



BACKGROUND PAPER #16

The Effect of Excise Tax Differentials on the Interstate Smuggling and Cross-Border Sales of Cigarettes in the United States

By Patrick Fleenor
Economist
Tax Foundation

October 1996

©1996 Tax Foundation. All rights reserved.

* * *

Price: \$10.00
\$5.00 for members
Add \$2.00 postage and handling

* * *

Tax Foundation
1250 H Street, N.W.
Suite 750
Washington, DC 20005
202-783-2760 Tel
202-942-7675 Fax
<http://www.taxfoundation.org>
taxfnd@intr.net

Table of Contents

| | |
|--|----|
| Executive Summary | 1 |
| I. Introduction | 3 |
| Implications for Federal Tax Reform..... | 3 |
| A Federal Retail Sales Tax | 3 |
| State Tax Policy | 4 |
| Tax Policy Driven by Social Policy | 4 |
| II. Cross-Border Effects | 5 |
| Variation in Per Capita Cigarette Sales by State | 7 |
| Historical and International Precedents | 10 |
| Recent Experiences in the United States | 11 |
| The Situation Today | 12 |
| Previous Analysis | 13 |
| III. A Model of Cigarette Supply and Demand..... | 13 |
| Estimation | 16 |
| Results | 17 |
| IV. Conclusion | 19 |
| Endnotes | 20 |
| Appendix | 21 |
| Bibliography | 23 |

Executive Summary

Recent increases in state excises on cigarettes offer an unusually rich opportunity to examine market behavior in response to changes in relative prices. In recent years, state governments have frequently turned to higher cigarette excise taxes as a means of both raising tax revenues and enforcing a particular social policy through their tax codes.

The escalation in state cigarette excise taxes, however, has not been uniform across the nation. While some states have raised their cigarette excise taxes by as much as 200 percent in recent years, others have not altered these taxes in nearly a quarter of a century. This has created a situation where a wide disparity exists among the states in both cigarette excise taxes and prices.

One possible response to higher cigarette prices is to lower consumption. The compact, lightweight nature of cigarettes, however, makes it an ideal product for both casual cross-border purchases and large scale, interstate smuggling. Thus the disincentive to consume tobacco products posed by higher taxes can be largely mitigated by changes in purchasing patterns. The incentives to engage in either of these activities clearly increase as the tax differentials between states rise.

This is not a new phenomenon. The avoidance of excise taxes has a long history both in the United States and the rest of the world. During the late 1960s and early 1970s differentials of a similar magnitude led the U.S. Advisory Commission on Intergovernmental Relations (ACIR) to declare that “[cigarette] tax evasion activities...are a serious [or moderate] problem” in nearly half of the states. In 1978, Congress responded by enacting legislation making it a federal offense to engage in large scale, interstate smuggling of cigarettes. This action, coupled with the high inflation of the period which reduced the real value of tax differentials, led to a decline in cross-border activity during the late 1970s and early 1980s.

Since 1983, however, there has been a marked increase in the variance of cigarette excise taxes among states. This has made both cross-border shopping and smuggling much more rewarding. In order to get an idea as to the consequences of this growing disparity in state cigarette excises, the Tax Foundation developed a model of cigarette supply and demand and used it to estimate changes in cross-border activity. Among the significant findings of this study are:

- The growing disparity in cigarette excise taxes among states has led to an increase in cross-border shopping. Increasingly, states with widely differing cigarette excises are bordering one another. In search of bargains, price conscious consumers in the high-tax states are crossing borders to purchase cigarettes. Such behavior led to a 395 percent increase in cross-border shopping between 1980 and 1994.

- Growing excise tax differentials have also made cigarette bootlegging a nationwide problem once again. The *flashpoint*, or point at which the bootlegging of cigarettes becomes sufficiently profitable to attract organized criminal elements, as identified in the original ACIR study, has now been reached in at least half of the states. As a result, cigarette smuggling is more profitable than ever. This led to a 253 percent increase in the number of cigarettes smuggled in the United States between 1980 and 1994.

- Rising state excise taxes on cigarettes also encourage individuals with access to cigarettes not subject to such taxes to alter their purchasing habits. The two primary sources of such cigarettes are Native American tribal reservations and commissaries on military bases. The Tax Foundation model shows that for states whose populations are comprised of large numbers of Native Americans and active duty military personnel and/or with high cigarette excise and sales taxes, this effect can be very dramatic. During FY 1994, for example, approximately 5.7 percent of Alaska's population was comprised of Native Americans with access to nontaxable cigarettes, while 3.8 percent were active duty military personnel. During this

year, sales and excise taxes added 53 cents to the price of each pack of cigarettes sold. As a result, the model predicts that per capita taxable sales fell 31.2 packs within the state. Of this decline, 15.1 packs were attributable to sales on Native American tribal reservations while 16.1 packs were the result of sales on military bases. These results are consistent with the findings of other investigators.

- The effects of cross-border shopping have been especially pronounced along the U.S.-Canadian border. Between 1980 and 1994, states along the border near large Canadian population centers, where cigarette prices had generally been higher due to excise taxes, experienced per capita cigarette sales which were approximately 10.4 packs higher than the national average simply by virtue of their location.

The findings of this study are therefore similar in many respects to the original ACIR report on this problem. Cigarette excise tax differentials among states lead to variations in cigarette prices. These price differences encourage both cross-border shopping by price conscious consumers and the organized smuggling of cigarettes. State legislators need to be cognizant of this fact when they consider raising cigarette excises if for no other reason than because the expected increase in state revenues may not be forthcoming and the state may suffer an overall loss of revenue.

I. Introduction

Recent increases in state excise taxes on cigarettes offer an unusually rich opportunity to examine market behavior in response to changes in relative prices. In recent years, state governments have frequently turned to higher cigarette excise taxes as a means of both raising tax revenues and enforcing a particular social policy through their tax codes.

The escalation in state cigarette excise taxes, however, has not been uniform across the nation. While some states have raised their cigarette excise taxes by as much as 200 percent in recent years, others have not altered these taxes in nearly a quarter of a century. As a result, both cigarette excise taxes and prices vary widely among the states.

One possible response to higher cigarette prices is to lower consumption. The compact, lightweight nature of cigarettes, however, makes it an ideal product for both casual cross-border purchases and large scale, interstate smuggling. The incentives to engage in either of these activities increase as the price differentials between states rise.

Implications for Federal Tax Reform

The study of cross-border sales may shed light on a number of important issues in tax policy. For example, the federal tax system may be overhauled in the next few years and a basic principle of this restructuring is to change the tax incentives facing individual taxpayers. The current federal income tax is universally recognized to tax income that is saved much more heavily than income used to finance consumption. A key question, then, relates to how income earners will respond to changes in the relative disincentives to consume and to save.

At the core of this question lies the matter of how responsive individuals are to changes in relative prices. The more evidence that is available to indicate how changes in relative prices affect consumer behavior, the greater assurance

policymakers and the public will have that tax reform dedicated to reducing the tax burden on saving will be worthwhile and successful. To be sure, changes in consumption patterns in response to a change in state cigarette excises offers only indirect evidence as to how consumers would respond to changes in savings disincentives. However, the issue is whether consumers' spending and savings patterns are essentially fixed, or whether they will change in response to changes in relative prices. Cigarette consumption is often thought to be relatively unresponsive to changes in price. If cigarette consumption patterns, including cross-border sales, can be shown to change in response to local changes in cigarette prices, it offers useful evidence that consumer behavior can and will in fact change in response to relative price incentives.

A Federal Retail Sales Tax

One of the options currently under discussion for federal tax reform is the replacement of the federal personal and corporate income taxes with a federal retail sales tax (RST). A federal RST has many strengths, to be sure, but a commonly raised concern with an RST is that it would lead to widespread tax evasion and the rapid growth of the underground economy. To be fair, the current tax system is certainly subject to a significant degree of tax evasion and the underground economy continues to be a significant share of our total national output.

Nevertheless, a study of cross-border sales and smuggling in response to significant differentials in state cigarette excise tax rates may shed some light on whether tax evasion and the size of the underground economy under an RST is likely to be a greater problem than we currently face under the federal income tax. Certainly the recent Canadian experience with its high tobacco excises indicates that this could be a serious problem.

State Tax Policy

One purpose of raising state cigarette excise rates is to raise additional tax revenue for state coffers. Even when this is not the primary purpose, it is certainly an expected consequence on which state budget policies may be based. A state that makes other tax or spending decisions either in part or entirely based on the assumption that a certain amount of cigarette excise revenues will be forthcoming may find itself in a very difficult position if cigarette excise revenues fall short of projections. This is particularly true if a state government is constitutionally required to maintain a balanced budget.

