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ECONOMICS OF TOBACCO TOOLKIT

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Tool 7. Smuggling

Understand, Measure, and Combat Tobacco Smuggling

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DRAFT

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I. Introduction

Purpose of this Tool

The intended purpose of this tool is to let readers gain the necessary knowledge about tobacco smuggling. With this knowledge, policy responses can be developed and further monitored in order to establish their effectiveness, appropriateness, and impact on other policy goals. For example, if enhanced tax revenue is one goal of a tobacco taxation policy, smuggling can be an important consideration, since smuggled tobacco avoids taxation. Likewise, tobacco smuggling can have an impact on health policies, as it can be difficult to regulate health warnings and conditions of sale on smuggled tobacco.

More specifically, by using the methods presented in this tool, a more accurate and objective understanding of tobacco smuggling can be gained. Tobacco manufacturers, distributors and sellers, and others with a narrow self-interest in the design of tobacco control policy often misrepresent the degree of tobacco smuggling. Well-documented, methodologically sound, quantitative estimates of tobacco smuggling are a useful tool for educating policymakers about the costs and benefits of various policies. Moreover, unbiased estimates of smuggling, and the change in smuggling over time, are essential tools to evaluate the success of many tobacco control policies.

Use several different methods of measuring tobacco smuggling to provide the most objective view of its illegal nature.

Why use this tool? Because of its illegal nature, smuggling can be more difficult to estimate than many other variables relevant to tobacco control. Analysts can demonstrate the reliability of these estimates by using several *different* methods and data sets, five of which are presented here. And while the precise quantitative estimates can vary with the method used, all estimates should yield compatible results if appropriate data and techniques are employed. Thus, presenting results from multiple studies increases the validity of one's conclusions.

Who Should Use this Tool

This tool is intended for researchers, analysts, and policymakers of tobacco control. This is a practical tool offering concise, step-by-step instructions on how to conduct measurements of tobacco smuggling. This is *not* another lengthy discourse and extensive review of the literature written solely for academic purposes.

This tool, therefore, is written and designed for the reader who has moderate to extensive knowledge of the background and empirical studies of tobacco smuggling, and is willing and capable of bringing about tobacco policy. However, for the reader who is less familiar with the issue, there are chapters providing background information, a brief review of other empirical studies on tobacco smuggling, and references to helpful resources and additional information.

How to Use this Tool

This tool presents five methods to measure illegal circumvention of tobacco taxes. Included are discussions on the strengths and weaknesses of each method and recommendations on the appropriateness of each method. Key definitions and background information on tobacco smuggling, a discussion on policies and economic models, and a review of empirical studies on tobacco smuggling are also provided.

All readers should become familiar with the **Key Information** chapter, which contains definitions and requirements for effectively using this tool, and the **Conclusions and Summary** chapter providing a wrap-up of this tool.

Knowledgeable readers can refer directly to the **How to Measure Smuggling** chapter, which discusses five methods and provides step-by-step instructions to implement each method.

Readers seeking either a refresher or a first-time discussion on tobacco smuggling should read the **Background Information on Tobacco Smuggling** chapter.

Those readers interested in the effects of policy should read the chapter called **What Happens when Policies and Actions are Implemented**.

Readers who are interested in additional research and empirical studies on tobacco smuggling should refer to the **Review of Literature on Tobacco Smuggling** and the **Additional References** chapters.

II. Key Information

Definitions

Smuggling

Smuggling is the evasion of excise taxes on goods by circumvention of border controls.

Smuggling of goods is often conducted for one or both of two reasons: to avoid excise taxes, and to evade rules prohibiting the sale of such goods (e.g., even though the sale of most foreign brands of cigarettes is forbidden in China, these brands are easily found, and advertised, in China). When similar products are sold at substantially different prices in different locations, there is an incentive to transport the product from the lower-priced to the higher-priced market. Therefore, smuggling can be defined as the evasion of excise taxes on goods by circumvention of border controls.

This definition of smuggling encompasses both illegal activities—typically thought of as "smuggling"—and tax avoidance activities which *are* legal and generally *not* considered "smuggling." Economists generally term illegal circumvention of taxes as tax "evasion" while legal circumvention is called tax "avoidance." Both illegal and legal circumvention can affect tax revenues and consumption, and hence can be important in the public policy debate. In this document the term "smuggling" is used rather broadly (and somewhat loosely) to refer to all attempts to circumvent taxes.

Illegal Tax Evasion

Bootlegging and wholesale smuggling vary from country to country. In general, price differentials among countries create incentives for bootlegging, while high tobacco taxes create an incentive for wholesale smuggling, even when tax systems are harmonized.

There are a number of illegal methods of circumventing tobacco taxes. Two predominant methods are

- bootlegging
- wholesale smuggling

Bootlegging

Bootlegging is the purchase of goods in one country but consumption or resale in another without paying applicable taxes and duties.

Bootlegging is the legal purchase of tobacco in one country but consumption or resale in another country without paying applicable taxes or duties. Joossens *et al* (2000) provide a clear description:

> *In general, bootlegging involves transporting cigarettes over relatively short distances (e.g., between neighboring countries or other nearby jurisdictions). As with the legal activities, significant price differentials between jurisdictions create incentives for bootlegging. In addition, greater corruption reduces the risks associated with bootlegging.*

They also say:

> *While the number of cigarettes involved in [bootlegging] ...is large relative to those resulting from the legal circumvention activities described [below], it is relatively small compared to that involved in other forms of illegal smuggling.*

Wholesale Smuggling

Wholesale smuggling is the sale of goods without the payment of applicable taxes and duties.

Wholesale smuggling occurs when tobacco products are sold without the payment of taxes or duties, even in the country of origin. Joossens *et al* (2000) explain:

> *...in contrast, [wholesale smuggling] involves the illegal transportation, distribution, and sale of large consignments of cigarettes and other tobacco products, generally avoiding all taxes. This type of smuggling usually involves millions of cigarettes that are smuggled over long distances, often involving large organized crime networks and sophisticated systems for distributing smuggled cigarettes at the local level. Large-scale organized smuggling is likely to account for the vast majority of cigarettes smuggled globally.*

Legal Tax Avoidance

Tobacco taxes are one cause of price differentials that lead buyers and sellers to attempt to circumvent taxes. Because tobacco price differences are often substantial, tobacco is especially appealing to travelers. Joossens *et al* (2000) categorize a number of types of legal tax avoidance, including

- legal cross-border shopping
- legal tourist shopping
- legal duty-free sales

Legal Cross-Border Shopping

Legal cross-border shopping is the purchase of goods, for personal consumption, in a lower

Legal cross-border shopping involves the purchase of cigarettes, for personal use, in a neighboring lower tax jurisdiction at a price that includes all relevant local taxes. For example, smokers living in Windsor, Ontario during a time of high Canadian taxes have a strong

tax jurisdiction at a price that includes all relevant local taxes.

incentive to cross the border into Detroit to purchase cigarettes at prices that include all United States and Michigan excise and sales taxes.

The smoker's incentive for this type of cross-border shopping depends heavily on the differences in taxes and prices between neighboring tax jurisdictions, the distance the individual lives from the lower-priced area, and the costs of traveling between the two. For example, Buck *et al* (1994) examine the incentives for cross-border shopping between France and Britain in 1994, and conclude the savings on 800 cigarettes bought in France for consumption in Britain were not sufficient to cover the costs of the trip. In practice, it is unlikely smokers are willing to travel long distances at high cost in order to achieve relatively modest amounts of tax savings. Instead, it is more likely that much of the cross-border shopping in cigarettes occurs when smokers are already across the border for other reasons.

Legal Tourist Shopping

Legal tourist shopping is the purchase of goods in non-neighboring jurisdictions in amounts allowable under customs regulations.

Legal tourist shopping is similar to legal cross-border shopping, but involves the purchase of tobacco products in *non-neighboring* jurisdictions in amounts allowable under customs regulations. The incentives for this type of activity depend on the magnitude of the differences in prices among countries and the extent of international travel among countries. Much lower cigarette prices in countries that are popular tourist destinations lead to greater cigarette smuggling of this type.

In most countries this is a relatively minor problem. For example, Trackray (1998) estimates, based on survey data from over 48,000 international travelers in the United Kingdom, that legal tourist and cross-border shopping amounts to approximately 0.5 percent of cigarette sales and 3.0 percent of hand-rolled tobacco sales. In some countries, however, where prices are relatively high and international travel by residents is extensive, the scale of this problem is larger. In Finland, Lipponen *et al* (1998) estimate legal cigarette imports by international travelers are approximately 12 percent of total domestic cigarette sales. Similarly high legal imports are observed in Norway (Lund, 1990). In Barbados in 1999, the annual consumption per person above 15 years of age was 57 packs, but per smoker sales were 634 packs. Similarly, in Jamaica in 1999 consumption per person above 15 years of age was 34 packs, while per smoker sales were 235 packs (World Bank Tobacco Data).

Legal Duty-Free Sales

Legal duty-free sales are tax-free purchases of products in amounts that fall within specific allowances.

Legal duty-free sales are related to legal tourist shopping, but involve tax-free purchases of tobacco products in amounts within specific allowances (e.g., 200 cigarettes, 100 cigarillos, 50 cigars, 250 grams of tobacco). Most duty-free sales occur in airports, on airlines, and on ferries. Again, differences in price (in this case the net-of-tax price in the country visited and the price inclusive of taxes in the home country) and the extent of international travel are key

determinants of the magnitude of duty-free cigarette and other tobacco product sales.

Estimates indicate more than 45 billion cigarettes per year were sold duty-free in recent years, with the absolute number rising as international travel increases, despite tobacco's sharply falling share of the duty-free market over the past 15 years (Market Tracking International Ltd. (MTI), 1998). While significant in and of itself, total duty-free sales account for less than 1 percent of global cigarette consumption.

Supply Chain

A supply chain is the method by which tobacco products are accumulated and illegally transported across taxation boundaries. The supply chain used by bootleggers is quite different than that used by wholesale smugglers, as most bootleggers use relatively simple and low cost techniques to transport their cargo and avoid detection.

Bootleggers usually obtain tobacco products from discount retailers, and then travel short distances before offering the products for sale.

Bootleggers often obtain their supplies through ordinary discount retailers or wholesale purchases in the country of origin. These supplies are loaded into specially made delivery vans and trucks whose structures have been altered with false walls, roofs, floors, and other hiding places (Joossens *et al*, 2000). The tobacco products are then transported relatively small distances before being offered for sale. Transport methods vary from country to country.

In the United States, bootleggers who haul cigarettes from low-to high-tax states sometimes use leased minivans or sedans with false trunks. Although modest efforts are made to hide the contraband—it is generally covered with old mattresses or tarpaulins—it is often transported by superhighway without extensive efforts to avoid detection (Walsh and Ottaway, March 6, 2000). Scottish youths are sometimes given free vacations in Europe in exchange for smuggling tobacco back into the country (Scottish Daily Record October 16, 1994). Airline passengers from Russia attempt to smuggle a significant amount of tobacco into Sweden where prices are much higher (Pittsburgh Post-Gazette, November 4, 1994). In Malaysia speedboats are used for tobacco smuggling (New Straits Times, November 13, 1995). In Israel more traditional customs-evasion tactics are employed (The Jerusalem Post, September 25, 1991). In Hong Kong container trucks holding tobacco are sometimes disguised as containing duty-free components for assembly at factories within mainland China, making it possible to evade China's prohibitive tariffs on foreign tobacco imports. (Hong Kong Standard, July 11, 1999.)

The supply chain for wholesale smugglers is significantly more sophisticated and complex. Wholesale smugglers generally operate at a much larger scale than bootleggers. Since ordinary retail or wholesale purchases at such a large scale are easy to detect, wholesale smugglers have several methods of obtaining untaxed

tobacco products that can later be smuggled past border and tax authorities.

Wholesale smugglers often legally ship tobacco products to a neighboring tax free zone before smuggling the products into a taxed zone.

Perhaps the simplest method is to legally ship the tobacco products to a tax free zone near the country into which they will be smuggled. A report by the International Consortium of Investigative Journalists (January 2000) documented large shipments of cigarettes to the free-trade zones on the island of Aruba and in the Colombian town of Maicao. From these locations cigarettes are smuggled into other areas of Colombia, such as the city of Bogota, where they are offered for sale. The report quotes an estimate that US$400 million per year of contraband cigarettes are smuggled from Aruba into Colombia.

During transport, export goods are accorded "in-transit" status, in which the goods can leave the country of export without being assessed taxes or duties. Furthermore, in-transit goods are often temporarily stored in a country other than their final destination as they await onward transfer. Large-scale smugglers often divert cargo at this point in its journey.

