlife trade with current data sources and limit the extent to which it can be characterized in an unbiased manner.

## Analysis of USDA random inspections data

USDA uses the AQIM program to improve the targeting of agricultural inspections and to assess the effectiveness of specific port operations. Under program protocol,

[4] TRAFFIC is a joint program of the World Wildlife Fund and the World Conservation Union.

ports are designated to randomly inspect certain goods received in large numbers and record the cargo's content, port of entry, origins, shipment contents, inspection method, pests found, and any indications of smuggling. AQIM inspections vary in levels of intensity. For example, an inspector might observe only the tailgate of a shipping container or truck, a proportion of the boxes drawn in a random sample, the entire contents of a part of the container, or the entire container's contents. These alternative methods of inspection may not reveal smuggling when it occurs.

AQIM data have other limitations. First, many AQIM inspections involve goods that are not specifically agricultural, including floor tiles, machine parts, and wood packing material. Trade restrictions on these goods make them unlikely candidates for smuggling or for providing cover for other illicitly traded agricultural goods.[5] Second, AQIM inspections may not reveal smuggling even when performed correctly at the most rigorous level, especially in the case of goods having moved in trans-shipment. Also, actual inspection may be targeted toward the generally regular inspection goal of uncovering pests rather than smuggled goods. Third, AQIM inspections do not cover all agricultural goods, including, for example, meats. Fourth, a recent Government report indicates that some AQIM inspections in this time period may not have been conducted and recorded correctly (see OIG, 2007).

Based on AQIM data (obtained through an interagency agreement with APHIS), inspections rarely revealed smuggling between March 2003 and January 2007. Smuggling was detected only once in 4,605 inspections of southern U.S. border cargo, twice in 4,894 inspections of manufactured goods, and zero times in the 2,473 inspections of air cargo and 2,858 inspections of northern U.S. border cargo. Given the infrequent detection of smuggling, little inference can be made surrounding the scope of agricultural smuggling from these data, although random sampling methods have been used successfully elsewhere.[6]

## Analysis of USDA interdiction data

Interdiction refers to the detection of illicitly traded goods in markets after they have entered the United States. While large resources are expended on the interdiction of narcotics and guns, far less is devoted exclusively to interdiction of illegally traded agricultural and wildlife goods. The APHIS Smuggling Interdiction and Trade Compliance (SITC) group comprises approximately 110 employees nationally who serve to recover goods that represent an SPS risk and have entered the U.S. supply chain. SITC prosecutes violators either through administrative or criminal punishments. In some cases, SITC focuses its efforts on recovering risky material, such as Spanish floor tile in wood packing material that was found to contain harmful wood-boring beetles in 2004. In these cases, no criminal intent is presumed.

Data on criminal interdiction are published in SITC's internal quarterly reports for the period 2002–06 and were obtained through interagency agreement with APHIS.

[5] Because machine parts and floor tile have carried hitchhiker pests in the past, they are randomly inspected for compliance with packaging protocols. The cargo containers carrying these goods are not refrigerated and are therefore unlikely to be suitable for the transportation of most agricultural goods.

[6] Specifically, Jacob and Levitt (2003) used the method for re-testing and Feinstein (1999) used the method for auditing.

These reports record each seizure by type, quantity, category, relevant Code of Federal Regulations violation for which the smuggler was penalized, and estimated value. Four types of goods are classified in the data: Animal and Meat Products,[7] Other Plant Products, Fruit Products, and Federal Noxious Weeds. Over the data-collection period, SITC expanded in size and budget and, subsequently, the number of interdictions also increased. Based on the data alone, it is difficult to determine whether interdicted goods are being sold in a commercial setting or used for personal consumption. For this reason, shipments valued at less than $50 were excluded from the following analysis.

Interdiction data are not random. Agents may target higher risk goods or exploit criminal networks, and they face administrative pressures to monitor certain goods more closely. As a result, data are likely to be biased toward easily observed, restricted goods that are obviously banned rather than goods that are regionally prohibited or easily misrepresented. Interdiction data are collected as part of ongoing interdiction efforts, and agents collect as much prohibited material as possible.

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Interdicted meat imports were particularly large from China, Japan, Korea, and India (...). Alternatively, the low monetary value of interdictions from Mexico suggests that shipments might have been oriented toward individual personal consumption (rather than distribution), which APHIS staff indicate is common prior to holidays when immigrants bring specialty meats across the southern U.S. border. For the Fruit Products category, interdictions were also high with imports from Mexico, China, and Thailand (...).