Because increases in cigarette excise taxes lead to increases in cross-border activity there is a great deal of uncertainty surrounding their net effects. Cigarettes are typically just one element of a shopping trip that may involve the purchase of other goods subject to both state sales and product specific excise taxes. When high cigarette excise taxes result in the migration of purchasing activity across state borders, state coffers are likely to see a diminution of these types of revenue. In addition, a state is also likely to see a decline in personal and business income tax receipts as the economic activity, and its associated income tax base, migrates to lower-tax states. Moreover, these secondary revenue losses have no offsetting benefits. While the full assessment of this effect is beyond the scope of this paper, state tax policymakers considering an increase in cigarette excises should consider these secondary effects carefully when making budget policy, or else they may face a significant revenue shortfall relative to state revenue projections.

On the other hand, a state whose neighbor raises its cigarette excise tax rate is likely to experience an increase in cross-border cigarette sales, thereby increasing its own cigarette tax receipts. And, of course, to the extent a high-cigarette-excise tax state experiences an emigration of economic activity through cross-border sales

and their secondary effects, the revenue gains to the low-tax state may be significant. In effect, low cigarette excise tax states are given the opportunity to export some of their state tax burden to the residents of high-excise tax states.

Tax Policy Driven by Social Policy

The purpose of tax policy is to raise revenue while interfering with the allocation of resources through normal market mechanisms as little as possible. This latter condition is called tax neutrality. There are instances in which a non-neutral tax policy may be advisable on economic grounds if regular market pricing fails to capture the full benefit or the full cost of an activity. For example, a case has long been made that research and development should receive special tax treatment because the individual or company doing the research very often cannot capture all the resulting economic benefits, leading to a lower level of research than would otherwise be socially and economically optimal. Appropriate tax incentives may increase R&D outlays to eliminate this shortfall. A common example of using public policy to capture the full cost of an activity is the use of money penalties and fines to punish behavior deemed unacceptable.

Beyond the philosophical questions that this type of tax policy raises, there is a basic issue of whether such an approach is effective. If higher cigarette excises are levied to capture some of the costs claimed to be associated with smoking, and if there is a significant degree of casual and/or organized smuggling, then the underlying policy is being significantly circumvented and it is reasonable to question the efficacy of the policy. This set of circumstances serves as an example of the dangers of using tax policy for purposes other than raising revenue.

II. Cross-Border Effects

In a market economy, competition will tend to drive down and eliminate any price differentials that exist among sellers. If the sellers are located in different governmental jurisdictions which levy different excise taxes on a product, however, this effect can be stymied and price differentials can persist. In such cases, with the price mechanism effectively blocked, the market will respond quantitatively as individuals shift some of their purchases to the low-priced location.

The sale of cigarettes within the United States is an interesting case study of this phenomenon. Cigarettes are a compact, lightweight product that can easily be transported from one jurisdiction to another. Furthermore, the price of cigarettes varies widely across the country. During the 1995 fiscal year, for example, the weighted average price of cigarettes ranged from a high of \$2.29 per pack in Hawaii to a low of \$1.35 per pack in Kentucky. Most of this variation in price among states was attributable to differences in state and local cigarette excise taxes. In addition, areas with high cigarette prices often share a border with low tax jurisdictions. Washington, D.C., which levies a \$6.50 excise tax on each carton of cigarettes, for example, shares a border with Virginia which levies a comparable tax of just 25 cents. These factors have led to the growth of three types of activity aimed at avoiding high cigarette excise taxes: cross-border shopping, the organized smuggling of cigarettes, and the seeking out of nontaxable cigarettes.

Cross-border Shopping. Cross-border shopping occurs when an individual living in close proximity to a low-price jurisdiction simply crosses the border to make cigarette purchases. The recent experience of Michigan shows just how strong this incentive can be. On May 1, 1994, Michigan raised its cigarette tax from 25 to 75 cents per pack, the second highest in the nation. During the next fiscal year, per capita taxable cigarette sales fell

26.7 percent in the state. Part of this decline was due to the increased incidence of cross-border shopping along the state's borders. Along the state's border with Indiana, where consumers could save as much as \$5.95 in avoided taxes on each carton of cigarettes purchased, cigarette sales soared. According to a survey conducted by Price Waterhouse, many Indiana merchants in the border region saw their cigarette sales rise by 40 percent or more while those located on the Michigan side of the border saw a corresponding decline.¹ One Michigan convenience store located approximately four miles from the Indiana border lost 98 percent of its cigarette carton sales and half of its pack sales in the wake of the tax increase.² During the 1995 fiscal year, in spite of a slight decline in national per capita cigarette sales, Indiana experienced a 5.6 percent increase in per capita cigarette sales. Other states bordering Michigan also experienced increases in per capita sales in the wake of the state's tax increase. Per capita sales rose 2.9 percent in Ohio while those in Wisconsin rose 5.3 percent. Other states in close proximity to Michigan also experienced an increase in per capita cigarette sales. Sales in Tennessee and Kentucky rose 1.8 and 3.1 percent respectively while those in Missouri rose 1.9 percent.

Smuggling. Tax differentials among states also create an arbitrage opportunity whereby individuals willing to break the law can buy cigarettes in a low-tax jurisdiction, transport them to a high tax jurisdiction, and resell them. By doing so the smugglers are able to expropriate much of the tax differential that exists between the two states on every pack smuggled. Traditionally, smugglers have purchased large quantities of cigarettes in Virginia, Kentucky, and North Carolina, the three states with cigarette excise taxes that are markedly lower than those found in the rest of the country. The cigarette excise taxes in these states were 2.5, 3.0, and 5.0 cents per pack respectively during FY 1995. Smugglers have also acquired cigarettes on Native Ameri-

can tribal reservations, military bases, and from stocks that were suppose to have been exported abroad. These sources of cigarettes are particularly attractive to smugglers since they are frequently subject to neither federal, state, nor local cigarette excise and sales taxes.

The lightweight, compact nature of cigarettes makes it possible to smuggle very large quantities of the product. A large semitrailer, for example, can hold more than 200 cases of cigarettes (a case contains 600 packs). The financial gain from smuggling such quantities of cigarettes can be substantial. Again, the recent experience of Michigan provides a poignant example. During FY 1995 the weighted average cost of cigarettes in Michigan was \$2.24 per pack. This compares to a per pack price of \$1.42 in North Carolina. Most of this difference in price was due to the 70-cent per-pack difference in excise taxes. The remainder is attributable to other factors such as differences in other taxes and transportation costs. A smuggler is therefore able to "earn" as much as \$100,000 in avoided cigarette excise taxes on every semitrailer load of cigarettes brought into Michigan from North Carolina. Large scale smugglers have also smuggled cigarettes into the state from Kentucky, Virginia, and from Native American tribal reservations in New York. Smaller scale smugglers driving RVs and vans have also brought cigarettes into Michigan from Indiana and Tennessee.³

The prospect of earning such large sums has apparently lured many individuals into the business of smuggling cigarettes. According to Lt. Robert Manes, head of the Michigan State Police Treasury Enforcement Division, the agency charged with enforcing the state's cigarette tax, "[w]ith the amount of money that can be made now, everybody who has an avenue is getting into it."⁴ One Detroit area man was caught after he earned more than \$500,000 smuggling cigarettes. According to a report in the *Detroit Free Press*, police admit that there is little they can do to stem the flow of illegal cigarettes.⁵

Another indication of the pervasiveness of this activity is the infrastructure that has arisen to service it. Retail outlets selling large quantities of cigarettes have been opened in Virginia, Kentucky, and North Carolina to supply smugglers with cigarettes. Because federal law prohibits individuals from buying 300 or more cartons of cigarettes per day and because it requires that retailers report cash transactions in excess of \$10,000 to the Internal Revenue Service, smugglers typically travel to several of these outlets until they have filled their vehicles. The cigarettes are then transported to states with relatively high cigarette excises and resold.

Nontaxable Sales. For many individuals it is unnecessary to cross state lines in order to avoid state cigarette excise taxes. Cigarettes which are not subject to state and local excise taxes are available on Native American tribal reservations and at commissaries on military bases. Individuals with access to them may either consume or resell them. Either way, they lower taxable sales within a state. As was the case with smugglers, individuals reselling untaxed cigarettes are able to expropriate much or all of the tax differential.