Additionally, there is considerable evidence and many claims that tobacco producers themselves assist, both tacitly and explicitly, wholesale smugglers in transporting tobacco products. The International Consortium of Investigative Journalists (January 2000) reviewed thousands of pages of internal documents of the British American Tobacco (BAT) company and concluded that:

> *The selected documents, covering mostly 1990–1995, do not suggest that BAT employees themselves transported contraband cigarettes across customs borders, where taxes would be due. Instead, they show that corporate executives in Britain, the United States, and other locales controlled the volumes, brands, marketing campaigns, timing, and price levels throughout the smuggling distribution networks they exploited. Company officials worked closely with their local agents—giving them perks such as tickets to Wimbledon—and provided incentives to local black-market distributors.*

Such charges are not confined to BAT. The government of Canada has "sued R. J. Reynolds Tobacco Holdings Inc. alleging that the company has smuggled billions of cigarettes into Canada as of a carefully orchestrated tax-dodging scheme" (Segal, 1999). The suit contends that the tobacco companies made tax-free Canadian brand cigarettes available to smugglers in the United States. The government charges that smugglers evaded border controls by transporting the cigarettes back to Canada via the St.

Regis/Akwesasne Indian reservation.[1] Both R. J. Reynolds and BAT have denied the charges.[2]

Finally, knowledgeable observers believe that organized crime syndicates have significant involvement in wholesale smuggling of cigarettes (BAT, February 16, 2000; Joossens *et al*, 2000). One informed source claims that cigarette smuggling is the third largest illegal business in Germany, behind drug trafficking and illegal gambling, and that there is extensive involvement with organized crime (von Lampe, 1999). There are reports that Calabrian gangsters are involved in the smuggling of tobacco as well as other contraband in the southern coast of Italy (The Toronto Sun, December 28, 1997).

Tobacco Smuggling and Corruption

Smugglers, like other businessmen, operate to make a profit. As emphasized above, price differentials enable smugglers to profit by purchasing tobacco products in low price markets and reselling them in markets where prices are higher. Inevitably, smugglers' transport of tobacco products between markets involves circumvention of legal controls designed to assess taxes and tariffs. The ease with which these controls can be circumvented greatly influences the proclivity of individuals to engage in tobacco smuggling. In fact, it is the ease of evasion of border controls, rather than the price differentials, that most determines the level of tobacco smuggling in a country. Consider:

> *...it is not always true that the incentive for smuggling is linked to the level of taxes. For example, in countries with the highest taxes in Europe, such as the Scandinavian countries, there is little evidence of smuggling, while in Spain, Italy and many Central and Eastern European countries, where taxes and prices are much lower, the illegal sale of international cigarette brands is widespread. (Joossens 1998 p.146.)*

This apparent paradox is resolved by understanding that it is often the countries with the *lowest* level of taxes that have the *least effective* systems of border and tax evasion controls. Merriman *et al* (2000) performed a statistical analysis of the relationship between the perceived level of tobacco smuggling into a country and the transparency of the country's administrative rules and government and business transactions. Since it is easier to evade border controls and tobacco taxes in countries that are less transparent, all else equal, these countries should experience a higher level of tobacco smuggling.

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[1] The Flathead Indian Reservation, straddling the border between the U.S. States of Montana and Washington, has been used in a similar manner to evade cigarette taxes in Washington State (Magaw, 1997). Further information on the use of Indian reservations to smuggle between Canada and the U.S. is contained in Canadian Cancer Society *et al*, 1999.

[2] For BAT's views on smuggling, see British American Tobacco (February 16, 2000) and British American Tobacco (March 8, 2000).

The empirical results strongly support this hypothesis. Merriman *et al* find that transparency (lack of corruption) in a country is negatively and significantly correlated with the level of tobacco smuggling. In fact, the level of corruption (as measured by the transparency index) is found to be an even more important determinant of tobacco smuggling than price differentials. The estimates reveal that each one-point increase in a country's transparency index is associated with a two percent decrease in estimated tobacco smuggling. This implies that anti-tobacco smuggling policies that target corruption can be successful even when countries impose heavy tobacco taxes.

Retailing Network

Smuggled tobacco is generally offered for retail sale in informal markets, such as outside street markets or inside a pub.

Once transported beyond tax and border controls, smuggled tobacco is generally offered for retail sale in informal markets. Methods for retailing smuggled tobacco vary depending upon the country and the group involved. Joossens *et al* (2000) write that in Russia, street sellers, often older women, sell smuggled cigarettes, typically operating in front of transport stations. In the United Kingdom most smuggled tobacco products are apparently sold in pubs.

In many countries smuggled tobacco is distributed within tightly-knit cultural and economic communities. Walsh and Ottaway (2000) report that in the United States:

> *Arab smugglers make contacts in mosques and sell their goods to bodegas, newsstands and small retail shops which in turn sell to individual smokers. The Chinese form partnerships and deliver supplies to warehouses where they are distributed to retailers within their own communities. The Russians deliver only to private homes.*

Similarly, von Lampe (1999) reports that Vietnamese and Eastern Europeans dominate the street sale of smuggled cigarettes in Germany. Often street vendors operating out of mobile and temporary stalls sell the smuggled cigarettes. The street vendors generally operate quite openly and are very widespread. In Berlin, untaxed cigarettes can apparently be purchased in 1,200 locations.

Assumptions and Requirements

In most countries, legal tobacco tax avoidance is a relatively insignificant problem. Furthermore, its scale may be relatively easy to measure since duty free sales and legally declared purchases can be directly observed. The primary focus of this tool is on methods to measure illegal circumvention of tobacco taxes.

When attempting to understand tobacco tax avoidance and evasion in a particular country it is important for the analyst to learn as much as possible about the specific mechanisms that are used in that country. Information about these issues can often be gathered by reviewing

media reports about tobacco marketing and smuggling. Tobacco industry trade publications such as industry annual reports or *World Tobacco File* publications (see the **Additional References** chapter) can be especially useful. Further information can be obtained through review of documents or consultation with government authorities responsible for (1) monitoring border trade, (2) collecting excise tax revenues, and (3) suppressing criminal activity, especially organized crime.

III. How to Measure Smuggling

Overview

Reliable quantitative measures of tobacco smuggling can enhance tobacco control policy. Baseline measurements of tobacco use and tax avoidance and evasion can be built, upon which policies are then established. Further measurements can provide appropriate benchmarks to ensure the implementation, review, and improvement of such policies. And sound measurements of the association between changes in tobacco control policies and changes in smuggling can prove the success of these policies.

Estimating the true nature of smuggling is challenging because it is an illegal and hidden activity. A number of useful and reliable methods to measure smuggling are available, but each method has limitations. When time and resources permit, it is best to use several different methods in order to cross-validate estimates. In this manner, any methodological objections can be minimized or better placed within the greater tobacco use context.

This tool, then, offers five methods to measure tobacco smuggling. The methods are ranked, with the first requiring the least technical and statistical sophistication and the last requiring the greatest level of technical complexity and statistical inference.

1. Observe the producers and ask the experts for smuggling data.

2. Observe smokers directly and ask them about their methods of obtaining tobacco.

3. Monitor and analyze data on the export and import of tobacco.

4. Compare the sale of tobacco with estimated consumption of tobacco by using household surveys.

5. Compare the sale of tobacco with estimated consumption of tobacco by using a mathematical formula and economic inference.

For each method, this tool offers a brief discussion on its application, strengths, and weaknesses, and then provides a step-by-step process to use the method.

A final summary provides recommendations on the appropriate use of each method.

Ask the Experts

Brief Discussion

The most direct method to measure the size of the tobacco smuggling industry is the same as that used to measure the size of other industries: survey those in the industry and ask about their revenues, employment, shipments, etc.

Unfortunately, this is not a feasible approach, as a distinct disadvantage to this method is that those participating in the industry are difficult to identify and unlikely to willingly provide information to authorities about their operations.

There are, however, several ways to get reliable information indirectly from such experts and participants.

Information from Smuggling Researchers

Smugglers and other criminals do sometimes voluntarily provide anonymous information to academics, journalists, and others studying the industry. By piecing together information gathered over time from smugglers, these experts can obtain an accurate understanding of the size and scope of the tobacco smuggling industry.

Information from Law Enforcement

Police authorities also have significant information about the industry. They can observe seizures of smuggled tobacco and may be able to accurately estimate the likelihood that illegal cargo is intercepted. This information can be used to estimate the size of the industry. Even more importantly, by monitoring *changes* in seizures of smuggled tobacco, police can estimate changes in the size of the tobacco smuggling industry. For example, if police seizures doubled with little change in the level of scrutiny, one might conclude that the level of smuggling also doubled.

Further, while smugglers generally do not volunteer information to legal authorities, police can use legal leverage to extract information. For example, those intercepted in the act of smuggling may negotiate for lighter penalties in exchange for the provision of information about their industry. Police who specialize in this area of law enforcement often obtain an accurate view of the industry.

Information from Retailers

Another possible source of information is direct questioning of retailers. Often retailers have little to fear from researchers inquiring about the source of their products.

Information from Trade Publications and Professionals

The tobacco industry publication *World Tobacco File* contains estimates of smuggling in each country it covers based on a canvass of experts who are familiar with local market conditions. However, this publication does not use a consistent method over time or in different countries, nor does it present a detailed explanation of how it arrives at its estimates. Since both the interviewers and the experts differ from year to year and from country to country, comparisons using this source can be unreliable. Without detailed methodological information, one cannot know which experts were interviewed, precisely the questions that were asked how differing estimates were weighted, or how much uncertainty experts have about their estimates. Other published estimates of expert opinion share similar limitations. Furthermore, experts, particularly those interviewed anonymously, may have biases or agendas that influence their estimates.

On the other hand, such published estimates of experts do provide valuable background and corroborating information. For instance, weighted country estimates on the amount of tobacco smuggling, as compiled from *World Tobacco File* and other publications, accords well with global estimates using other methods. This suggests that, as a whole, expert estimates of smuggling can be relatively accurate even though they can be inaccurate in particular countries or for particular years.

Step-by-Step Process

Use this process to collect expert opinions of tobacco smuggling:

1. Identify the experts to be interviewed. Consider tobacco industry professionals, tobacco control advocates, academic experts, journalists, and police and customs officials. If possible, also arrange for direct interviews with smugglers.

2. Develop standard and identical questions that can be answered by all experts. This assures that different experts provide estimates of the same phenomena.

3. Pretest interview questions and procedures. Use the results of the pretest to refine questions and interviewing techniques. Upon completion of this step, no procedural changes should be made unless absolutely necessary—and then they should be made for *all* interviews.

4. Interview the experts, and clearly inform them of the time period and region the interview is meant to cover.

5. Conduct interviews at several points in time, unless resources prevent this. In general, seek estimates of *changes* in smuggling, as they are more useful and reliable than estimates of *levels* of smuggling.

6. Develop an explicit procedure to weight the answers of different experts when arriving at a final estimate. The simplest procedure may be to mathematically average the answers of various experts. However, in some circumstances certain experts may have knowledge that should be weighted more (or less) heavily than others.

7. Carefully document all procedures and estimates. Measures of dispersion such as the standard error or the range of estimates should be calculated and published along with point estimates of the amount of smuggling.

References and Additional Information

The following sources of information are applicable for this particular method. See the **Review of Literature on Tobacco Smuggling** and the **Additional References** chapters for a complete description of these and other sources.

Hu and Mao (2000) report success conducting informal personal surveys among retailers and street vendors in four Chinese cities.

Joossens (1998) discusses the limitations of other published estimates of expert opinion.

Merriman *et al* (2000) offer an analysis of *World Tobacco File* as a viable source of information.

Observe Smokers and their Buying Habits

Brief Discussion

In any market there are both sellers and buyers. The market for smuggled tobacco is no exception. Sellers of smuggled tobacco can be quite reluctant to provide information about their trade because they face potentially serious penalties if detected. However, tobacco consumers can provide direct evidence on tobacco smuggling.

The sections below present the advantages and disadvantages of directly polling consumers, as well as a discussion of two survey techniques successfully used by researchers.

Advantages of Interviewing Tobacco Buyers

Buyers of smuggled tobacco generally have little or no legal incentive to conceal their behavior. Laws against purchasing smuggled tobacco are typically nonexistent or, if enforced, have very light penalties. Furthermore, it is often possible to gather information from buyers while protecting their anonymity. Polling consumers directly is perhaps the simplest and most direct approach to obtaining estimates of smuggled tobacco. Asking them where they make purchases, whether they buy in the black market, if they have crossed borders to purchased lower priced tobacco, and so on has the potential to increase our knowledge about tobacco smuggling. But it also has some important limitations.