For the Other Plant Products category, China has a disproportionately high number of interdictions, primarily involving shipments of szechuan pepper and citrus-based spice (...). Both of these goods may carry a variety of diseases that threaten citrus fruit, which has been an area of specialized focus following an outbreak of citrus canker in Florida in the late 1990s.

SITC interdiction data reveal a high likelihood for interdicted goods to be nontraditional, ethnic goods (specifically, spices) and to have a high value relative to their size. This was evident in the Animal and Meat Products, Fruit Products, and Other Plant Products categories. Avocados represent an exception to this tendency, which is likely due to heightened political attention to avocado imports as trade of this product was liberalized over the period in question (APHIS, 2006).

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Only a limited number of goods are considered Federal Noxious Weeds, a designation that indicates that the good's establishment and propagation make it an environmental threat by itself. (...) Domestic transport accounts for a large share of Federal Noxious Weed interdictions, suggesting that internal trade is present. Given the infrequency of interdictions from Mexico and Vietnam, these observations are likely to be anomalous.

In terms of absolute monetary value, China is the largest source of interdicted material for trade, a finding that bears out over several product categories (...). In

[7] The Animal Products and Meat Products categories were combined from the original data because their goods overlapped significantly.

terms of the value of interdicted goods to its legal trade, China also has the largest percentage[8] of interdicted trade to legal trade (0.03 percent of total value), although the amount is not inordinately large relative to that for Japan, South Korea, and Taiwan. Although the percentages from each of the top 10 origin countries are small, it is important to recognize that this figure represents only a minimum level because the interdiction process almost certainly fails to uncover all smuggled goods. Moreover, certain factors may help explain why these countries have higher detected levels of smuggling.

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Asian countries, particularly China, have recently been recognized by the Federal Government as a source of potential invasive species because they have climates and habitats similar to those of the United States, they are home to a large variety of species that (unlike European species) have not been cultivated in the United States, and their volume of trade with the United States has increased significantly (Mack et al., 2002, p. 37). Based on the types of goods interdicted, it appears that illegally traded foods are most commonly discovered in ethnic food markets. The expansion of U.S. immigration in the 1990 s, as well as the rise in food imports from China over the last 20 years, may have encouraged the growth of Asian ethnic food markets that support this trade.

The degree to which inspection and interdiction evidence is gathered is likely to depend on the ease with which smuggled goods are discovered. Inspectors and SITC officers may be more likely to identify contraband material if it is subject to a comprehensive ban based on the material's country of origin rather than just based on a region within a country. Frequently interdicted goods, such as szechuan pepper from China, fall under this criterion. Also, China has hosted two particularly large threats to U.S. agriculture—avian influenza and citrus diseases—that may have caused inspectors to pay closer attention to imports from China than from other countries.

## Analysis of USDA targeted inspections data

The outcomes of targeted agricultural inspections are collected in APHIS's PPQ 280 database, which is publicly available under the Freedom of Information Act. PPQ 280 data reveal the types of good, origin, quantity, and disposition code for plant agricultural goods physically inspected in the course of their importation to the United States. The disposition code indicates whether the shipment was inspected and whether pests were detected, but it does not indicate whether cargo concealed smuggled goods. Even if such distinctions were available, however, estimated percentages of goods that are smuggled would be biased upward because targeted inspections are oriented toward finding the maximum amount of prohibited material. Targeting factors and intensity of inspection efforts are not available in the data.

[8] Ivanova (2007) similarly finds that China is the largest source of illicit traded ozone-depleting substances prohibited under international agreement.

Using data from 1996 and 2006, this study isolates five disposition codes[9] that suggest that smuggling is being attempted,[10] including three codes for products that are prohibited and destroyed, returned, or assigned another action; one code for products destroyed due to a discrepancy with the shipment's phytosanitary certificate; and one code for products that are endangered species and sent to a rescue center.[11] The sum of these shipments is herein called refused shipments. To avoid aggregation problems,[12] the focus of this analysis is on refused shipments of fruits and vegetables only. (...)

While Mexico has the largest amount of refused fruits and vegetables, it is also the largest source of fruit and vegetable imports to the United States. Mexico and China lead other nations in the number of shipments refused. While the rate of refusal for China is noticeably larger than that for Mexico, it is actually smaller than that for Argentina and Brazil. Inspection data do not allow for a specific estimation of the size of smuggling but do indicate the types of goods that are refused because of suspected smuggling. These include citrus goods, tropical fruits (including papaya and mango), and ethnic foods (including szechuan pepper and ya pears). These varieties also overlap with the types of goods interdicted in markets as discussed in the previous section.