In order to give some idea as to how powerful this incentive can be, consider the case of Alaska. According to the latest study by the Centers for Disease Control, approximately 27.8 percent of Alaskans smoke.⁶ This compares to a nationwide average of 22.9 percent. However, per capita sales of taxable cigarettes in Alaska during FY 1995 were lower than the national average, 89.5 packs as compared to 95.8 packs nationwide. What accounts for this apparent discrepancy in taxable sales? According to a report published by the Barents Group of KPMG Peat Marwick, approximately 45.0 million packs of nontaxable cigarettes were sold on military bases in the state, or 793 packs for every base resident.⁷ The report estimated that approximately 80 percent of these cigarettes were diverted into the civilian market where individuals could "earn" as much as

55 cents or more on each pack resold in avoided excise taxes. Sales of cigarettes at military bases in Michigan have also reportedly soared in the wake of that state's 50 cents per pack increase in its cigarette excise tax.⁸

Washington state faces a similar problem with cigarettes procured on Native American tribal reservations in the state. According to the state's Department of Revenue, approximately 14 percent of all cigarettes consumed in the state during FY 1995, or about 46.1 million packs, had been illegally diverted into the statewide market from stocks intended for sale at Native American tribal reservations.⁹

Cigarettes intended for export are another source of untaxed cigarettes. Each year millions of packs of such cigarettes make their way into the domestic market. Once again, individuals reselling these cigarettes are able to expropriate much or all of the federal, state, and local cigarette excises. Schemes to divert cigarettes intended for export have been uncovered in Washington, California, Texas, New York, and New Jersey.¹⁰

Variation in Per Capita Cigarette Sales by State

These three types of activity, coupled with demographic and other differences, have led to a great deal of variation in cigarette sales among the states. This variation is illustrated in Figure 1, which ranks states by their per capita sale of taxable cigarettes as compared to the national average for the period from July 1, 1994, to June 30, 1995, (the 1995 fiscal year in most states). Table 1 lists taxable sales and price data by state for FY 1995. Note the wide disparity in per capita taxable sales among states and how much of it is influenced by price. Nationally, 95.8 packs of taxable cigarettes were sold per capita during this period at a weighted average price of \$1.76 per pack. The state with the highest per capita sales during this year was Kentucky which sold 175.3 packs of taxable cigarettes per capita,

79.5 packs per capita more than the national average. In FY 1995, Kentucky had the lowest average weighted price of cigarettes in the country at \$1.35 per pack. At the other end of the spectrum was Hawaii, which sold 45.7 packs of taxable cigarettes per capita, 50.1 fewer than the national average. Hawaii also had the highest priced cigarettes in the country during this period with a weighted average price of \$2.29.

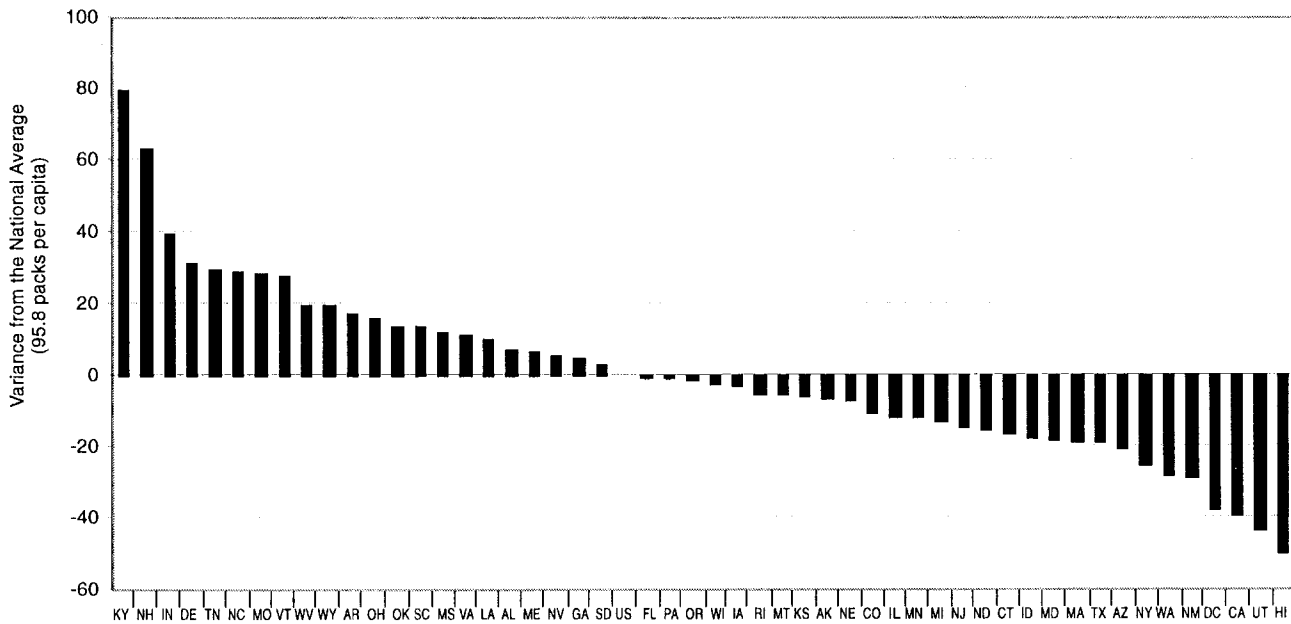
States with relatively low priced cigarettes serve as a supply sources for organized smugglers and act as a magnet to price conscious consumers. Kentucky's lowest-in-the-nation cigarette prices have made it one of the three primary states providing cigarette smugglers with cigarettes. The state which had the second highest per capita sales during FY 1995 was New Hampshire, which sold 158.5 packs per capita. Note that New Hampshire had the lowest priced cigarettes of any state in New England during this year. This was in large part due to the state's relatively low cigarette excise tax. The state's low taxes, coupled with the short driving distances in this region of the country, have drawn price conscious consumers from other states and Canada. It's interesting to note that New Hampshire sells more than twice as many cigarettes per capita than does its neighbor Massachusetts where, according to the Centers for Disease Control, the rate of cigarette smoking is slightly higher, 22.3 versus 22.0 percent.¹¹

The state with the third highest per capita sales during this period was Indiana. The Hoosier state provides an interesting case study of the power of cross-border effects. Following the general trend in the rest of the country, per capita sales had been falling in Indiana since the mid-1970s. These trends are illustrated in Figure 2. Then, beginning in FY 1993, those states bordering Indiana with higher priced cigarettes further increased this differential by raising their cigarette excise taxes while Indiana kept its constant at 15.5 cents per pack. Figure 2 shows what happened in the wake of these tax hikes and the corre-

Table 1
Variation in Per Capita Cigarette Pack Sales Among States, FY 1995

| | Per Capita Sales | Variance from National Average | Average Price (per pack) |
|----------------------|---------------------|-----------------------------------|-----------------------------|
| Kentucky | 175.3 | 79.5 | \$1.35 |
| New Hampshire | 158.5 | 62.7 | 1.64 |
| Indiana | 135.4 | 39.6 | 1.46 |
| Delaware | 127.2 | 31.4 | 1.61 |
| Tennessee | 125.4 | 29.6 | 1.53 |
| North Carolina | 124.9 | 29.1 | 1.42 |
| Missouri | 124.0 | 28.2 | 1.50 |
| Vermont | 123.2 | 27.4 | 1.60 |
| West Virginia | 115.2 | 19.4 | 1.57 |
| Wyoming | 115.0 | 19.2 | 1.53 |
| Arkansas | 113.0 | 17.2 | 1.67 |
| Ohio | 111.7 | 15.9 | 1.56 |
| Oklahoma | 109.5 | 13.7 | 1.61 |
| South Carolina | 109.2 | 13.4 | 1.40 |
| Mississippi | 107.5 | 11.7 | 1.54 |
| Virginia | 106.7 | 10.9 | 1.58 |
| Louisiana | 105.7 | 9.9 | 1.56 |
| Alabama | 102.6 | 6.8 | 1.55 |
| Maine | 102.3 | 6.5 | 1.85 |
| Nevada | 100.9 | 5.1 | 1.90 |
| Georgia | 100.3 | 4.5 | 1.54 |
| South Dakota | 98.6 | 2.8 | 1.62 |
| UNITED STATES | 95.8 | 0.0 | 1.76 |
| Florida | 95.4 | -0.4 | 1.73 |
| Pennsylvania | 95.4 | -0.4 | 1.62 |
| Oregon | 94.6 | -1.2 | 1.90 |
| Wisconsin | 93.5 | -2.3 | 1.88 |
| Iowa | 93.0 | -2.8 | 1.79 |
| Rhode Island | 90.8 | -5.0 | 2.10 |
| Montana | 90.5 | -5.3 | 1.55 |
| Kansas | 90.1 | -5.7 | 1.66 |
| Alaska | 89.5 | -6.3 | 2.02 |
| Nebraska | 88.5 | -7.3 | 1.71 |
| Colorado | 85.4 | -10.4 | 1.64 |
| Illinois | 84.3 | -11.5 | 1.85 |
| Minnesota | 84.1 | -11.7 | 2.02 |
| Michigan | 82.8 | -13 | 2.24 |
| New Jersey | 81.0 | -14.8 | 1.88 |
| North Dakota | 80.6 | -15.2 | 1.80 |
| Connecticut | 79.3 | -16.5 | 2.05 |
| Idaho | 78.2 | -17.6 | 1.64 |
| Arizona | 77.3 | -18.5 | 1.63 |
| Maryland | 77.1 | -18.7 | 1.76 |
| Massachusetts | 76.9 | -18.9 | 2.06 |
| Texas | 75.2 | -20.6 | 1.85 |
| New York | 70.5 | -25.3 | 2.12 |
| Washington | 67.4 | -28.4 | 2.26 |
| New Mexico | 67.0 | -28.8 | 1.64 |
| District of Columbia | 57.9 | -37.9 | 2.22 |
| California | 56.4 | -39.4 | 1.95 |
| Utah | 52.0 | -43.8 | 1.69 |
| Hawaii | 45.7 | -50.1 | 2.29 |

Figure 1
Variation in Per Capita Cigarette Pack Sales Among States, FY 1995



sponding rise in cigarette prices. Per capita taxable sales in Indiana actually rose in contrast to the trend in the rest of the country.