Disadvantages of Interviewing Tobacco Buyers

Buyers of smuggled tobacco may be significantly less likely to provide information about their purchases than buyers of legal (tax paid) tobacco. First, even in anonymous surveys, consumers may be unwilling to admit they have engaged in illegal behavior like purchasing smuggled cigarettes. Consumers are known to under-report legal purchases of cigarettes and alcohol on surveys even when the purchases are legal. Illegal purchases would almost certainly also be under-reported. Second, even when they wish to fully report their purchases, in some cases consumers are not certain if the tobacco they purchased legally cleared customs or whether applicable taxes were paid. Thus it can be difficult to obtain an accurate representative sample of information about the purchases of tobacco.

Person-to-Person Survey

In Spain and the Netherlands, interviewers, posted in areas with heavy foot traffic, asked passing smokers to show their cigarette packs. By studying the packs the interviewer determined whether taxes were paid on the cigarettes, and made note of such. At the end of the day the interviewer tallied the data of all cigarette packs examined and conducted a simple calculation to determine the percentage of smuggled tobacco.[3]

This method faces several technical obstacles. In some cases it is difficult, even for trained interviewers, to discern whether cigarettes are smuggled by a brief examination. The best evidence that cigarette taxes are paid is often the presence of a tax stamp. However, in some cases smokers remove the stamp when opening the pack. Therefore, the lack of a stamp cannot definitively prove that cigarettes have been smuggled.

Perhaps an even more serious problem is the difficulty of obtaining a sample of cigarette packs that accurately represents those carried by smokers in general. Since participation in the survey is voluntary

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[3] This information was provided in a personal communication to the author from Luk Joossens on April 9, 2000.

those carrying smuggled cigarettes may avoid participation because they fear legal prosecution, confiscation, or embarrassment.

Even if those carrying smuggled cigarettes did not particularly wish to conceal that fact, it would be difficult to get a representative sample of the population by stopping people on the street. Some individuals such as the elderly or ill are unlikely to appear on the streets. Further, certain types of people are much less likely than others to consent to the interview. In general, those with higher incomes, employed people, underage smokers, and immigrants (who might not speak the local language) are less likely to respond. The survey results are biased if those who consent to show their cigarette packs have a different propensity to consume smuggled cigarettes than the general population.

In conclusion, while surveys conducted in this manner are more likely to under-estimate rather than over-estimate smuggling in the locale surveyed, they can provide a useful low-end estimate of the market penetration of smuggled cigarettes.[4] Furthermore, if several comparable surveys are taken at different points in time they can provide useful information about whether tobacco smuggling is increasing or decreasing over time.

Mail-In Survey

A similar approach was used in recent research sponsored by the Tobacco Manufacturers' Association in the United Kingdom. Data was collected via a series of advertisements offering consumers free gifts in exchange for sending in empty packages of hand-rolled tobacco and cigarettes. By examining the packages researchers were able to determine whether duty was paid on the pack.[5]

The postal code from which the packs were sent was also recorded. Using this method, researchers were unable to distinguish legal cross-border shopping from illegal smuggling. However, independent estimates of legal cross-border shopping indicate that it

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[4] When evaluating the results of studies using this method, it is important that reviewers appraise whether sales in the survey area(s) are representative of tobacco sales in the market as a whole. That is, a researcher wishing to promote the idea that smuggling is a large problem can choose to survey only areas where smuggled cigarettes are known to be sold. In such a case a survey would probably over-estimate, rather than under-estimate, smuggling in the market as a whole.

[5] A variant to this approach is to extract used cigarette packs from garbage. If a representative sample of trash is assembled and investigated, this method can develop quantitative estimates of legal and smuggled consumption. A crude version of this technique was used to discover that "40 percent of discarded cigarette packets retrieved from football matches at British grounds were imports" (Studd, 2001). The viability of this technique depends upon whether it is possible to determine if duty has been paid on cigarette packs extracted from the trash collection system.

While going through garbage is quite messy, archeologists and anthropologists have used trash-sorting techniques to study consumption in a variety of settings. The proposed method is not totally unprecedented. This method can probably avoid most of the biases of alternative pack inspection methods, since consumers of smuggled cigarettes probably dispose of their packs in the same manner as consumers of legal cigarettes (at least holding income constant).

is relatively insignificant and the researchers attributed most non-duty paid packages to smuggling.

This method has some of the same limitations as that of the person-to-person survey, discussed above. It may not be possible to determine definitively whether duty is paid on all packs received via mail.

Furthermore, tobacco packs obtained in this manner can be even less representative of smokers in general than packs obtained from street collection. On the one hand, people who mail in their tobacco packs cannot be guaranteed anonymity if they receive incentives in exchange. Thus, those who possess smuggled tobacco may be unwilling to participate in the method.[6] On the other hand, mailing tobacco packs is a rather laborious enterprise that is unlikely to seem worthwhile for well-to-do or extremely busy individuals. It also seems likely that these individuals are less prone to consume smuggled tobacco because their adequate financial resources simply do not make it worth the risk. Therefore, this method could understate, or overstate, the share of smuggled tobacco in the market.

In conclusion, despite these limitations some valuable information may be obtained by examination of consumers' cigarette packs.

Step-by-Step Process

Use this process to collect tobacco smuggling data directly from consumers:

1. Instruct cigarette-pack examiners to carefully separate duty paid from non-duty paid packages. Test these examiners with packs of known origin to ensure successful instruction and package identification.

2. Use sampling techniques that produce an accurate representation of tobacco users. Whenever possible, social and demographic data about smokers whose packs are examined should be collected. This data can then be analyzed to determine if the sample represents all tobacco users. If the sample is not representative of the population, consider giving more or less weight to responses from under-represented and over-represented segments of the population.

3. Conduct interviews at several points in time, unless resources prevent this. In general, seek estimates of *changes*

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[6] DTZ Pieda Consulting (2000) reports that "one would expect smokers of black market tobacco to be less likely to return empty packs than legal smokers, so…the survey data could under-represent the true size of the black market" (p. 33). However, the probability that smokers return their cigarette packs also depends, in part, on whether advertisements announcing the study are placed in the periodicals they read. Since the study provides no information about the placement of ads announcing the study, one cannot determine whether it targeted a representative sample of smokers.

in smuggling, as they are more useful and reliable than estimates of *levels* of smuggling.

4. Carefully document all procedures and estimates. Measures of dispersion such as the standard error or the range of estimates should be calculated and published along with point estimates of the amount of smuggling.

References and Additional Information

The following sources of information are applicable for this particular method. See the **Review of Literature on Tobacco Smuggling** and the **Additional References** chapters for a complete description of these and other sources.

DTZ Pieda Consulting (2000) discusses in further detail the results of the mail-in survey and the subsequent estimates of tobacco smuggling.

Joossens (2000) provided information about the person-to-person survey technique through e-mail correspondence with the author.

Monitor Tobacco Trade

Brief Discussion

International trade statistics contain substantial information about the legal flow of tobacco products between countries. Each country records the quantity of its exports of each product by country of destination. Similarly, each country records the quantity of its imports of each product by country of origin. In principle, at least, country A's exports of product X to country B ought to match with country B's imports of product X from country A. In practice, these two values often do not precisely match. While there are a number of possible reasons for this discrepancy, one explanation is purposeful misrepresentation in order to evade duties and taxes.

In most countries there are no export duties or taxes on tobacco products. Therefore, exporters do not have an incentive to under-represent their exports of these products. On the other hand, many countries impose duties and levy taxes on tobacco products at the point of import. Thus, importers can have a strong incentive to under-report tobacco imports. They may bribe customs officials to misreport quantities and values; they may circumvent the usual customs inspection by entering the country illegally; or they may disguise the tobacco products as other goods subject to lower taxes and tariffs.

One method to detect and measure such tactics of tobacco smuggling is to compare reported tobacco exports destined for a country to that country's reported tobacco imports. Persistent discrepancies between these amounts—discrepancies that cannot be explained by other

factors—provide an estimate of the amount of wholesale smuggled tobacco. The benefit of this method is that it relies on well-documented information, and its application is straightforward.

Assumptions and Limitations

This method requires the implicit assumption that all goods lost between export and import are eventually smuggled into the country designated as the destination country by the exporter and are not diverted to a third country (or even back to the exporting country). Readers are cautioned that there is no logical necessity for this assumption to be true. However, personnel in the exporting country have no financial incentive to misidentify the country for which their exports are destined. Thus, their reports can be an unbiased estimate of intended shipments to the importing country. When taxes or tariffs are collected in the process of clearing border controls, personnel in the importing country have a distinct financial incentive to understate imports.

On the other hand, this assumption cannot be entirely dismissed, most particularly when focusing on tobacco smuggling within only one country. Unaccounted tobacco is never really "lost" within a country, but is susceptible to being shipped to neighboring countries or regions. This is becoming increasingly so with the growth of international trade, wherein trade patterns have become more complex and many products stop at intermediate ports during their journey from origin to destination. Therefore, this method is best used to estimate global or perhaps regional tobacco smuggling, rather than to provide a fully accurate estimate when applied to a single country.

Furthermore, this method does not uncover bootlegging (the transport of tax paid tobacco from lower priced countries) and is not designed to discover the consumption of tobacco in the country of production without payment of taxes. Thus, use of this method is not recommended in countries that are significant producers of tobacco or in countries that have significant problems with tobacco bootlegging.

Presenting a Case Study as an Example

An excellent example of this method in use is the effort of Bhagwati (1974b) to study smuggling of various products (but not tobacco) into Turkey in the early 1960s. Some of the data used in this study is reproduced in Table 7.1.

The table shows France's recorded exports of various products to Turkey and Turkey's recorded imports of those same products from France. In every case France's recorded exports to Turkey exceed Turkey's recorded imports from France. For example, France recorded about $5.3 million of exports of machinery and transport equipment to Turkey but Turkey reported only about $3.8 million of imports of these goods from France.

Table 7.1
1960 Trade between France and Turkey (US$000)

SITC Code	Commodities	France's Exports	Turkey's Imports	Discrepancy
313	Petroleum products	9,059	617	−8,442
6	Main manufactured goods	3,212	3,196	−16
66	Non-metallic mineral manufactures	343	266	−77
68	Non-ferrous metals	4,412	3,464	−948
69	Metal manufactures	3,915	544	−3,371
7	Machinery and transport equipment	5,270	3,820	−1,450
8	Miscellaneous manufactured goods	1,246	595	−651
	Others	4,197	3,834	−363
	Total:	**31,654**	**16,336**	**−15,318**

Source: Bhagwati (1974b), Table 1.

There are several factors that might explain these discrepancies, including (1) errors of commodity classification, (2) time lags between export and the receipt of imports, (3) misallocation of imports by country, and (4) over-invoicing of exports. Each of these explanations is carefully considered, and in fact the discrepancy in petroleum products is attributed to misallocation by country (that is, some of France's petroleum exports to Turkey were misattributed to other countries).

However, Bhagwati cannot find explanations for discrepancies between trade partners' recorded exports and Turkey's recorded imports of other products. He concludes that there is "strong evidence of understatement of import values of manufactures, especially in the field of transport equipment and machinery" (1974b, p.141).

Step-by-Step Process

Use this process to monitor the import and export of tobacco products:

1. Gather data on your country's recorded imports of tobacco products by country of export. Collect several years' worth of data on all importing countries whenever possible.

2. Gather data on the exporting countries' recorded exports of tobacco products to your country. Collect several years' worth of data on all exporting countries whenever possible.

3. Prepare a table (similar to Table 7.2) of the collected data for each year. Record data by row in the table columns as follows:

    Column 1: Name of the exporting country

    Column 2: Exporting country's recorded exports of tobacco products to your country

    Column 3: Your country's recorded imports of tobacco products from the exporting country

    Column 4: The value in Column 3 minus the value in Column 2

4. Investigate for any discrepancies (values other than zero) listed in column 4. Confer with customs officials to assure that imports and exports are not misclassified or misallocated by country. Investigate time lags between export and importation. Make adjustments in recorded exports and imports to reflect this information.

5. Record the total sum of each column.

6. Determine and record the estimate of under invoicing of tobacco imports as a share of total imports of tobacco products by dividing the total sum of the discrepancies (Column 4) by the total sum of the recorded exports (Column 2). This value is an estimate of the extent of smuggled tobacco within your country.