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## Analysis of U.S. fish and wildlife service targeted inspections data

FWS (2005) used goods refused at import to characterize illegally traded wildlife goods based on entries in FWS's Law Enforcement Management Information System (LEMIS) declaration subsystem during 2000–04. The study explicitly acknowledged the known biases previously mentioned with APHIS inspections data. Refusals consist of goods that were given the disposition codes of seized, abandoned, or re-exported. While abandoned and re-exported goods suggest that trade might have been inadvertent, inspectors indicate that these goods are actually being traded illegally. The data collected through LEMIS are divided into the following taxonomic groups: reptiles, mammals, birds, mollusks, fish, coral, insects, amphibians, echinoderms, arachnids, crustaceans, and invertebrates. LEMIS data contain records on the number of goods imported each year as distinguished by country of origin, intended purpose (personal, commercial, hunting), estimated value (when possible), species, and size of shipment. Unlike goods under the PPQ 280 system, where the pest risk may be unknown when the good is imported, goods

[9] These codes are DEPP, OTPP, and RXPP for the goods that were prohibited products; DEPD for the goods rejected for having phyto discrepancies; and ESRC for goods confiscated for being endangered species.

[10] Although APHIS staff indicate that attempting to import prohibited goods is suggestive of smuggling, import shipments may still receive these disposition codes when the goods are correctly manifested. Typically, APHIS does not consider goods as being smuggled unless there is intent to conceal the true contents.

[11] The relatively small number of endangered plant species include orchids, cacti, and cycads.

[12] Cut flower and propagative material imports are measured in stems and plant units rather than by weight and are difficult to interpret in terms of volume

refused under the LEMIS system are known to be prohibited from entry into the United States.

Total refusals of wildlife goods in LEMIS data are disaggregated by purpose as follows: 61 percent for personal, 33 percent for commercial, 5 percent for hunting, and less than 2 percent for other reasons. Though the share of personal shipments refused each year (24 percent) is considerably higher than that of commercial shipments (1 percent) (FWS, 2005, p. 133), FWS does not distinguish between commercial and personal shipments in its detailed data reporting. The average refusal rate for all wildlife shipments was consistent at around 2.5 percent per year between 2000 and 2004, which includes both personal and cargo shipments. Note that about 24 percent of all wildlife shipments are inspected.[13] From the LEMIS data, it is difficult to determine the SPS risks posed by illegally traded wildlife. Certain types of frequently traded wildlife goods, such as animal leather, bones, and shells, are likely to pose a relatively small threat. Conversely, nonthreatened wildlife entering the United States legally may pose an SPS risk without causing a resource risk because quarantine and disease inspection measures are inadequate (for example, deer transported by U.S. hunters returning from Canada).[14]

Based on refusals in LEMIS data, the wildlife goods entering the United States with the highest percentage of refused entry are reptiles, coral, birds, and echinoderms (including starfish and sea cucumbers) (...). High refusal percentages for these goods are associated with a small volume of imports. This suggests that importers refrain from trading goods with a high probability of detection.

Based on primary use of refused goods, the following is evident. First, refused goods tend to be goods that are high in value relative to their size and might be characterized as luxuries, such as boots and shoes produced with alligator or crocodile leather, jewelry, and traditional medicines. Caviar was recently added to the CITES list of restricted species after Caspian Sea stocks grew extremely depleted, and illegal trade in caviar has been particularly problematic. Second, for most animal categories (except birds), the meat and live animal trade represents a relatively small portion of illegal trade, which is significant if these items have a greater SPS risk than other wildlife products, such as jewelry, leather, bone, and skin products.

(...) Excluding the totals for Laos and Azerbaijan (whose wildlife trade is extremely small), Mexico is shown to have the highest rate of refusal of wildlife goods (and total number of refusals), but this finding is likely the result of the large amount of passenger travel between the United States and Mexico.[15] (...) For Mexico and Nicaragua, refused goods typically include live birds and snakes and leather products made from reptile skin. In these cases, the movement of live animals is of special concern, especially among birds, due to the potential of these animals to introduce diseases and pathogens into the United States. For China, refused goods

[13] Isolating commercial shipments to arrive only from air cargo, ocean cargo, mail, rail, or truck changes this figure from 24 to 25 percent (FWS, 2005, pg. 137).

[14] USDA enacted several restrictions on Canadian wildlife imports after the 2003 discovery of bovine spongiform encephalopathy in a Canadian dairy cow.