As was the case in Kentucky, New Hampshire and Indiana, the state with the fourth highest per capita sales, Delaware, had the lowest priced cigarettes of any state in its region of the country during FY 1995. The weighted average price of cigarettes in Delaware during this period was \$1.61 per pack. This compares to per pack prices of \$1.76 and \$1.88 in Maryland and New Jersey respectively, two states adjacent to Delaware.

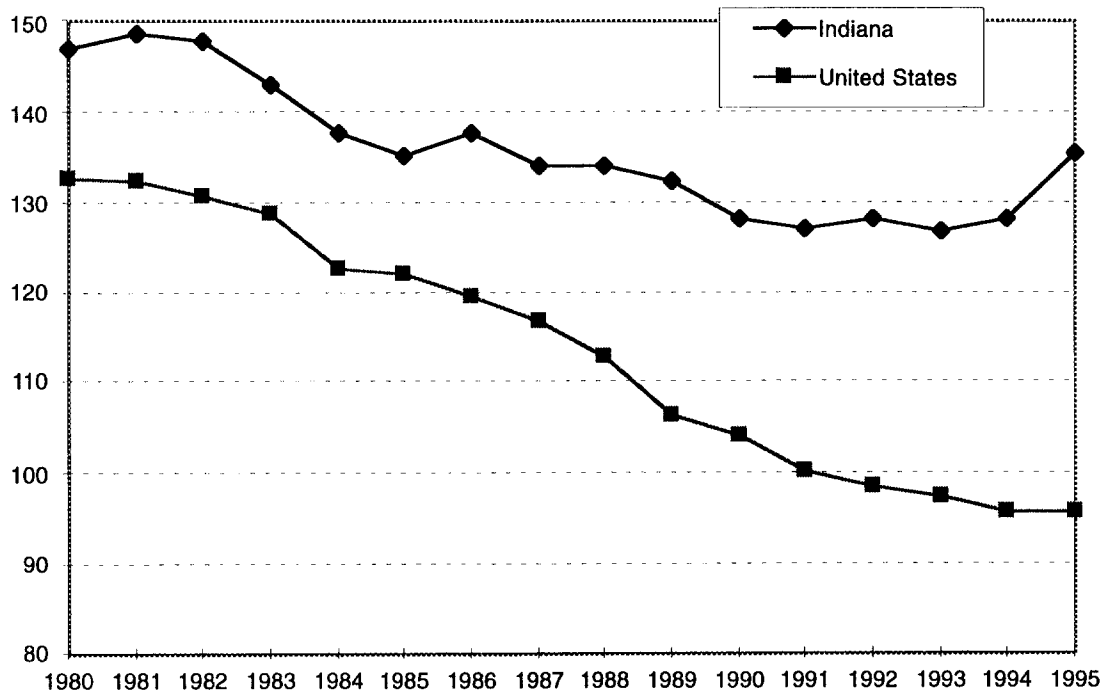
The fact that some states experience low per capita sales may also be attributable to non-tax, demographic factors. Per capita sales are low in Utah, for example, because a large fraction of the population are members of the Church of Jesus Christ of Latter-Day Saints (Mormons) which strongly discourages smoking by its members. Nevertheless, cross-border activity and the availability of cigarettes which are

not subject to state and local excise taxes have important effects. As stated above, the state with the lowest per capita sales in the country during FY 1995 was Hawaii, which had per capita sales of 45.7 packs. According to the latest Centers for Disease Control report comparing rates of cigarette smoking by state, Hawaii ranks slightly below the national average in the percentage of its adult population which smoke, 19.5 percent as compared to 22.9 percent for the population as a whole.¹² Why then are per capita sales within the state almost half the national average? A 1985 federal study of cigarette tax evasion found that the availability of untaxed cigarettes on military bases is a significant factor affecting sales within the state.¹³

Another way of comparing states is to examine sales in the high-tax versus low-tax blocs of states. Since 1989 there have been more than 54 cigarette excise tax increases. As a result, a high-tax bloc of states (California, Massachusetts, Michigan, and

Figure 2

Trends in Per Capita Cigarette Sales in Indiana and the U.S., FY 1980–FY 1995



New York, with an average tax of 55 cents per pack) sells less cigarettes than a low-tax bloc of states (Indiana, Kentucky, Missouri, New Hampshire, North Carolina, Tennessee, and Virginia, with an average per pack tax of 12 cents). Yet the four high-tax states have a population (65.4 million) that is nearly double that of the low-tax states (34.4 million). Fiscal year 1995 marked the first year that the low-tax block of states had more tax-reported sales (4.5 billion packs) than the high tax block (4.3 billion packs).¹⁴

Historical and International Precedents

Cross-border effects are not a new phenomena. Smugglers have made their living for thousands of years avoiding taxes and tariffs. In fact, eighteenth century England faced a problem very similar to that faced by states imposing high cigarette excise taxes today. Throughout the eighteenth century, England continually raised its tariff on

tobacco. Then, as now, this had the effect of encouraging smuggling. By the early part of the eighteenth century the situation had reached a point where, even though tobacco consumption in England was on the rise, tobacco tariff revenue was falling. Then in 1826, a drafting error inadvertently caused the tobacco tariff rate to be cut by 25 percent. This had the effect of decreasing smuggling to such an extent that revenue from the tobacco tax actually increased.¹⁵

Astute observers at the time recognized the link between excise taxes and smuggling as well as the possibility that excise taxes could be raised to such levels that they became counterproductive from a revenue standpoint. Adam Smith, the father of modern economics, commented in his book *The Wealth of Nations* that:

The high duties which have been imposed upon the importation of many different sorts of foreign goods, in order

ferent sorts of foreign goods, in order to discourage their consumption in Great Britain, have in many cases served only to encourage smuggling; and in all cases have reduced the revenue of the customs below what more moderate duties would have afforded.¹⁶

In America, while discussing methods of financing the operations of the federal government, the founding fathers also recognized the problems associated with high excise taxes. In Federalist No. 31 Alexander Hamilton wrote that:

Exorbitant duties on imported articles would beget a general spirit of smuggling; which is always prejudicial to the fair trader, and eventually to revenue itself.¹⁷

More recently, Canada and European nations have experienced increases in cross-border activity. Between 1991 and 1994 total taxes imposed on cigarettes in Canada ranged as high as \$35.00 per carton. This caused cross-border shopping and smuggling to increase dramatically.¹⁸ Organized crime became involved and soon the incidence of violence escalated. Shootouts between competing smuggling gangs became commonplace.¹⁹ After trying various methods of combating this problem, the Canadian government cut its tobacco taxes in February 1994 and encouraged the provinces to follow suit. These measures significantly reduced the cigarette price differential between the United States and Canada. In fact, cigarette prices are now higher in some U.S. border states than in Canada. As a result, Canada has experienced a decline in both cross-border shopping and cigarette smuggling.

On January 1, 1993, all tariffs among members of the European Community were eliminated. In the past, these tariffs had sometimes been used to offset differences in sales and product-specific excise taxes among the nations of Europe. With these tariffs removed, however, such levies sometimes create substantial differences in the price of products in different European

countries. As a result, the continent is experiencing increasing incidents of both cross-border shopping and smuggling.

Recent Experiences in the United States

Prior to 1960 most cross-border activity was a regional phenomena. In 1956, for example, the average cigarette excise tax levied by states was just 3.3 cents (16.9 cents in 1995 dollars). Furthermore, there was not a lot of variation in cigarette excise taxes nationwide. As a result, cross-border shopping was confined to those areas where high- and low-tax jurisdictions abutted one another. Similarly, because only a few states levied cigarette excise taxes which were high enough to make smuggling profitable, the bootlegging of cigarettes was a relatively minor problem in most states.

During the early 1960s this situation began to change as various states began to raise their cigarette excise taxes. By 1963 the average tax levied by states had risen to 5.1 cents (22.7 cents in 1995 dollars). Because this rise in taxes had not been uniform across the country the instances in which high- and low-tax jurisdictions abutted one another increased and the incidents of cross-border shopping grew. In addition, because several states increased their cigarette excise taxes beyond the point where smuggling became profitable, the bootlegging of cigarettes ceased to be a regional problem and began to spread across the country.