7. Compare each year's estimated extent of smuggled tobacco to identify and monitor smuggling causes and trends.

Table 7.2
Hypothetical Data on Tobacco Trade between Home Country and Trade Partners per Year

Name of Exporting Country	Exporting Country's Recorded Tobacco Exports to Home Country	Home Country's Recorded Tobacco Imports from Exporting Country	Export/Import Discrepancy
A	70	25	–45
B	83	76	–7
C	23	20	–3
D	90	58	–32
E	89	60	–29
F	46	62	16
G	84	50	–34
Total:	**484**	**352**	**–134**

134 ÷ 484 = **27.7%**   Estimate of under-invoicing of tobacco imports as a share of total tobacco imports.

References and Additional Information

The following sources of information are applicable for this particular method. See the **Review of Literature on Tobacco Smuggling** and the **Additional References** chapters for a complete description of these and other sources.

> Bhagwati (1974b) and Simkin (1974) are apparently the first to use this method.

> Merriman *et al* (2000) employ a variant of this method as one of their measures of worldwide tobacco smuggling.

Compare Tobacco Sales against Consumption via Surveys

Brief Discussion

In many countries it is relatively easy to obtain reliable statistics about tax paid sales of tobacco products. Such records are generally maintained by official government agencies—in most cases by the Tax Administration and Customs department. If reliable *independent* estimates of tobacco consumption are available, then the difference between consumption and tax paid sales can be used to estimate the amount of smuggled tobacco.

One major independent source of tobacco consumption is the household survey. These surveys, which typically ask respondents how much tobacco, alcohol, and other products they consume, can be appropriately weighted and totaled to estimate total tobacco consumption.

Assumptions

Unfortunately, it is well know that respondents consistently understate the quantity of tobacco consumed when responding to such surveys. So adjustments must be made to ensure that tobacco consumption, as derived from survey respondents, is fully accurate. Furthermore, since this method is useful in detecting trends in smuggling, the level of smuggling for the baseline year *must be known,* or at least safely assumed, in order for this method to be reliable. If the level of smuggling at the starting point is not known the method may still be used to estimate the increase in smuggling between the starting and ending point.

In addition, the assumption or stated level of under-reporting *must be consistent* from year to year. This consistency is crucial. Responses to survey questions about smoking rely on respondents' faulty memories. Furthermore, respondents often give the socially approved response even when it does not represent their actual experience. Thus, in an era when smoking is becoming less socially acceptable,

under-reporting of consumption on surveys may increase. If current trends continue this method may increasingly understate smuggling.

Presenting an Example

Consider the example provided in Table 7.3, in which changes in smuggling are monitored between two years. In 1992, tobacco consumption, derived from a survey, is 80 units while tax paid sales, derived from official statistics, is 100 units. This difference is not surprising because consumption is known to be under-reported in surveys. Further, this method assumes that smuggling is essentially zero in 1992, so tax paid sales become an accurate indicator of total consumption. Therefore, using this assumption, under-reporting of consumption in 1992 is estimated as the difference between tax paid sales and reported consumption, or 20 units, which in this example means the survey data under-reports consumption by 25 percent (20 units ÷ 80 units).

The method further assumes that this 25 percent of under-reporting on surveys does not change between 1992 and 1999. Therefore, survey-reported 1999 consumption of 72 units translates into estimated 1999 total consumption of 90 units. Smuggling is calculated as the estimated total consumption (90 units) minus tax paid sales (70 units). Thus, this method estimates that 20 units are smuggled in 1999.

Step-by-Step Process

Use this process to compare tobacco sales against estimated consumption by using household surveys:

1. Locate several years of reliable data on tax paid sales (for multiple regions if possible).

Table 7.3
Hypothetical Example of Estimating Smuggling Using Household Survey Data

Process Step	Year 1992	Year 1999	Change from 1992 to 1999
1. Reported consumption (from survey data)	80	72	−10%
2. Tax paid sales (from official statistics)	100	70	−30%
3. Assumed under-reporting (__% of reported consumption)[†]	20	18	−10%
4. Total estimated consumption (1 + 3)	100	90	−10%
5. Estimated smuggling (4 − 2)	0[‡]	20	
6. Estimated smuggling as a percent of total estimated consumption (5 ÷ 4)	0%	22%	

[†] In this example only, under-reporting is assumed to be 25% of reported consumption.
[‡] Estimated smuggling is assumed equal to zero in 1992.

2. Locate household surveys in order to estimate total tobacco or cigarette consumption. The survey region and period should correspond exactly with the region and period of the data on tax paid sales.

3. Investigate any factors that might lead to a change in under-reporting on the household survey. For instance, carefully investigate any changes in the wording of survey questions or the sampling strategy, since even small changes in survey procedures can significantly effect reported consumption.

4. Calculate total tobacco consumption using the household survey data. This will typically involve weighting survey responses so that they are representative of the population.

5. Calculate the percentage change in tax paid sales and the percentage change in reported consumption.

6. Estimate the change in smuggling using the step-by-step process outlined in Table 7.3.

References and Additional Information

The following sources of information are applicable for this particular method. See the **Review of Literature on Tobacco Smuggling** and the **Additional References** chapters for a complete description of these and other sources.

DTZ Pieda Consulting (2000) and HM Customs and Excise (March 2000) use this approach in estimating tobacco smuggling in the United Kingdom.

Compare Tobacco Sales against Consumption via Modeling and Calculations

Brief Discussion

Economic models provide an alternative estimate of tobacco consumption. Total tobacco consumption is correlated with the price of tobacco, consumer income, prior consumption, and certain other variables. Further, smuggling is positively correlated with the relative price of tobacco and the ease of cross-border transportation. Thus an econometric study (a mathematical formula using economic data) of the relationship between observed tax paid sales, variables associated with the demand for tobacco, and variables associated with smuggling can be used to determine the level of smuggling.

Advantages

This method advantageously exploits the fact that it is much more difficult to smuggle tobacco in some geographically isolated regions (e.g., the islands of Hawaii) than others. Thus, with little smuggling

in these areas, tax paid sales provide an accurate estimate of tobacco consumption. By studying the relationship between tax paid sales and tobacco price (measured in a common unit of currency), and controlling for non-price influences, one can estimate the shape of the tobacco demand curve. Furthermore, provided the ease (or difficulty) of smuggling in a region is not associated with factors that determine the shape of the tobacco demand curve, smuggling within the region can be accurately estimated.

Conceptual Explanation

Figure 7.1 illustrates the basic logic of this approach. (For illustrative purposes the steps involved in this method are discussed sequentially. In the econometric analyses all of the steps are undertaken simultaneously.) Suppose that one observes the price of tobacco and total sales in regions 1 and 2, both of which are known, beforehand, to experience little smuggling. In region 1, when price is 1.0 sales are 1.0; whereas in region 2, price is 10 percent higher (1.1) than in region 1 and sales are 10 percent lower (0.9). We infer that in these two regions a 10 percent increase in price causes a 10 percent decline in sales. Remember from above that, with little or no smuggling, *sales* equal *consumption*. Therefore, based on this data the following relationship between price and consumption is identified: when price equals 1 consumption equals 1, when price rises to 1.1 consumption falls to 0.9. Thus, there is an inverse relationship between tobacco consumption and price.

Figure 7.1
Basic Approach to Econometric Analyses

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1. Tobacco Price and Sales in Two Isolated Regions

In a study of isolated regions (where no smuggling occurs), we observe that

   when Price = P = 1.0, Sales = S = 1.0

   when P = 1.1, S = 0.9

Isolated Region 1	**Isolated Region 2**
P = 1.0 S = 1.0	P = 1.1 S = 0.9

2. Tobacco Price and Sales in Two Linked Regions

In a study of linked regions (where smuggling is possible), we observe that

   when P = 1.0, S = 1.1

   when P = 1.1, S = 0.8

Linked Region A	**Linked Region B**
P = 1.0 S = 1.1	P = 1.1 S = 0.8

3. Conclusion

We infer that in linked regions

   when P = 1.0 (Region A) and neighbor P = 1.1, smuggled exports = 0.1

   when P = 1.1 (Region B) and neighbor P = 1.0, smuggled exports =- 0.1

Now consider the linked regions A and B. The linked regions are identical to the isolated regions in all respects except for geographic location. In region A, price is 1 and sales are 1.1 (higher than in an isolated region). In region B, when price is 1.1 sales fall to 0.8 (lower than in an isolated region.) The (sales) value of consumption in each linked region is known because of the analyses of the isolated regions. Smuggling can therefore be computed as a residual—that is, smuggling is the difference between expected consumption and observed sales. In region B expected consumption is 0.9, so 0.1 consumption must be serviced by smuggling. On the other hand, in region A expected consumption is 1.0, so smuggling must be equal to –0.1. Therefore, one can conclude that tobacco is exported from region A and sold in region B.

Mathematical Explanation

Using the conceptual approach above, Merriman *et al* (2000) developed an econometric model to estimate bootlegging among 17 European countries from 1989 to 1995. Their basic equation is:

Sales = consumption – bootlegged imports + bootlegged exports [7.1]

> where   Sales = observed tax paid sales, consumption is a function of observed variables as in:

Consumption = f(P, Y, X)   [7.2]

> where   P = price of cigarettes, Y = real per capita income, and X is a vector of other variables effecting tobacco consumption. Bootlegged imports and exports are not directly observed. Rather these variables are assumed to depend on the incentives for, and ease of, bootlegging, as in the equations below:

Bootlegged imports = h_j (I_j, E_j)   [7.3]

> where I_j = the incentives for activity j (i = imports)
>
> E_j = the ease of activity j (i = imports)

Bootlegged exports = h_x (I_x, E_x)   [7.4]

> where I_j = the incentives for activity j (x = exports)
>
> E_j = the ease of activity j (x = exports)

Equations 7.2–7.4 are substituted into Equation 7.1, and observed sales are calculated as a function of price, income, other variables effecting demand, and incentives and ease of bootlegged imports and exports.

An econometric analysis using this conceptual model requires data from these categories:

1. Observed tax paid sales

2. Tobacco prices in own and neighboring regions

3. Variables, such as income and demographic information, that influence the demand for tobacco at a given price

4. Variables that measure the incentives for, and ease of, bootlegging between regions

Data in categories 1–3 are similar to those needed in the estimation of demand curves when smuggling is not an issue. (Consult **Tool 2. Tobacco Data** for a discussion of data for economic analysis, and **Tool 3. Demand Analysis** for a discussion on economic analysis of tobacco demand.) Data in category 4 measure the incentives for, and ease of, smuggling, and play a crucial role in the econometric analyses.

- Incentives for smuggling depend primarily upon the relative price of tobacco in the origin and destination country.

- The ease of smuggling measures the effort required to transport tobacco past customs stations without prosecution.

Unfortunately, reality is rarely as simple as the scenario depicted in Figure 7.1, in which ease of smuggling is either impossible (the isolated regions) or possible (linked regions.) In general, ease of smuggling can be measured on a continuum from very difficult to very easy.

Example of Regression Analyses

Once a full data set is obtained, regression analyses is used to obtain econometric estimates of the parameters of Equation 7.1, above. For example, Merriman *et al* (2000) estimate a linear regression with independent variables that include price, income, country dummies, time dummies, and variables representing the incentive for bootlegged imports and exports. The dependent variable is the natural log of cigarette consumption per capita. Once econometric estimates of the coefficients are obtained, estimates of smuggling can be derived through statistical simulations.

This example is further illustrated in Table 7.4. Column A displays the estimation results. Incentives for imports and exports are defined so that they vary between zero and negative infinity. When incentives for smuggling equal zero no smuggling will take place. In column B, the estimated regression coefficients are used to simulate the level of smuggling for any value of incentives for bootlegged imports and exports.

Column C lists the sample averages for incentives for imports and exports. In this example, if incentives for bootlegging decline from the sample average of 0.23 to zero, the regression results predict that consumption declines by about 3 percent (0.23×-0.14). This is indicated in column C. Thus, in a country with the mean incentives for bootlegged imports, smuggling accounts for about 3 percent of consumption. Similarly, in a country with the mean incentives for bootlegged exports, about 1.2 percent of consumption is smuggled out of the country. Using the raw data on incentives for bootlegged

Table 7.4
Estimate of Smuggling Based on Linear Regression with Independent Variables

Independent Variable[†]	A.Estimated Regression Coefficients	B. Mean Value of Independent Variable	C. Simulated Percentage Change in Consumption if Variable is Reduced to Zero
Total incentive for bootlegged imports	–0.14	0.23	–3.2%
Total incentive for bootlegged exports	–0.02	0.53	–1.2%
Price	–0.11		
GDP per capita	1.09E-05		
Year dummies	yes		
Country dummies	yes		

[†] Dependent variable is natural log of packs of 20 cigarettes per capita.
Source: Based on Merriman *et al* (2000), Table 15.4.

imports and exports, it is possible to estimate the level of smuggling in each country in each year. Furthermore, the regression results can be used to forecast the change in smuggling as a result of policies that impact the incentives for smuggling.