[15] FWS (2005, p. 128) also notes that "the high number and rate of refusal (28.1 percent) for imports from Mexico is largely due to the strict prohibitions against export of most wildlife without permits, coupled with a vibrant trade in a variety of protected species products such as reptile skin boots."

often include traditional medicinal products made from a variety of animals as noted in Henry (2004) and Von Hippel and Von Hippel (2002). Refused goods from Russia often include caviar.

The proportion of the monetary value of the illegal wildlife trade to that of all wildlife trade is approximately 0.4 percent based on refusal data after correcting for data anomalies (...). As with APHIS inspections data, if targeting occurs across the type of good imported, its origin, and its arrival conveyance, this estimate will be biased upward.

However, no further adjustment is made to correct for this potential bias for several reasons. Unlike agricultural inspections, wildlife goods inspections are more specifically directed at uncovering illicit trade, making the reported rates of interception much more reliable. Little correlation exists in refusal and inspection rates across transport methods, which indicate that alternative transports likely receive the same level of scrutiny. Based on the number of shipments, a larger percentage (around 1 percent) of inspected commercial import entries than personal entries is refused (FWS, 2005, p. 133). Finally, there is no obvious manner in which this bias might be corrected.

## The characteristics of agricultural and wildlife goods

This analysis supports three general conclusions. First, illegally traded agricultural goods are not those conventionally sold in supermarkets but tend to be specialty items with a high value relative to their size. Food items interdicted by APHIS are more likely to be ethnic foods and spices, such as szechuan pepper (a citrus-based spice), tejocotes (a Mexican crab apple), and ya pear (an Asian pear variety). Inspections data corroborate this finding somewhat, with szechuan pepper and ya pear being frequently found, along with citrus and high-value tropical fruits, including mango and papaya. Second, illegally traded wildlife goods are likely to be luxury items to be used for jewelry, reptile-leather shoes, and other products; caviar; and medicinal goods. Third, Mexico and China represent a large percentage of the detected illegal trade for wildlife and agricultural goods, respectively, though biological and geographical factors may help account for the different percentages across countries.

## Conclusions

The recent passage of the Plant Protection Act and the Animal Health Protection Act reflects the ongoing concern in the United States over sanitary and phytosanitary concerns and resource risk in an era of increasing agricultural and wildlife imports and recent costly episodes of invasive species introductions. Inspections of imports play a crucial role in risk management, and U.S. inspection agencies have undergone significant consolidation since the creation of the U.S. Department of Homeland Security in 2003.

Several findings emerge from the examination of import refusals and interdiction data from APHIS and FWS. Illegal agricultural imports are driven primarily by specialty markets for ethnic foods and may reflect the general idiosyncrasies of

agricultural trade prohibitions and enforcement. Illegal wildlife imports are driven by the trade in luxury items and jewelry, including leather products; culturally specific traditional medicines; ivory; caviar; and shell jewelry. These types of imports are also likely to command high prices relative to their cost and size, which is not surprising given the profit motive of smuggling.

Smuggling of wildlife into the United States is most prevalent with Mexico, and smuggling of agricultural products is most prevalent with China. Both countries are major trade partners with the United States, and U.S. imports from both increased dramatically over the last 25 years. Similarly, immigration may have increased the prevalence of ethnic food, traditional goods, and medicinal goods that seem to be especially associated with illegal trade. In terms of size, detected illegal trade seems to be a significant part of the total wildlife trade and a smaller but nontrivial part of the agricultural trade. Based on the fragmentary inspection evidence, the illegal wildlife trade is approximately 1 percent of commercial wildlife shipments and 0.4 percent of the total value of the wildlife trade. Based on fragmentary interdiction evidence, the illegal agricultural trade has a lower bound of approximately 0.03 percent of total agricultural trade for China, which had the highest reported proportions and volumes. Still, these figures, along with most widely reported public estimates, are inexact due to the potential for bias in the data.

Concerns over smuggling extend beyond risks surrounding invasive species or endangered wildlife. Expertise across different fields, including international law, criminology, economics, agricultural sciences, pathology, and environmental science, is necessary to formulate an impartial and comprehensive regulatory and enforcement regime. Idiosyncratic factors influence the need for individual regulations, yet the nature of inspections and border security has necessitated that risks from imports—SPS, resource, or other national security interests—be addressed in a unified manner. A better understanding of the incentives to smuggle goods is emerging and will aid further research efforts as markets and supply chains become more integrated.

(...)