Between 1964 and 1969 the variation in cigarette excise taxes levied by states grew rapidly as state legislators across the country cited the 1964 Surgeon General's report on smoking and health as a justification for raising cigarette excise taxes. By 1969 the average cigarette excise tax levied by states had risen to 8.3 cents (30.8 cents in 1995 dollars) per pack with rates varying widely across the country. North Carolina continued to levy no tax on cigarettes while other states levied taxes as high as 15 cents (55.7 cents in 1995 Dollars) per pack. Because of this variation in tax rates,

cross-border shopping became more commonplace. Of greater concern to federal, state, and local officials, however, was cigarette bootlegging which by this time had become a major problem nationwide.

During the early 1970s, state legislators continued to raise cigarette excise taxes even as their revenue officers grappled with ways of dealing with cross-border activity. By the middle of the decade there was sufficient public awareness of the problem that the federal government began to examine ways of dealing with it. In 1977 the Advisory Commission on Intergovernmental Relations (ACIR) issued a report entitled "Cigarette Bootlegging: A State and Federal Responsibility." This report concluded that:

Tax evasion activities, which cost the high-tax states \$391 million (\$887.8 million in 1995 dollars) in revenue losses each year, are primarily due to state tax differentials and are a serious problem in 14 states and a moderate problem in another eight states.²⁰

The report contained a number of recommendations for dealing with this problem. At the federal level, the commission suggested that Congress create a federal law prohibiting individuals from transporting large quantities of cigarettes with the intent of avoiding state and local excise taxes. It also recommended that state governments take steps to minimize the variation in their cigarette excise tax rates.

In October of 1978, Congress enacted P.L. 95-575 which prohibits the transport, receipt, shipment, possession, distribution or purchase of more than 60,000 cigarettes not bearing the tax stamp of the state in which the cigarettes are located. Violation of this statute is punishable by up to 5 years in prison and a \$100,000 fine. Vehicles used in smuggling activities are also subject to seizure.²¹ This law has had the effect of increasing the costs associated with smuggling cigarettes.

The state governments' reaction to the ACIR report was mixed. While they did not collectively take steps to lessen variation in cigarette excise taxes, most refrained from

raising them dramatically and the high inflation of the late 1970s reduced the variation in these taxes to pre-1950s levels. As a result, cross-border shopping once again became a regional phenomena confined to just a few areas of the country. The high inflation of the late 1970s also reduced real tax differentials such that cigarette bootlegging once again became a minor problem in most states.

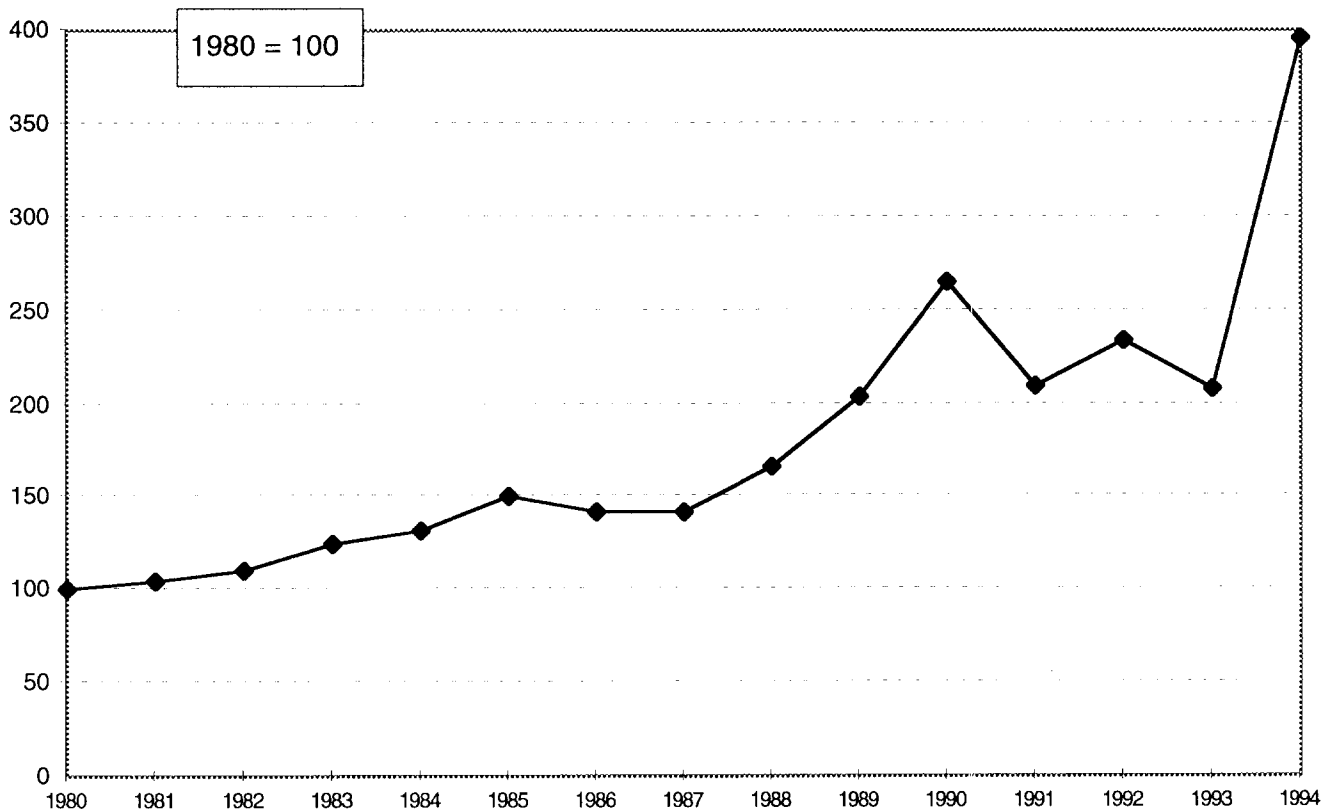
The Situation Today

For obvious reasons no one knows precisely how many packs of cigarettes are purchased by cross-border shoppers, smuggled across state and international borders, or result from nontaxable sales each year. It is, however, possible to create a model which estimates the demand for cigarettes and its supply by source. This model can then be used to estimate changes in cross-border shopping and smuggling over time. Such a model is developed in the third section of this paper. The results of an analysis conducted using this model show that the lull in cross-border activity during the late 1970s and early 1980s was temporary. Figures 3 and 4 illustrate the increases that have occurred in cross-border shopping and cigarette smuggling since 1980 as estimated by this model. Between 1980 and 1994 the model estimates that the incidence of cross-border shopping increased 395 percent while cigarette smuggling increased 253 percent. The reasons for these increases are related. The amount of cross-border shopping that occurs in a given year is a function of the variance in cigarette prices among states and the number of individuals with the ability to cross-border shop. While the number of individuals with the ability to cross-border shop has remained relatively constant, the variance in cigarette prices among states grew rapidly between 1980 and 1994. Again, most of the variation in cigarette prices among states is due to differences in cigarette excise taxes.

Cigarette bootlegging, as stated above,

Figure 3

Trends in Cross-Border Shopping for Cigarettes in the U.S., FY 1980–FY 1994



is driven by excise tax differentials between individual states and those of the three traditionally low-tax states. Nationwide the real value of most of these differentials fell during the late 1970s and early 1980s due to the high inflation of the period. In many cases this eliminated the potential profitability of smuggling cigarettes into most states. However, a new round of cigarette excise tax increases since 1983 have restored profitability to cigarette bootlegging and it is re-emerging as a problem nationwide.

Previous Analysis

The econometric analysis contained in the following section of this report builds on several previous studies of cross-border effects. The most significant of these are the 1985 and 1987 Advisory Commission on Intergovernmental Relations (ACIR) studies