Note that all statistical estimates have some margin of error. By using standard statistical procedures, it is possible to give a confidence interval on estimates of smuggling.

Step-by-Step Process

Use this process to compare tobacco sales against estimated consumption by using econometric analyses:

1. Assemble a data set containing the following variables:[7]

   - Tax paid sales of tobacco in the regions in which smuggled tobacco originates and terminates

   - Tobacco prices in each region

   - Tobacco taxes in each region[8]

   - Consumer income in each region

   - Measures of accessibility between regions (these might include simple measures of geographic proximity—how long is the shared border, density of population living near border—or more complex measures of inter-regional travel or trade)

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[7] Refer to Tool 2 for a discussion of data sources and issues of data quality.
[8] Refer to Tool 4 for a discussion of tobacco taxes.

- Other variables relevant to tobacco consumption (e.g., changes in laws relating to tobacco labeling or advertising)

2. Determine measures of the incentive for smuggled imports and exports following previous literature. In particular, analysts are referred to the appendices in Becker *et al* (1994) and Merriman *et al* (2000) for technical explanation of the procedure.

3. Construct an econometric analysis to explain tax paid sales as a function of price, income, other variables, and incentives for smuggled imports and exports.[9]

4. Conduct simulations to develop estimates of bootlegged imports and exports.

References and Additional Information

The following sources of information are applicable for this particular method. See the **Review of Literature on Tobacco Smuggling** and the **Additional References** chapters for a complete description of these and other sources.

Merriman *et al* (2000), Thursby and Thursby (2000), and Becker *et al* (1994) have all employed this statistical method to analyze black market purchases of tobacco in developed countries.

Baltagi and Levin (1986) assumed that ease of bootlegging depended only upon geographical adjacency to lower priced sources of supply.

Becker *et al* (1994) consider population densities in border regions as well as the relative price in home and neighboring states.

Merriman *et al* (2000) recognize that the ease of bootlegging depends on the ease and frequency of inter-regional travel rather than geographic adjacency. They assume that the *incentive* to bootleg is proportional to the difference in price between the home and destination countries, while the *ease* of bootlegging is proportional to the total number of cross-border travelers.[10] Refer to their Appendix 15.2 for full details on the construction of these variables.

Recommendations

Though this tool presents only five methods to quantify smuggling, it should be clear there is a wider range of methods available. The five

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[9] Refer to Tool 3 for a discussion of estimation techniques.
[10] Ideally, variables measuring the ease of bootlegging should also take into account the stringency of border controls. Unfortunately, it is difficult to measure stringency quantitatively and, to date, no study has included such a variable.

presented here have certain strengths and weaknesses, and no single method is recommended for every country in every situation. In fact, as a general practice it is best if several methods are used, so that estimates of smuggling are cross-validated.

Table 7.5 provides a brief summary of the data requirements, data availability, strengths, and weaknesses of each of the five methods. Select the method(s) most appropriate to your situation and relevant policy issues.

Methods 1 and 3 are most appropriate in countries that need an estimate of tobacco smuggling very rapidly and do not have adequate data or a high degree of funding. Method 5 is the most appropriate if the largest problem is perceived to be bootlegging (rather than wholesale smuggling) and adequate time and expertise are available. Method 3 is not appropriate if bootlegging is a significant concern.

Method 1 is not recommended in political environments in which tobacco smuggling is very controversial, because its objectivity may be questioned. Methods 2 and 4 are inappropriate in countries in which smoking is considered anti-social or shameful.

Table 7.5
Five Methods and their Data Requirements and Availability, Strengths, and Weaknesses

Method	Data Requirements	Data Availability	Strengths	Weaknesses
1. Ask the experts.	Open-ended survey of experts.	Primary collection of data is necessary in most countries.	Low cost. Provides an agreeable, "common sense" view. Highly specialized training not required.	Difficult to establish constant and consistent selection of experts. Results may not be objective and cannot be replicated.
2. Observe smokers and their buying habits.	Consumer surveys follow a precise and established process.	Primary collection of data is necessary in most countries.	Provable and reproducable. Potential bias isdiscernable to those who carefully study the methodology..	Very high cost. Requires high level of expertise to select appropriate survey locations. Smuggling may be underestimated in countries with strict legal codes.
3. Monitor tobacco trade.	Data on exports and imports by country and product.	Appropriate data is available in most countries.	Very low cost. Provable and reproducable. "Common sense" results are easy to explain.	Does not detect bootlegging. Relies on a questionable assumption about "lost" exports.
4. Compare tobacco sales against consumption via surveys.	Data on tax paid sales and a variety of income, demographic, and population characteristics in neighboring areas.	Appropriate data is available in some countries. Primary collection of data on cigarette smoking is necessary in some countries.	Provable and reproducable. "Common sense" results are easy to explain. Comparable to similar data in other countries.	High cost if cigarette consumption surveys not available. Results may be inaccurate in countries with changing perceptions about smoking.
5. Compare tobacco sales against consumption via modeling and calculations.	Data on tax paid sales and a variety of income, demographic, and population characteristics in neighboring areas.	Appropriate data is available in most countries.	Low cost if appropriate expertise is used. Provable and reproducable. Comparable to similar data in other countries.	Does not detect wholesale smuggling. Requires high level of expertise. Appropriate data not available in some countries.

IV. Background Information on Tobacco Smuggling

Overview

The potential gain from tobacco smuggling depends upon the difference between smugglers' purchase and sale price. Smugglers who purchase tobacco tax-free have the potential to make large profits if the tobacco can be resold in high tax and high price countries. However, obtaining tax-free tobacco can require a large-scale operation, capital investment, and significant risk of legal jeopardy. Purchasing tax-paid tobacco in a low price country and transporting it to a high price country can involve significantly diminished legal risk.

There is a large incentive to smuggle tobacco across national borders because prices in neighboring countries sometimes vary enormously. Delipalla and O'Donnell (1999) report that in 1997 the price of the most popular brand of cigarettes in France was more than twice the price of the most popular brand in neighboring Italy and nearly four times the price in France's western neighbor, Spain. Merriman *et al* (2000) document even larger price disparities between Germany and Eastern European countries. Scandinavian countries have much higher cigarette prices than those in southern Europe. Outside of Europe, there are large price disparities in Latin America and East Asia. Within North America, cigarette prices in Canada have been more than twice those in U.S. states along the Canadian border. In some cases, these geographic variations in price provide an incentive for tobacco bootlegging.

Reasons for Price Differences

When gathering data on average tobacco prices across regions or over time, the analyst should consider the mix of brands being

smoked.[11] Whenever possible, it is best to gather data on brand-specific prices and consumption. However, even after accounting for differences in the types and brands of tobacco there are substantial differences in price in some regions. For example, in Poland a pack of Marlboro may cost $1 while the same cigarettes cost $3 in Germany. Average price differences may be explained by one of the reasons enumerated below.

- Smoking patterns differ by culture. In some countries, premium international brands are very popular, while in other countries lower priced domestic brands are mainly consumed. Some types of cigarettes are smoked in only a few cultures. *Bidis* are widely smoked in India, Bangladesh, Pakistan, and Nepal, and *kreteks* are smoked in Indonesia and Malaysia but are almost non-existent in Eastern Europe and South America. Compared to most cigarettes sold in the United States and Europe, *bidis* and *kreteks* deliver higher levels of tar, nicotine, and carbon monoxide, and are inexpensive. In countries where the price of *bidis* is averaged with the price of conventional "white stick," the average cigarette price can be quite low. Similarly, countries in which hand-rolled cigarettes (Norway) or clove cigarettes or *kreteks* (Indonesia) are widely smoked may appear to have low prices.

- Suppliers price similar cigarettes differently. A fundamental principle of economics, called "the law of one price," demonstrates that competitive forces tend to equalize prices for similar products across geographic areas. That is, *over the long term* and *in competitive markets*, the prices of similar products differ geographically only to reflect differences in the cost of transport and retailing. However, because cigarettes have a high value-to-weight ratio, in most instances transportation costs are a relatively insignificant factor in their price. Likewise, retailing costs (other than taxes) are also generally a small fraction of cigarette prices. Thus, one would expect geographic variations in price to primarily reflect variations in taxes.

  However, in some countries *tobacco markets are not competitive* and a few sellers with significant market share dominate the tobacco industry. In the European Union five firms control 90 percent of the cigarette market, while the U.S. contains a similarly concentrated market (Delipalla and O'Donnell, 1999; U.S. Federal Trade Commission, 1997). Sellers with significant market share may "price to market." That is, they set different prices in different markets after considering both changes in demand and competitors'

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[11] It is quite common for consumers in neighboring countries to have very different brand preferences. For example, the most popular cigarette brands in Canada have almost no market in the United States, and French and German consumers have very different brand preferences.

possible reactions. Additionally, in some countries government chartered monopolies have complete control over supply, and may set prices to achieve public goals such as revenue maximization. Thus, geographical price differences can reflect differences in the structure of the tobacco industry.

■ Government policies on the importation and retailing of tobacco can affect price. Many countries impose significant constraints on the importation of tobacco, to include quotas, tariffs, and non-tariff barriers. Empirical evidence suggest that these measures significantly reduce the availability of certain brands of cigarettes and lead to changes in smoking behavior (Taylor *et al*, 2000). Such restrictions on the supply of imported tobacco can lead to significant price differences in neighboring countries, differences that may provide an opportunity for profit through smuggling.

■ Taxes affect tobacco prices.[12] Taxes vary a great deal around the world. In the early 1990s European taxes averaged about US$1.50 per pack, ranging from US$5.47 cents per pack in Norway to just US$0.20 cents per pack in Poland (World Bank as referenced in Chaloupka *et al*, 2000).[13] In many countries taxes account for a large share of the price of tobacco products. European Union legislation requires that the tax burden on cigarettes account for at least 70 percent of the gross (retail) price (Delipalla and O'Donnell, 1999).

Gains and Advantages from Smuggling

There are two market conditions that almost undoubtedly provide an economic gain for smuggling.

1. If tax-free tobacco can be obtained, there is an incentive to smuggle it into countries with significant tobacco taxes, where the potential gain from such smuggling is directly related to the size of the tobacco tax and inversely related to the costs of smuggling.

2. If tax-paid tobacco prices differ between geographical areas because of the pricing policies of suppliers with market share or because of differences in taxation, there is an incentive to smuggle from low-priced to high-priced areas. The potential gain from smuggling tax-paid tobacco is directly related to the difference in price between the two areas and inversely related to the costs of smuggling.

The costs of smuggling include the cost of transporting and reselling the tobacco, and the possibility that the smuggler will be

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[12] Refer to Tool 4 for a discussion of tobacco taxes.
[13] The situation in Poland has changed considerably as a result of a series of significant tax increases in recent years.

apprehended and penalized if caught. The higher the price difference between two areas the greater the incentive to smuggle. However, the cost of smuggling is also relevant. The higher the cost of smuggling the smaller the inducement to smuggle.

Because tobacco taxes account for a large share of price and because tobacco products are relatively light-weight, the potential monetary gains from smuggling can be quite large. It is estimated that a single truckload of smuggled cigarettes can evade US$1.2 million of taxes in the European Union (Joossens, 1998, p. 150).

Tobacco smugglers may choose between occupation in legal endeavors and illegality. Compared to shipping of legal commodities, smuggling of tobacco offers potentially high revenues. However, smuggling usually requires evasive action to avoid detection. Smugglers may be required to travel by slower, less scrutinized routes, to expend resources to camouflage their illegal cargo, and to bribe border guards and customs officials. As a result, smugglers' costs are likely to be greater than those engaged in transporting a similar weight and volume of legal goods.

In addition to higher transport costs, potential smugglers face the risk of detection and monetary fine, jail, or other punishment. If the potential benefits from smuggling are very great, or the potential rewards from legal occupations are very small, many people will choose to smuggle. As the relative rewards for smuggling are reduced the number of people choosing to smuggle and the quantity of tobacco smuggled will be reduced. Policy actions to reduce smuggling must either lower the returns to smuggling or raise the return to legal occupations.

V. What Happens when Policies and Actions are Implemented

Types of Policies

Policies to combat smuggling fall into four general categories.

1. Reduce incentives for smuggling by harmonizing tax and pricing policies.

2. Reduce the supply of smuggled tobacco by regulating transport and retail sales.

3. Reduce demand for smuggled tobacco by influencing consumers not to purchase smuggled products.

4. Increase the certainty and severity of punishment through enhanced law enforcement and prosecution.

Policies in the first category are quite effective but difficult to implement. As indicated in the previous chapter, there are several reasons for retail price differentials. One important cause is multinational tobacco producers pricing-to-market by setting prices in accordance with differing demand conditions. Such differential pricing provides incentives to smuggle tobacco from low- to high-priced countries (in this case, evading taxation may be only one factor motivating smugglers). Multinational tobacco companies can reduce smuggling of their products by using uniform pricing policies within a region. Therefore, policies discouraging monopoly power within the tobacco manufacturing and retailing industry can also discourage differential pricing.

A second cause of price differentials is differential taxation of similar products in nearby countries. Regional agreements harmonizing tax rates can reduce smuggling. The European Union recently took steps in this direction as part of a broader policy of tax

harmonization. Even when neighboring countries cannot agree on tax rates, they may cooperate on measures to make tax evasion more difficult.

The most important step for government to reduce smuggling is to incorporate a simple and effective tobacco tax administration.

Policies in the second category are designed to minimize tobacco smuggling even in the presence of price differentials. Smuggling is reduced if it is very difficult to acquire and distribute tobacco products without paying appropriate taxes. Therefore the single most important element governments can do to reduce tobacco smuggling is to put in place a simple and effective system of tobacco tax administration.[14] Government personnel should be carefully trained and anti-corruption regulations should be fully explained and enforced.

Using a system of prominent but difficult to counterfeit tax stamps makes enforcement of anti-tobacco smuggling laws easier. Other labeling requirements, such as unique serial numbers, can further discourage smugglers (see Joossens *et al* 2000; Canadian Cancer Society *et al* 1999). Much tobacco is diverted by smugglers during an "in-transit" regime prior to tax payment. Diversion can be discouraged by requiring documentation of a clear chain-of-custody for all tobacco products transported into the country.

Policies in the third category include "mass media campaigns and other efforts...to raise public awareness concerning the problems associated with...[tobacco] smuggling, something that is often viewed as a 'victimless crime'" (Joossens *et al* 2000). The United Kingdom recently announced it would undertake exactly this kind of public relations campaign (HM Treasury 2000). Enactment and enforcement of sanctions for possession of smuggled tobacco can also discourage purchase of such products.

Policies in the fourth category are the most straightforward and sometimes the most effective way of discouraging tobacco smuggling. Increasing and mobilizing law enforcement resources to intercept smugglers increases seizures. The United Kingdom recently announced a major clampdown on tobacco smugglers with the addition of nearly 1,000 additional customs officers, additional x-ray equipment, and increased investigators and intelligence staff. Additional sanctions and penalties have also been put in place (HM Treasury 2000). Prosecutors and court systems should be given sufficient resources to process additional cases that develop because of increased enforcement activities.

Models for Smuggled Tobacco

In order to measure and develop effective policy responses to tobacco smuggling, it is necessary to have a clear understanding of how smuggled tobacco affects the market for tobacco products. Here,

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[14] Refer to Tool 4 for a discussion of tobacco taxes. For further information on tobacco tax administration, see British American Tobacco (1994).

economic models show how smuggled tobacco products are substituted for legal tobacco products and how this can affect the market price and consumption. A simple supply and demand model is first presented. Once the implications of this model are explored and understood, more complex cases in which the supply of legal cigarettes is not purely competitive will be introduced. A number of other issues closely related to smuggling will be considered but not modeled.

Simple Supply and Demand Model

A very simple demand and supply model for legal (tax paid) cigarettes is shown in Figure 7.2. Although the basic theory presented here is applicable to all tobacco products, the discussion is simplified by focusing only on cigarettes. This model depicts legal suppliers competing with each other and acting independently of smugglers.

The quantity of cigarettes demanded depends on many factors including consumers' knowledge of the health effects of smoking, regulations on the sale of tobacco products, advertising, types of brands available, and many cultural factors. A large number of studies have demonstrated that, despite the addictive nature of

Figure 7.2
Effect of a Tax Increase on the Equilibrium Price and Quantity of Cigarettes with Pure Competition and No Smuggling
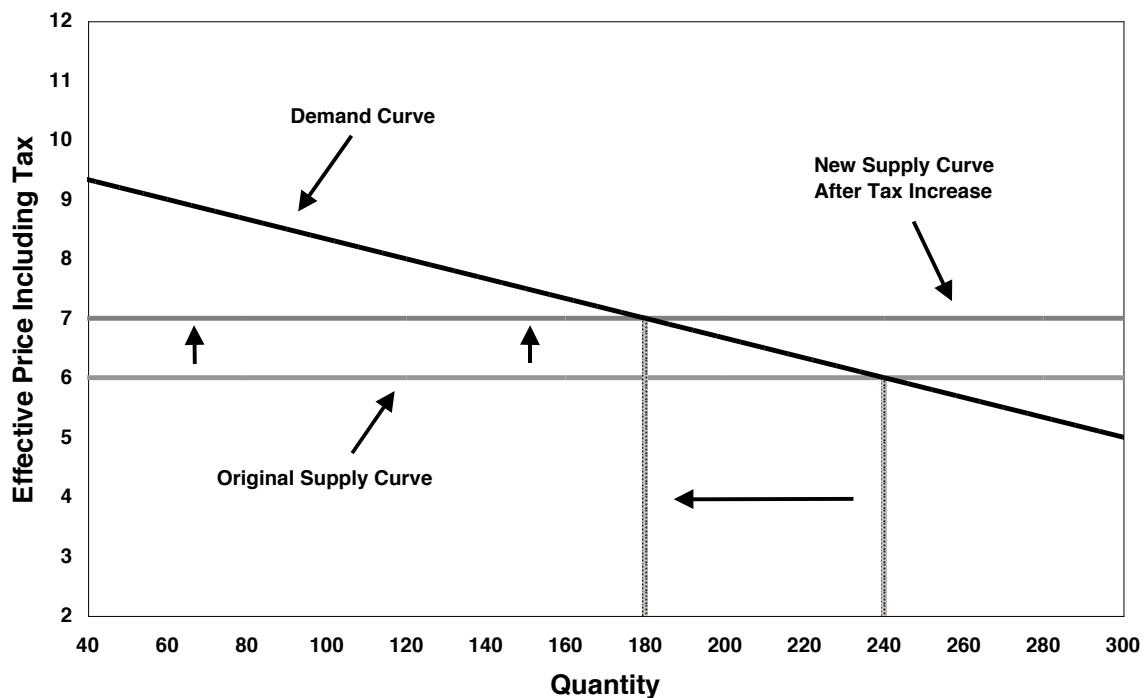
tobacco, its price is also an important determinant of demand. In this case, quantity demanded is inversely related to price—the demand curve for cigarettes is therefore depicted as downward sloping. This is important because it suggests that any policy that raises the price of cigarettes will lower consumption.

The quantity of cigarettes supplied depends on the amount of profit the producer obtains in return. International tobacco companies, which sell their product in many countries, have an incentive to ship cigarettes to countries in which they can obtain the highest return. As more cigarettes are shipped to a country a higher percentage of demanders obtain them, and the price additional cigarettes can be sold for declines. Profit-maximizing producers increase the quantity of cigarettes shipped to a country until additional cigarettes bring the same return as those shipped to alternative countries; this rate of return becomes the international norm. The return the cigarette producer receives for a product tend to the international norm in all countries (otherwise the producer would ship a higher share of cigarettes to countries in which there is a higher return). Any country that offers a higher than average return to the producer immediately gets a large increase in supply, which pushes the return back to the international norm. Any country in which the producer obtains a lower than average return experiences a fall in supply until the return rises to the international norm.

Suppose that the international norm for a cigarette price is designated as P and is equal to 5. In the absence of tobacco taxes the producer's gross return will be equal to the price of a cigarette. If tobacco taxes are levied, the price of cigarettes must be sufficiently high that, after paying the tax, the producer get a net return equal to P. Suppose that the tax in a particular country is initially $t_1 = 1$. The producer will supply only as many cigarettes as can be sold at a price $P_1 = P + t_1 = 6$. This situation is depicted in Figure 7.2 by showing the supply of cigarettes as a horizontal line at the price level of 6.

If there were no smuggled cigarettes, the quantity of cigarettes sold in this market would be just equal to the quantity of cigarettes demanded when the price is 6. In Figure 7.2, this occurs at a quantity of $Q_1 = 240$.

In the absence of smuggling, an increase in the cigarette tax (from say, $t_1 = 1$ to $t_2 = 2$) shifts the horizontal supply curve upward,[15] and the new equilibrium occurs along the new supply curve and the original demand curve. In the scenario, the new equilibrium price increases from 6 to 7 and consumption falls from 240 to 180.

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[15] Equivalently, we could view the tax as causing the demand curve to shift down (lower quantity demanded at each price) with no impact on the supply curve. The two approaches yield equivalent equilibrium prices, quantities, and distribution burdens. See Rosen p. 78–293.

Model with Smuggled Cigarettes

Unfortunately, cigarette taxes present an opportunity for bootleggers and large-scale smugglers. Figure 7.3 introduces smuggled cigarettes into the earlier supply and demand model. The greater the difference between smugglers' cost of obtaining cigarettes and the price at which the cigarettes can be sold, the greater is the incentive to smuggle. Since smugglers usually have limited alternatives for selling their cigarettes, the supply curve for smuggled cigarettes is upward sloping. All else constant, the higher the price, the more cigarettes smugglers will supply. The total quantity supplied, at any price, is the sum of the amount supplied by smugglers and the amount supplied by legal suppliers. In Figure 7.3, smugglers supply a quantity of 80 when the market price is 6. The total demand at a market price of 6 remains at 240 (as in Figure 7.2), so legal suppliers provide 160 = 240 – 80 units. Note that, in this model, smuggling has no effect on equilibrium price or consumption.[16]

Figure 7.3
Irrelevance of Smuggling on the Equilibrium Quantity and Price of Cigarettes with Pure Competition in Legal Supply

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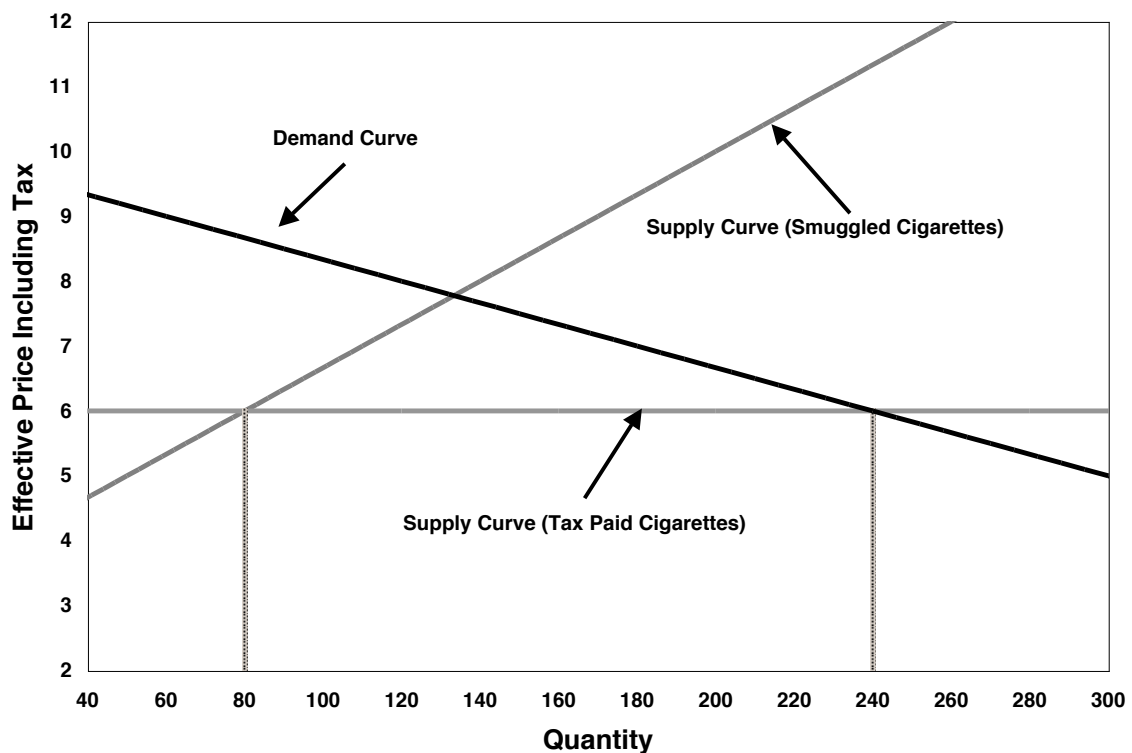
[16]A recent United Kingdom government report on smuggling (HM Customs and Excise 2000) implicitly adopts this model when they assume that "100 per cent of smuggled tobacco replaces UK purchases" (p. 7). This appears to be at variance with the report's claim that "the effect of duty increases in discouraging cigarette consumption is considerably less than it would otherwise be" (p. 6) because of increases in cigarette smuggling.