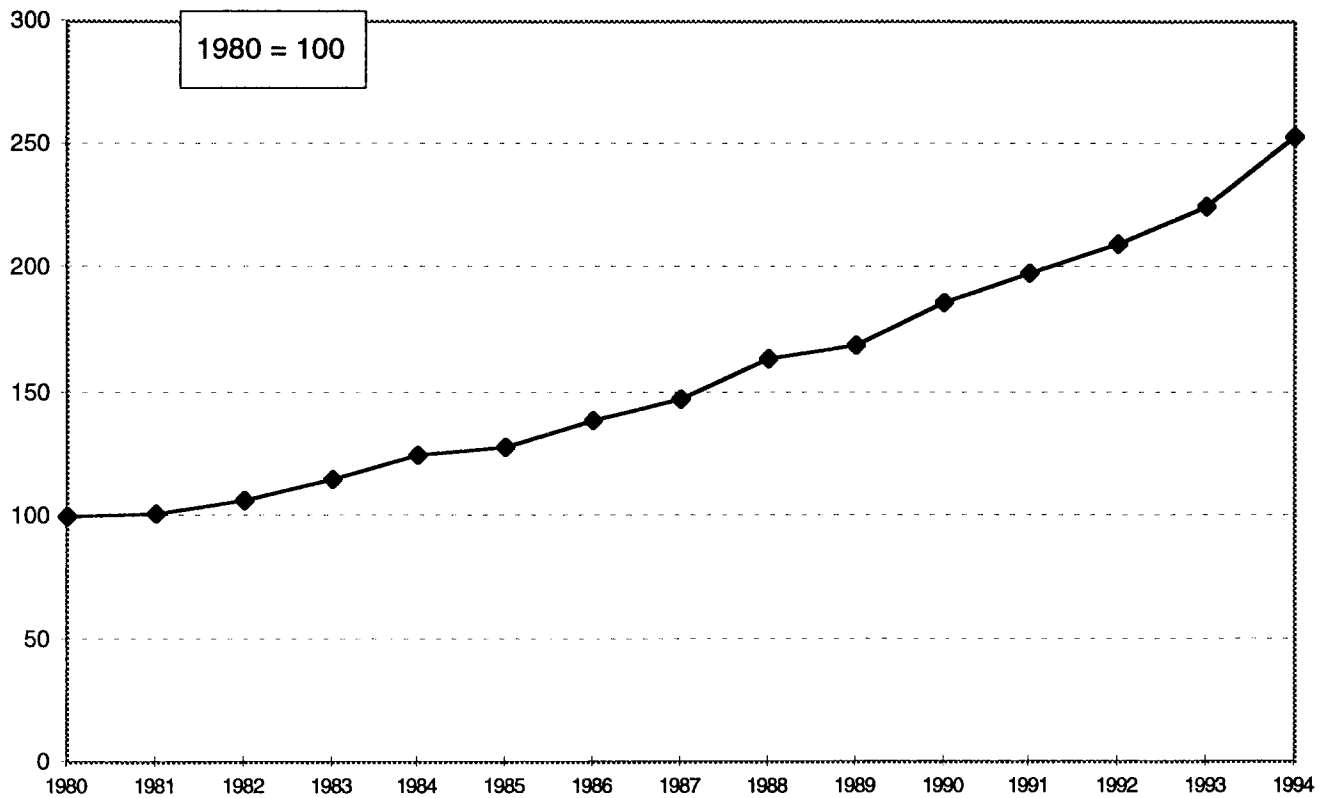
of cross-border effects. A 1993 Tax Foundation analysis conducted by the Economic Policy Group of KPMG Peat Marwick built on the two ACIR studies and formed the basis for the model developed in the next section. The methodology used in this analysis, however, represents a significant extension of that used in the 1993 report. For example, it includes a regional variable which controls for regional variation in cigarette consumption. In addition, it includes a variable to capture cross-border effects on states bordering Canada.

III. A Model of Cigarette Supply and Demand

Economic theory suggests that the demand for a good is a function of consumers' income levels, the price of the good relative to the prices of other goods and ser-

Figure 4

Trends in Cigarette Smuggling in the U.S., FY 1980–Fy 1994



vices, and the demographic characteristics of consumers. Equation (1) is an algebraic representation of the demand for cigarettes by residents of different states.

$$c_i = \alpha + \beta y_i - \pi \left(\frac{\hat{p}_i}{\bar{p}_i} \right) - \sigma s_i (\ln d_i) - \zeta a_i - \xi b_i - \mu m_i \quad (1)$$

Consumption of cigarettes by residents of a state is given by c_i in Equation (1). The income level of state residents is given by y_i . Since cigarettes are assumed to be a normal good whose consumption rises with income, the sign of the coefficient β is expected to be positive. The price of cigarettes, \hat{p}_i , relative to the price of other goods and services, \bar{p}_i , in the state is given by (\hat{p}_i/\bar{p}_i) . Since consumption of cigarettes can be expected to fall as their price rises relative to other goods and services, the sign of the coefficient π is expected to be negative.

Individuals living in states outside of the tobacco growing region of the country have generally been less inclined to smoke cigarettes than residents of this area.²² To capture this effect, the variable $s_i(\ln d)$ was created. It measures the distance of a state from the heart of tobacco country, Raleigh, North Carolina. Since the cigarette consumption is expected to fall as a state's distance from this region increases, the sign of the coefficient σ is expected to be negative.

Just as cigarette smoking is less popular in some regions of the country, some demographic groups have been less inclined to smoke than the population as a whole. Such demographic groups include individuals of Asian and Hispanic descent, and Mormons.²³ The percentage of a state's residents who are of Asian and Hispanic descent are given by a_i and b_i , respectively. The percent-

age of a state's population who are Mormon is given by m_i . Since cigarette consumption should be lower in states where these groups make up relatively large shares of the population, the signs of the all of the coefficients ζ , ξ , and μ are all expected to be negative.

Consumption of cigarettes by residents of each state is the sum of taxable and nontaxable sales within the state less net exports of cigarettes to other areas. This relationship is given in Equation (2).

$$c_i = s(t)_i + s(nt)_i - NX_i \quad (2)$$

Taxable and nontaxable sales are given by $s(t)_i$ and $s(nt)_i$ respectively. There are four potential components of net exports NX_i : 1) sales which result from out-of-state residents purchasing cigarettes while visiting a state as tourists; 2) sales which result from out-of-state residents living in close proximity of state borders crossing into the state to purchase cigarettes; 3) sales which result from organized, interstate smuggling of cigarettes within the United States; and 4) sales which result from a state bordering Canada. The components of net exports are listed in Equation (3).

$$NX_i = c_i^* + \gamma \sum [(p_i - p_j) w_{ij}] + \tau (tx_i - tx_i^*) + \kappa k_i \quad (3)$$

Sales which result from tourism are given by c_i^* . Price differentials between states may provide individuals living near state borders with the incentive to shop across state borders. Sales which result from cross-border shopping are measured by $\sum [(p_i - p_j) w_{ij}]$. The direction and magnitude of this incentive is given by the price differential $(p_i - p_j)$ where p_i is the price of cigarettes in state i and p_j is the price of cigarettes in a bordering state. The number of individuals with the ability to avail themselves of this opportunity is given by w_{ij} , where

$$w_{ij} = \frac{\text{population of } i \text{ on } ij \text{ border}}{\text{population of } i}, \text{ if } i \text{ imports from } j$$

$$w_{ij} = \frac{\text{population of } j \text{ on } ij \text{ border}}{\text{population of } i}, \text{ if } j \text{ imports from } i$$

(4)

By summing the variable $(p_i - p_j)w_{ij}$ for all of the states which surround a state it is possible to determine whether the state will experience a net increase or decrease in cigarette sales as a result of cross-border shopping.

There is ample evidence that a considerable amount of cigarette smuggling occurs within the United States. In order to gauge the effect of smuggling on per capita taxable cigarette sales within a state, a tax differential variable $(tx_i - tx_i^*)$ was created where tx_i is the cigarette excise tax in the state into which cigarettes are smuggled and tx_i^* is the tax in the nearest low tax state.

A state's taxable cigarette sales are also likely to be affected if it shares a border with Canada. Until recently, cigarette prices were much higher in Canada than in the United States. This price differential, due in large part to high Canadian sales and excise taxes, resulted in large scale cross-border shopping. In order to capture this effect, a dummy variable was created which assigned a 1 to all states which were located on the U.S.-Canadian border near large Canadian population centers and a 0 to all other states.

Substituting Equation (3) into Equation (2) yields,

$$c_i = s(t)_i + s(nt)_i - c_i^* - \gamma \sum [(p_i - p_j) w_{ij}] - \tau [tx_i - tx_i^*] - \kappa k_i \quad (5)$$

Substituting Equation (5) into Equation (1) and rearranging terms so that taxable sales, $s(t)_i$, is alone on the left hand side of the equation yields

$$s(t)_i = a + \beta y_i - \pi (\hat{p}/\bar{p}) - \sigma s_i(1nd)_i - \zeta a_i - \xi b_i - \mu m_i - s(nt)_i + c_i^* - \gamma \sum [(p_i - p_j) w_{ij}] - \tau [tx_i - tx_i^*] + \kappa k_i \quad (6)$$

Accurate data on nontaxable cigarette sales by state does not exist. However, virtually all nontaxable sales within a state occur on Native American tribal reservations and at military bases. In order to capture the effect that the availability of such cigarettes have on states' per capita cigarette sales the variables iz_i and nz_i were created. The first component of each of these variables measures the percentage of a state's population that is either Native American (i) or active duty military personnel (n). The intent of creating these components was to measure the percentage of a state's population with access to nontaxable cigarettes. The second component of these variables, z_i , measures the total effect that federal and state excise and sales taxes have on a pack of cigarettes. The intent of creating this component was to capture the incentive created by these taxes for individuals with access to them to buy nontaxable cigarettes.

As was the case with nontaxable cigarette sales, accurate data on cigarette purchases by out-of-state tourists does not exist. To capture this effect, tourist expenditures as a percent of gross state product was used as a proxy for this variable. Since neither Alaska nor Hawaii borders any state, binary variables were included to capture the anticipated changes in the intercept for these states. To capture the effect of changing preferences for cigarette smoking over time, a time variable was also added to Equation (6), yielding Equation (7).

$$\begin{aligned}
 s(t)_i = & \alpha + \beta y_i - \pi(\hat{\rho}/\bar{\rho}_i) - \sigma s_i(1nd)_i - \zeta a_i - \xi b_i \\
 & - \mu m_i - \iota iz_i - \nu nz_i + \theta t_i - \gamma \Sigma[(p_i - p_j)w_{ij}] \\
 & - \tau [tx_i - tx_i^*] + \kappa k_i + \chi b_i + \psi b_i - \rho r_i
 \end{aligned}
 \tag{7}$$

The signs of the coefficients of the first seven variables of Equation (7) were discussed above. Since nontaxable cigarettes are a substitute for taxable ones, the signs of the coefficients ι and ν are expected to be negative. The sign of the coefficient θ , on the other hand, is expected to be positive since taxable cigarette sales within a state should increase with influxes of out-

of-state tourists. Recall that if the cross-border variable, $\Sigma[(p_i - p_j)w_{ij}]$, is positive, the state is a net importer of cigarettes from surrounding states. Since consumers substitute cigarettes purchased across state borders for taxable purchases within a state, an increase in the number of imported cigarettes will cause taxable sales to decline within a state. As a result, the sign of the coefficient γ is expected to be negative. Similarly, cigarettes which are smuggled into a state replace taxable sales. As a result, the sign of coefficient τ is expected to be negative.

Until recently, the combination of Canadian sales and excise taxes created a price differential as high as \$3.50 per pack between Canadian and U.S. cigarettes. This resulted in both widespread cross-border shopping and smuggling of cigarettes. The sign of the coefficient κ on the variable representing sales between the United States and Canada is therefore expected to be positive.

Both Alaska and Hawaii levy relatively high excise and sales taxes on cigarettes. Consumers living on the outskirts of these states, however, do not have the ability to cross-border shop. Likewise, because of the distances involved, the costs associated with smuggling cigarettes to these states are significantly greater than for the other states. Because of these factors, per capita cigarette sales are expected to be somewhat higher for these states, all else being equal. As a result, the signs of χ and ψ are expected to be positive. Since there has been a secular decline in the percentage of Americans who smoke since the mid-1960s, the sign of ρ is expected to be negative.

Estimation

Equation (7) was estimated using pooled time series/cross section regression analysis. This type of analysis is very powerful in that it allows each of the factors affecting a so-called dependent variable to be identified. The effects that each of these so-called independent variables have on the

dependent variable can then be examined while holding the effects of the other independent variables constant. In Equation (7), per capita taxable cigarette sales (measured in 20 unit packs) is the dependent variable, $s(t)$. Earlier studies have found that approximately 99 percent of the variation in total cigarette sales among states can be attributed solely to differences in population. In order to control for population differences among states, per capita taxable cigarette sales is used. All of the variables listed on the right hand side of the equation are independent variables. The data used to estimate this equation was collected for all fifty states and the District of Columbia for the fifteen year period 1980 through 1994. All data collected was measured as of June 30 in order to coincide with the ending of the fiscal year in most states.

Results

Table 2 presents the results of the regression analysis. The first column of the table lists the independent variables used in the regression. These have been segregated by the effects they were intended to capture. The second column lists the estimated coefficients of these variables. The coefficients measure the direction and magnitude of change in the dependent variable for each one unit change in an independent variable while holding the effects of the other independent variables constant. The t-statistics, listed in the third column, measure the degree of confidence in each estimated coefficient. If the t-statistic is greater than 1.96 in absolute value, it indicates a high level of confidence in the estimated coefficient. All of the variables estimated in this analysis were statistically significant. The R^2 statistic at the bottom of Table 1 measures the amount of variation in the dependent variable that is explained by the overall model. In this particular case, Equation (7) explains more than 77 percent of the variation in per capita cigarette sales among states.

It was hypothesized above that ciga-

rettes are a "normal" good whose consumption would rise with personal income. The sign of the estimated income coefficient, β , supports this notion. For every 1 dollar rise in personal income, per capita cigarette pack sales can be expected to rise 0.0013 packs, or roughly 1.3 packs for every \$1,000 rise in personal income. Similarly, it was hypothesized above that a rise in the price of cigarettes relative to the prices of other goods and services would lead to a decline in per capita cigarette sales. The sign of the estimated real price coefficient, π , supports this hypothesis. According to the model, a doubling of the real price of cigarettes will lead to a decline in per capita taxable sales of roughly 25.6 packs.

Earlier it was hypothesized that cigarette smoking, and consequently the demand for cigarettes, was much more prevalent in the southeastern region of the country, particularly the tobacco producing states. The sign of the estimated coefficient of the distance variable, σ , supports this notion. It shows that demand for cigarettes drops off fairly rapidly as one travels out of the tobacco producing states and into bordering states. As one moves further and further from this region, demand for cigarettes continues to decline, but at a less rapid rate.²⁴

It was pointed out above that some groups, including individuals of Asian and Hispanic descent and Mormons, have traditionally been much less inclined to smoke than the population as a whole. It was then asserted that per capita cigarette sales would be lower in states in which these groups comprised a relatively large percentage of the population, all else being equal. The negative signs of the estimated coefficients ζ , ξ , and μ support this assertion. The higher the percentage of a state's population that is comprised of any of these groups, the lower per capita cigarette sales will be.

Recall that nontaxable cigarettes are a low cost alternative to taxable ones. The variables iz_t and nz_t were included in Equation (7) to capture nontaxable sales on Native American tribal reservations and military bases. It was hypothesized that the greater

the proportion of a state's population that was made up of either of these two groups and/or the larger the tax differential, the lower per capita sales would be within that state. The negative signs of both estimated coefficients ι and ν support this notion. For states whose populations are comprised of large numbers of Native Americans and active duty military personnel and/or with high cigarette excise and sales taxes this effect can be very dramatic. During FY 1994, for example, approximately 5.7 percent of Alaska's population was comprised of Native Americans with access to nontaxable cigarettes while 3.8 percent were active duty military personnel. During this year sales and excise taxes added 53 cents to the price of each pack of cigarettes sold. As a result, the model predicts that per capita taxable sales fell by 31.2 packs within the state. Of this decline, 15.1 packs were attributable to sales on Native American tribal reservations while 16.1 packs were due to sales on military bases.

It was also hypothesized above that states which entertained large numbers of out-of-state tourists would have relatively high per capita cigarette sales, all else being equal. The positive sign of the estimated coefficient of the tourist variable, θ , supports this notion. Every one percentage rise in the tourist expenditures as a percent of gross state product is associated with 1.4 increase in per capita cigarette sales within a state.

The variable $\Sigma[(p_i - p_j)w_{ij}]$ was included in the model to capture the effect of cross-border shopping. It was hypothesized that states with relatively high priced cigarettes as compared with neighbors would lose cigarette sales to them. The positive sign of the estimated coefficient of the cross-border shopping variable supports this notion. The effect of cross-border shopping on cigarette sales varies by state depending on the price of cigarettes in a particular state relative to its neighbors and the dispersion of its population as well as that of neighboring states. New Jersey offers an interesting case study of the cross-border shopping effect. During FY 1994, New Jersey had, on

average, higher priced cigarettes than two of its neighbors, Delaware and Pennsylvania. As a result, the state "imported" cigarettes from both of these states because of cross-border shopping by its residents. According to the model this caused per capita cigarette sales to fall 3.7 packs in New Jersey during this fiscal year. However, because of the 24.8 cent per pack price advantage the state enjoyed over New York and due to the very large number of that state's residents who lived within close proximity of the state, New Jersey was a net exporter of cigarettes. According to the model, sales to New Yorkers increased per capita sales 17.5 packs in the state, which more than offset losses to Delaware and Pennsylvania. If New Jersey had lost this price advantage over New York due to an excise tax increase, it is easy to see how dramatic the effect would have been. Not only would the state have lost more sales because of an increased incidence of cross-border shopping by its residents, it would also have lost its "export" sales to New York.

The tax differential variable $(tx_i - tx_i^*)$ was included in the model to account for the interstate smuggling of cigarettes within the United States. The larger the tax differential between a state and the nearest low tax state, the greater the incentive to smuggle cigarettes. Consequently, it was hypothesized that states with relatively high cigarette excise taxes would have corresponding low per capita taxable cigarette sales. The negative sign of the estimated coefficient of the tax differential variable, τ , supports this notion. It shows that per capita cigarette sales can be expected to fall approximately 0.5 packs for every one cent tax differential that exists between a state and the nearest low tax state. The model estimates, for example, that per capita cigarette sales in Alabama during FY 1994 were 6.9 packs lower than they would have been in the absence of smuggling.

It was hypothesized above that states near large Canadian population centers could expect to experience net increases in cigarette sales due to cross-border shop-

ping. The positive sign of the estimated coefficient κ supports this hypothesis. It says that states near large Canadian population centers have experienced per capita cigarette sales which are on average 10.4 packs higher simply by virtue of their location.