This result may puzzle some readers and provoke the objection that smugglers are observed to offer cigarettes at a lower price than those sold in the tax paid (legal) market. In order to evaluate this objection it is important to clarify what is meant by the "price" of cigarettes. The price that consumers pay for cigarettes (or any other good or service) should be divided into two parts:

- The first part of price, which economists call the "transaction price," is the amount of money the buyer pays to the seller in exchange for the product. This is also called the "sale price."

- The second part of price is called the "inconvenience price." This is the time and discomfort consumers incur in order to engage in a transaction. A shop that is centrally located and which many consumers pass in the course of their daily affairs has a low inconvenience price. A shop located in a dark corner of the city and which requires a special trip to visit has a high inconvenience price. Purchasers may also face potential legal sanctions and other risks that go along with participating in a black market. Although the inconvenience price does not require a monetary transaction, it is none-the-less quite real.

The sum of the transaction price and inconvenience price is called the "effective" price. It is the effective price that consumers consider when deciding whether to make a purchase. In general, the higher the effective price, the lower the quantity of cigarettes demanded.

It is true that smugglers often charge a lower transaction (or sales) price than in the tax paid (legal) market. The explanation for this is that, in many cases, consumers who purchase smuggled cigarettes pay a high inconvenience price. The location of the street sellers who deal in smuggled cigarettes can be undependable, or there can be uncertainty about the authenticity of brand markings on the cigarettes. Consumers may even fear embarrassment or legal penalties if they are detected buying smuggled cigarettes.

There is some empirical evidence suggesting consumers are unwilling to pay as high a transaction price for smuggled cigarettes as they would pay for legal cigarettes. One study in the United Kingdom found that 17 percent of adult smokers prefer to buy cigarettes from recognized outlets rather than individuals even if the transaction price of the cigarettes sold by the individuals was £1.00 lower (quoted in DTZ Pieda Consulting 2000.)

In the scenario presented in Figure 7.3, the presence of cigarette smuggling does not lessen the health benefits from cigarette tax increases. Imagine that, beginning from the equilibrium, the tax is increased from $t_1 = 1$ to $t_2 = 2$ (as in Figure 7.2). The supply curve for tax paid cigarettes shifts up and becomes a horizontal line at a price of 7 (this is not shown in the figure). The new equilibrium quantity occurs at the intersection of this new supply curve and the original demand curve—180 units—exactly as in Figure 7.2. The sale of smuggled cigarettes increases, however. With the increased tax,

smuggled cigarette sales is determined by the supply of smuggled cigarettes (about 110) at a price of 7. Thus, smuggled sales increase and tax paid sales fall more than consumption as a result of the tax increase.

The emerging conclusion is that smuggling has no effect on equilibrium price or consumption and does not lessen the health benefits of cigarette tax increases. This conclusion does not imply that cigarette smuggling does no harm and can be safely ignored. On the contrary, cigarette smuggling deprives the government of tax revenues that could be used to educate the public about the health effects of smoking. Furthermore, smuggling can breed corruption and disrespect for law enforcement officials. Finally, smuggling can make it difficult to obtain political support for future tobacco control efforts.

Model with Increasing Total Supply

As discussed in earlier sections, in many countries the market for cigarettes is controlled by a few sellers and may not be purely competitive. There is vast literature on how sellers set prices and quantities in markets when they have few competitors. While many outcomes are possible, consider the case in which the total market supply for legal cigarettes is upward sloping—the higher the equilibrium price the greater the quantity of cigarettes supplied.

This case is illustrated in Figure 7.4. The demand and supply curves for smuggled cigarettes remain as they were in the previous figures. However, because the supply curve of legal cigarettes is upward sloping, total cigarette supply (e.g., the sum of smuggled and legal cigarette supply) is greater than the legal supply at each price. Thus the total supply curve intersects the demand curve at a lower price and a higher quantity than the legal supply curve. In this model, equilibrium price is lower and consumption is higher than they would be if smuggling were eliminated.

However, the increase in consumption resulting from smuggling is likely to be much less than the total quantity of cigarettes smuggled. The total quantity of smuggled cigarettes is determined by the intersection of the smuggling supply curve and the equilibrium price. The increase in consumption as a result of smuggling is determined by

1. the difference between the quantity at which the supply of legal cigarettes intersects the demand curve (240 units)

2. the quantity at which the total (legal plus smuggled) supply curve intersects the demand curve (slightly more than 260 units)

In general, this difference is less than the total quantity of smuggled cigarettes because smuggled cigarettes to some extent substitute for legal sales. In this example, equilibrium smuggled sales are nearly 70

units but the presence of smuggling increases total sales by only about 20 units.

Furthermore, the main conclusions about tax increases discussed with respect to Figure 7.3, continue to hold in Figure 7.4. Even when the legal supply curve is upward sloping and smuggling is possible; increases in cigarette taxes reduce cigarette consumption. Increased cigarette taxes can result in increased smuggling unless counter measures are taken, but the increase in smuggling is less than the decline in legal consumption.[17]

Four further issues related to this model can be discussed.

- For simplicity, Figures 7.2 through 7.4 illustrate the supply and demand curve for a single type or brand of cigarette. In general, introducing multiple brands complicates the diagrams without altering the fundamental result. However, smuggling can provide an avenue of market entry for producers of prohibited brands. It is alleged that in some

Figure 7.4
Effect of Smuggling on the Equilibrium Quantity and Price of Cigarettes with Upward Sloping Legal Supply

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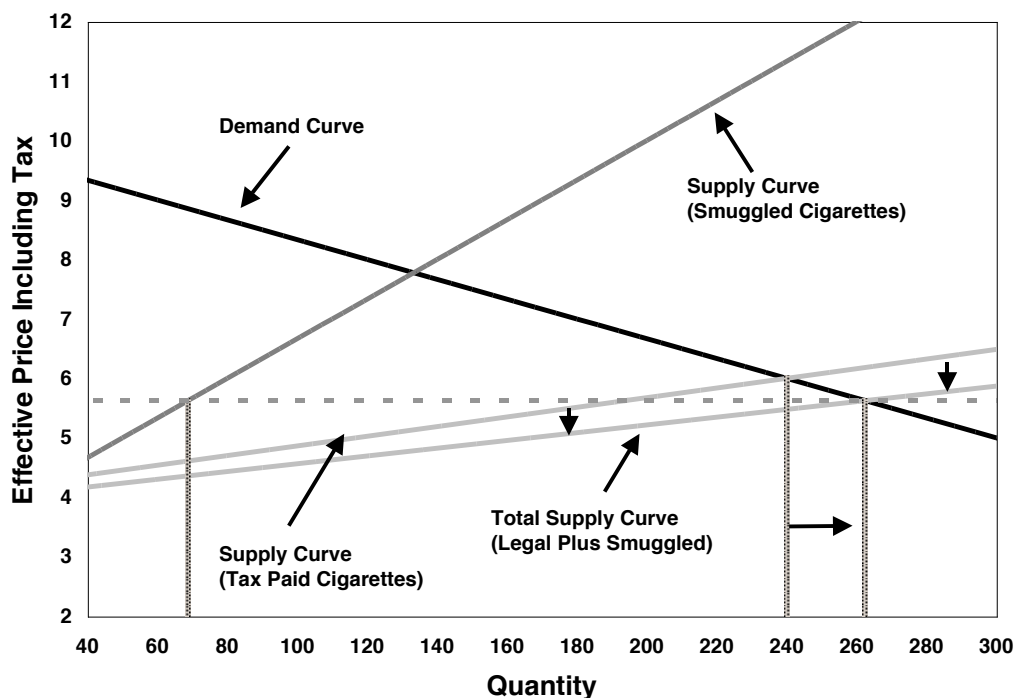
[17] Xu, Hu and Keeler (no date) present a more complete and sophisticated model of cigarette smuggling in imperfectly competitive markets that obtains similar results. They find that even in models with imperfect competition and smuggling, the tax rate increases the equilibrium price and therefore decreases total consumption.

cases, producers of prohibited brands use smuggling to gain access to prohibited markets. After penetrating the market with smuggled cigarettes, producers then use customer loyalty as a political wedge to lobby for legal access to the market.

- The three models presented assume that the quantity demanded depends only on current price. However, because cigarette smoking is addictive, demand also depends on consumption in prior periods. For this reason, cigarette sellers can obtain long-term benefits (e.g., an increase in the demand for their product) from reductions in current price. As shown in Figure 7.4, smuggling can reduce current price, but the effect is likely to be quite small. Thus, smuggling is unlikely to significantly increase long-term consumption by increasing the addicted population.

- The direct resource costs of smuggling should not be ignored. As noted in Bhagwati and Hansen (1974), smugglers incur high transport costs because of the need to avoid detection. If smuggling markets are competitive profits are driven to zero. This implies that, in the long run, the cigarette tax revenue the government loses to smugglers is entirely consumed by excess travel costs incurred by smugglers. This is a wasteful use of society's scarce resources.

- Although not done so here, these three models can be easily adapted to show the revenue raised from a cigarette tax with and without smuggling. As is made clear in the figures, the key parameters necessary to estimate revenue changes when taxes are altered include: (a) the slope of the demand curve, (b) the slope of the legal supply curve, and (c) the slope of the smuggled supply curve.

Conducting a Simulation Analysis

Often the key motivation for conducting studies of tobacco smuggling is to analyze recently enacted or proposed changes in policy. Econometric simulations of policy changes can be a useful tool for understanding the impact of smuggling, and can play an important role in public policy debates.

Assumptions and Requirements

A basic principle of simulation analysis is that it compares the state of the world *with* a certain policy to the state of the world *without* a certain policy. One of the most common errors made by aspiring policy analysts is confusing this *with/without* comparison with a *before/after* comparison. That is, many analysts compare the state of world prior to implementation of a policy with the state of the world

after the policy was put in place. Differences in the state of the world are considered attributable to the policy. Yet such an analysis can falsely attribute changes in smuggling to policy changes when, in fact, it is variables other than policy (such as changes in economic conditions) that are responsible for changes in smuggling.

An example of a with/without policy simulation is contained in Merriman *et al* (2000). They use their econometric results (see Table 7.5) to simulate the changes in tax revenue resulting from changes in tax rates, taking into account both changes in consumption and changes in bootlegging. Two types of policy changes are simulated. The first policy, a multilateral tax increase, is a 10 percent tax increase undertaken jointly by all countries in Europe. The second policy, a unilateral tax increase, is a 10 percent tax increase undertaken independently by each country in Europe.

A 10 percent tax increase alters three of their independent variables. Assuming that tax increases are passed on to consumers in the form of higher prices, the price of tobacco is altered by the tax increase. Tax increases also change the *relative* price (home country price divided by neighbor country price) of cigarettes. In turn, this change alters the incentive for bootlegged imports and exports. For each country, the increase in relative price is greater with a unilateral tax increase than with a multilateral tax increase. In fact, with a multilateral tax increase, the relative price falls in some countries.

Tax revenue is simply the product of the tax per pack and the number of packs of tax paid sales. Merriman *et al* (2000) use their estimation results to simulate tax paid sales with original (observed) and new (higher tax rate) independent variables (see Table 7.5). Simulated tax revenues are calculated in each case and the results are presented in tabular form.[18]

Simulated results are subject to sampling variation. It is technically possible to construct confidence intervals for simulation results based on econometric estimates, but this can be quite laborious. Technical details of the necessary calculations are presented in Theil (1971, p. 134). In general, if the coefficients of the econometric model are estimated precisely (e.g., the standard errors are small relative to the coefficients), confidence intervals around the simulated results are also relatively small. Poorly fitting econometric models lead to wide confidence intervals around simulated policy changes. It may not always be feasible to construct formal estimates of the statistical variability of simulation estimates. However, analysts should be aware that their estimates are subject to statistical variability and should interpret their results accordingly.

Step-by-Step Process

The mechanics of conducting a simulation analysis vary depending upon the exact relationships that are estimated and the exact policy

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[18] See Table 15.6 of Merriman *et al* (2000) for more detailed information.

change that is to be simulated. Follow these necessary steps to conduct a simulation analysis:

1. Specify a relationship between outcome variables and policies. This relationship may be estimated econometrically or may be based on analyses conducted by others.

2. Predict outcomes with initial (observed) policies.

3. Predict outcomes with new (hypothesized) policies.

4. Compare initial and new value of outcome variables to determine the impact of the policy change.

VI. Review of Literature on Tobacco Smuggling

Tobacco smuggling is clearly a significant political issue. It figures largely in the debate about tobacco control. It is a contentious issue between tobacco producers and tobacco control advocates. Tobacco smuggling is also a significant legal issue for both the government and the tobacco industry. Is tobacco smuggling a quantitatively important issue? How large a share of tobacco is smuggled?

There are currently no definitive answers or resolutions to these concerns and questions. The methods and pervasiveness of tobacco smuggling vary from country to country and from time to time. Reliable estimates of tobacco smuggling in particular countries require detailed study and focus on the country or countries in question. Perhaps even more important, sound evaluation of the relationship between a country's tobacco control policies and *changes* in smuggling require knowledge about the particular situation in that country, good data, and sound methodological techniques.

This chapter briefly reviews some of the estimates of tobacco smuggling in various areas around the world. These examples provide some idea of the variety of methods and results currently in use. For more specific discussion on conducting some of these methods, refer to the earlier **How to Measure Smuggling** chapter.

Estimates of Cigarette Smuggling in the United States and Canada

Merriman *et al* (2000) review academic estimates of cigarette smuggling in the United States and Canada.[19] Table 7.6 summarizes their review.

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[19] No literature is available on the smuggling of tobacco other than cigarettes in the United States.

Table 7.6
Econometric Studies of Cigarette Smuggling

Study	Geography & Period	Results	Notes
Baltagi and Levin (1992)	46 U.S. states, 1963–88	10% price increase in neighboring state causes 0.8% increase in taxed sales of home state.	Results largely confirm Baltagi and Levin (1986).
Saba, Beard, Ekelund and Ressler (1995)	48 continental U.S. states and D.C., 1960–86	Excluding DC, no state lost more than 2% of sales as a result of purchases in neighboring states in 1986.	In many states cross-border sales declined between 1960 and 1986.
Thursby and Thursby(2000)	40 U.S. states, 1972–1990	0.69% to 7.8% of consumption is smuggled.	In most years smuggling is 3% to 5% of total sales.
Galbraith and Kaiserman (1997)	Total Canadian monthly consumption, 1980–1994	Total consumption is less responsive to price increases (short-run elasticity of –0.40) than taxed consumption (short-run elasticity of –1.01).	Canada's 1991 cigarette tax increase was rolled back in 1994 due to belief that high taxes encouraged smuggling.

Source: Based on Table 15.1 of Merriman *et al* (2000).

Baltagi and Levin (1992 and 1986) studied cigarette bootlegging and legal cross-border shopping between U.S. states. They find that cigarette sales varied inversely with price, and higher prices in neighboring states *increase* cigarette sales in the state of residence. They reason that such price increases reduce the incentive for consumers to cross into neighboring states to make purchases. In their 1992 paper, Baltagi and Levin find that each 10 percent increase in a neighboring state's price causes an increase of 0.8 percent in home state sales.

Saba *et al* (1995) also find significant evidence of citizens crossing U.S. state borders to purchase lower-priced cigarettes. Where many citizens reside in high-tax jurisdictions in close proximity to low-tax jurisdictions (most importantly, the District of Columbia and New Hampshire), border crossing accounts for a substantial portion of sales. However, in most states border crossing accounts for less than two percent of sales.

A sophisticated study by Thursby and Thursby (2000) allows for wholesale smuggling as well as bootlegging and cross-border shopping. Using data from 39 U.S. states and the District of Columbia from 1972 to 1990, they find that in most years between three and five percent of U.S. consumption results from cross-border shopping or smuggling.

Galbraith and Kaiserman (1997) study smuggling in Canada. They note that "virtually all cigarettes smuggled into Canada...were previously exported from Canada" (pp.288–89). Using this insight they measure the responsiveness of smuggling to changes in taxes. Beginning in the early 1980s, Canada steadily increased its cigarette taxes so that, by 1991, there is a large price differential between U.S.

and Canadian cigarettes. In 1994, Canada subsequently reduced cigarette taxes due to a perception that smuggling increased. Galbraith and Kaiserman find there was a large increase in untaxed sales following the increase in Canadian taxes. They estimate a unitary elasticity of taxed cigarette consumption with respect to price: each one percent increase in Canadian taxes causes taxed sales to fall by about one percent. However, they also find that total consumption (taxed plus smuggled sales) fell by only 0.4 percent, with smuggled sales increasing by 0.6 percent. Gailbraith and Kaiserman's estimates suggest that, despite the increase in smuggling, total Canadian tax revenues are not diminished by the tax rate increase, and that total consumption is reduced.

There is evidence that the high level of smuggling into Canada is facilitated by the tobacco industry. There is a distinct taste difference between Canadian and U.S. cigarettes and there is little demand for Canadian cigarettes among U.S. smokers. Despite the lack of demand for their product, Canadian tobacco firms significantly increased exports to the United States in the early 1990s, greatly aiding smugglers. Canadian tobacco taxes were avoided by shipping the cigarettes to the U.S. These untaxed cigarettes provide a source of product that can be smuggled back into Canada. Further details are provided in Canadian Cancer Society *et al* (1999).

In summary, existing evidence suggests that in the United States interstate smuggling is, in most cases, a relatively minor annoyance rather than a major barrier to cigarette taxation. In Canada cigarette smuggling can be a larger impediment. This difference may stem from the relatively small inter-state price differentials induced by U.S. cigarette taxation compared to the relatively large price differentials brought about by increases in Canadian taxation.

Estimates of Tobacco Smuggling Outside of North America

Merriman *et al* (2000) also provide their own original estimates of bootlegging in Europe using a method similar to that employed in earlier academic studies of bootlegging in the U.S. and smuggling between Canada and the United States. Using data from 1989 to 1995, they estimate the demand for cigarettes in 17 European countries. Cigarette demand is allowed to be a function of home country price, income, and other variables. Cross-border shopping and bootlegged imports and exports are allowed to depend upon the price in neighboring countries and the frequency of travel between those countries. This method represents a significant advance over earlier studies using simple geographic proximity to identify origins and destinations of smuggled cigarettes. Merriman *et al's* empirical findings are quite consistent with studies of cross-border shopping and bootlegging in the U.S. They estimate that about three percent of total European consumption during this period is due to cross-border

shopping, tourist shopping, duty free sales, and bootlegging. Germany is estimated to have significantly greater imports from these sources (about 15 percent in 1995) because of the high price of German cigarettes relative to its neighbors and the high frequency of travel between Germany and other countries.

The British Government recently produced its own estimates of cigarette smuggling in the U.K. (HMCE 2000). This method, described in more detail in the **How to Measure Smuggling** chapter, compares official estimates of tax paid sales with survey respondents reports of cigarette consumption. The government estimates the market share of smuggled cigarettes in the United Kingdom rose from about 3 percent in 1996–97 to about 18 percent by 1999–2000. This rapid rise in smuggling is attributed to large annual increases in duties since May 1997 that have increased the price of legal tobacco by about 25 percent.

In addition to estimates for specific countries in Europe, Merriman *et al* (2000) provide two sets of estimates of total smuggling worldwide as a share of consumption. Their first method builds on earlier work by Joossens (1998) and compares worldwide recorded exports of tobacco with worldwide recorded imports. Tobacco products diverted during "in-transit" status are normally recorded as exports from the country of origin. However, because these tobacco products are surreptitiously transported into the country in which they are consumed they do not appear as imports. Thus, smuggling from in-transit regimes creates a total excess of exports. Worldwide data show that, in recent years, recorded tobacco exports exceed recorded imports by more than one-third of exports. This is consistent with more than one-third of the international trade in tobacco products being diverted by smugglers. Since about 18 percent of total tobacco production is exported, Merriman *et al* (2000) estimate that approximately one-third, or 6 percent of total tobacco production, is smuggled worldwide through diversion of untaxed exports. These figures do not include bootlegging, cross-border shopping, and similar activities where tobacco taxes are paid in the country of origin.

Merriman *et al* (2000) also use a second method to estimate worldwide cigarette smuggling. They gathered estimates of the share of smuggled cigarettes in specific countries published by Market Tracking International in its series of publications called *Marketfile*, which gives detailed descriptions of the tobacco market in many countries around the world. The primary users of this publication are tobacco industry analysts. Each country description contains an estimate of the share of smuggled cigarettes. Although a uniform method is not used to produce these estimates, experts familiar with the country are consulted, as are media and police reports. Estimates from more than 30 countries are gathered, and supplemented with expert estimates on a number of European countries for a total of more than 40 countries. The population-weighted average of experts' estimates of smuggling in these countries is 8.5 percent. This result is

remarkably consistent with the result obtained using the completely independent method of calculating the excess of exports over imports.

Preliminary results from several studies provide evidence about tobacco smuggling in developing countries. Tal (2000) focuses on cigarette smuggling in Estonia, and estimates that nearly half of the cigarettes legally sold in Estonia go to foreign visitors. She attributes a large share of these sales to visitors from neighboring Finland, where cigarette prices are much higher. She further estimates that illegal Estonian consumption (sale without payment of applicable Estonian taxes) accounts for 10–20 percent of the cigarette market in the late 1990s.

Hu and Mao (2000) perform a case study of China, and note that China has long-standing legal prohibitions on the importation of foreign cigarettes. However, "[i]t is quite obvious for visitors in urban China to observe numerous foreign brands of cigarettes are readily available at retail stores and vendors." (p.12) The authors estimate that "most likely, 8 to 9 percent of domestic [cigarette] consumption came from illegal sources: smuggling" (p.13).

In summary, published estimates suggest that worldwide cigarette smuggling accounts for approximately six to nine percent of consumption. Estimates from the U.S. and Europe suggest that cross-border shopping, tourist shopping, duty free sales, and bootlegged cigarettes can account for about three percent of consumption. However, there is considerable evidence that the level of cigarette smuggling varies dramatically from country to country and from time to time. More detailed studies of cigarette smuggling in individual countries are essential to the development of sound tobacco control policy.

VII. Conclusion and Summary

A Final Word of Caution and Encouragement

Tobacco smuggling problems vary a great deal from country to country. The tobacco use habits, marketing practices, design of taxes, regional context, and any other information relevant to the country of study should all be considered during the research design phase. The techniques described in this tool should be adapted to the particular situation and relevant policy issues in the country of interest.

Study of tobacco smuggling is especially difficult because of the illegal nature of the activity. Further, adding to this difficulty is the scarcity of studies of tobacco smuggling in less developed countries. Although this lack of experience is a handicap to those wishing to conduct research, it increases the significance of their contribution. Each study of tobacco smuggling, especially those in developing countries, enables everybody to better understand this phenomena. As studies of individual countries are circulated and analyzed, measurement techniques can be refined and tobacco smuggling can be better understood. Ultimately, this research will lead to improved tobacco control policies.

Key Ideas to Remember

This tool is intended to provide background and a roadmap for those wishing to understand, measure, and develop policies to combat tobacco smuggling in their own countries. It is not feasible to provide a complete summary of every point made in this tool. Rather, key ideas from each chapter of this work are highlighted.

How to Measure Smuggling

Five broad approaches can be used to obtain quantitative estimates of tobacco smuggling, including (1) asking the experts, (2) observing smokers and their habits, (3) monitoring tobacco trade, and comparing tobacco sales against consumption via (4) surveys and (5)

econometric analyses. Step-by-step instructions for the use of each approach are presented.

Background Information on Tobacco Smuggling

Tax differentials are only one factor making smuggling potentially profitable. Regional price differentials also exist because sellers price to market and because the quality and brand composition of tobacco consumption differs.

Legal circumvention of taxes is a relatively insignificant problem in most areas. Illegal circumvention of taxes, either because of bootlegging or wholesale smuggling, is generally a more significant problem.

What Happens when Policies and Actions are Implemented

Policies to combat smuggling include those that

1. reduce incentives for smuggling by harmonizing tax and pricing policies

2. reduce the supply of smuggled tobacco by regulating transport and retail sales

3. reduce demand for smuggled tobacco by influencing consumers not to purchase smuggled products

4. increase the certainty and severity of punishment through enhanced law enforcement and prosecution

Theoretical models suggest that, in most cases, smuggling has little effect on equilibrium tobacco price and consumption. The models imply that the presence of tobacco smuggling does not lessen the health benefits from tobacco tax increases.

Review of Literature on Tobacco Smuggling

Estimates suggest that worldwide cigarette smuggling accounts for approximately six to nine percent of consumption. Estimates from the United States and Europe suggest that bootlegged cigarettes, one component of worldwide smuggling, account for about three percent of consumption. However, there is considerable evidence that the level of tobacco smuggling may vary dramatically from country to country and from time to time.

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