In order to control for the gradual decline in the number of Americans who smoke, a time variable was added to the regression equation. As expected, the sign of the estimated coefficient of the time variable, ρ , is negative. It shows that per capita cigarette sales decline approximately 2.0 packs per year as a result of the secular decline in smoking that has occurred in the United States since the mid-1960s.

IV. Conclusion

The per capita sale of taxable cigarettes varies greatly among states. It is widely suspected that these differences are largely due to cross-border effects. Building on earlier work in this area, this study sought to explain differences in per capita cigarette sales among the states. A model of cigarette supply and demand was created. This model was constructed in a manner that allowed it to capture the effects of nontaxable cigarette sales on Native American tribal reservations and military commissaries, cross-border shopping, and the interstate smuggling of cigarettes on per capita cigarette sales within a state. The model was then tested empirically using data from 1980 - 1994. All of these cross-border effects were found to have a significant impact on states' per capita cigarette sales. In particular, the study clearly shows that high interstate excise tax differentials lead to significant increases in cross-border sales and interstate cigarette smuggling.

Table 2
Regression Results
Dependent Variable: Per Capita Sales of Taxable Cigarettes (Measured in 20 Unit Packs)[$s(t)$,]

| Variable | Coefficient | t-statistic |
|---|-------------|-------------|
| Constant | 158.3 | |
| Income and Price | | |
| Income (β) | 0.0013 | 4.9 |
| Real Price (π) | -25.6 | -3.2 |
| Demographic | | |
| Distance (σ) | -2.0 | -7.3 |
| Asian (ζ) | -2.1 | -4.4 |
| Hispanic (ξ) | -0.5 | -6.0 |
| Mormon (μ) | -0.7 | -14.4 |
| Nontaxable Sales | | |
| Native American Tribal Reservations (ι) | -0.05 | -6.4 |
| Military Bases (ν) | -0.08 | -3.0 |
| Tourism | | |
| Tourism (θ) | 1.4 | -13.8 |
| Cross-Border Sales | | |
| Cross-Border Sales (γ) | -0.6 | -11.5 |
| Smuggling | | |
| Tax Differential (τ) | -0.5 | -5.2 |
| Other | | |
| Canada (κ) | 10.4 | 6.5 |
| Alaska (χ) | 18.4 | 3.7 |
| Hawaii (ψ) | 81.9 | 2.9 |
| Time (ρ) | -2.0 | -5.8 |

R² 77.5

Endnotes

¹Cited in Dwight Lee, *The Economic Impact of Michigan's 50 Cent Per Pack Cigarette Tax Increase*, Unpublished Manuscript.

²Chris Christoff, "Smugglers Win," *Detroit Free Press*, February 17, 1995.

³See Christoff (note 2).

⁴See Christoff (note 2).

⁵See Christoff (note 2).

⁶*State Tobacco Control Highlights*, (Atlanta: Centers for Disease Control and Prevention, 1993).

⁷Barents Group LLC of KPMG Peat Marwick LLP, "The Estimated Revenue Effects of a Proposed \$1 Per Pack Increase in the Cigarette Tax Rate in Alaska," (Washington, D.C.: Peat Marwick, December 1995), p. 15.

⁸See Christoff (note 2).

⁹Donald Gutmann, *The Cigarette Tax Gap* (Draft), Research Division, Washington State Department of Revenue, August 17, 1993.

¹⁰Lindquist Avey Macdonald Baskerville: Forensic Financial Investigations, *Cigarette Smuggling in the State of Michigan*, August 15, 1994.

¹¹State Tobacco Control Highlights, pp. 52-53 and pp. 68-69.

¹²State Tobacco Control Highlights, pp. 32-33.

¹³Advisory Commission on Intergovernmental Relations, *Cigarette Tax Evasion: A Second Look*, (Washington, D.C.: U.S. Government Printing Office, 1985).

¹⁴See Tobacco Institute, *The Tax Burden on Tobacco: Historical Compilations*, Volume 29, 1984 (Washington D.C.: Tobacco Institute).

¹⁵Bruce Bartlett, *Cigarette Taxes, Smuggling, and Revenues*, (Arlington, VA: Alexis de Tocqueville Institution, 1994), p. 2.

¹⁶Adam Smith, *The Wealth of Nations*, (New York: Modern Library, 1937), p. 832.

¹⁷Alexander Hamilton, "The Federalist No. 35," in Alexander Hamilton, James Madison, and John Jay, *The Federalist Papers*, (New York: Bantam Books), p. 164.

¹⁸For discussion of Canada's experience

see, Clyde Farnsworth, "Canada Cuts Cigarette Taxes to Fight Smuggling," *New York Times*, February 9, 1994, Bernard Simon, "Canadian Tobacco Taxes Cut Sharply in Curb Smuggling," *Financial Times*, February 9, 1994, and Rosanna Tamburri, "Canada May Cut Its Tobacco Taxes To Curb Smuggling," *Wall Street Journal*, December 8, 1993.

¹⁹See Lindquist Avey Macdonald Baskerville, p. 22, and Christoff.

²⁰Advisory Commission on Intergovernmental Relations, *Cigarette Bootlegging: A State and Federal Responsibility*, (Washington, D.C.: U.S. Government Printing Office, 1977).

²¹Advisory Commission on Intergovernmental Relations (1985), p. 107.

²²State Tobacco Control Highlights.

²³State Tobacco Control Highlights

²⁴Recall that the distance variable was constructed by taking the natural logarithm of the distance of a state, if it was not a major tobacco producing state, from Raleigh, N.C. Doing so assigns lesser and lesser weight to distances further and further from tobacco country. The intent of constructing the distance variable in this manner was to capture the rapid decline in demand for cigarettes that was expected to occur as one moved further and further from this region.

Appendix

Using the Tax Foundation Cross-Border Model to Estimate the Effects of Four Hypothetical Cigarette Excise Tax Increases in the State of Alabama.

Four Hypothetical Cigarette Excise Tax Increases in Alabama During FY 1994

Table 1 of the Appendix (page 22) presents the results of an analysis of four hypothetical statewide cigarette excise tax increases in Alabama during fiscal year 1994. The first column of this table lists the amount of these increases in excess of the 16.5 cent per pack tax that was in effect in the state during that year. The second column presents FY 1994 per capita taxable sales of cigarettes in Alabama as estimated by the Tax Foundation model for the various hypothetical levels of tax.¹ The first row of this column shows that the model estimates that per capita sales of cigarettes within Alabama during this year were 107.3 packs.² The second row of this column shows that if the cigarette tax had been increased by 8.0 cents that year, per capita cigarette sales could have been expected to fall 7.6 percent, to 99.1 packs. The figures in this row in the five columns to the right of this column show the composition of this decline in taxable sales. The third column shows the decline in per capita sales that would be attributable to the real price effect. It shows that per capita sales within the state could be expected to fall 1.4 packs as a result of decreases in consumption. The figure in the next column shows the decline in per capita sales within Alabama that would be attributable to individuals living in border areas crossing over into neighboring states to buy their cigarettes. It shows that per capita sales within the state could be expected to fall 2.2 packs as a result of cross-border shopping. The figure in the fifth column of this row shows the decline in per capita sales that would be attributable to increases in smuggling. It shows that per capita sales could be expected to fall

4.1 packs as a result of increases in smuggling. The final two columns show the decline in per capita taxable sales that would be attributable to increased shopping on Native American tribal reservations and military bases. The figure in the sixth column shows that per capita taxable sales could be expected to fall 0.2 packs as a result of increased shopping on Native American tribal reservations within the state. Similarly, the figure in the seventh column shows that per capita sales could be expected to fall 0.3 packs as a result of increases in cigarette purchases on military bases. The figures in the remaining three rows of the table give analogous results for the three other hypothetical cigarette excise tax increases.

Table 2 of the Appendix (page 22) presents the model's estimates of the effects of these tax increases on total cigarette sales and gross state cigarette tax collections for FY 1994.

¹Fiscal year 1994 is the latest year for which the complete set of data used by the model is available. However, estimates can be used to make forecasts.

²Note that this figure varies less than two tenths of one percent from the actual FY 1994 per capita sales figure of 107.1 packs.

Appendix Table 1

The Effects of Four Hypothetical Cigarette Excise Tax Increases on Per Capita Cigarette Sales in Alabama by Type of Effect (FY 1994)

| Tax Increase (cents per pack) | Per Capita Sales* | Real Price Effect* | Cross-Border Shopping* | Smuggling* | Tribal Sales* | Military Sales* |
|----------------------------------|----------------------|-----------------------|---------------------------|------------|------------------|--------------------|
| 0 | 107.3 | - | - | - | - | - |
| 8 | 99.1 | 1.4 | 2.2 | 4.1 | 0.2 | 0.3 |
| 10 | 97.1 | 1.7 | 2.8 | 5.1 | 0.2 | 0.4 |
| 12 | 95.0 | 2.1 | 3.4 | 6.1 | 0.3 | 0.4 |
| 16 | 90.9 | 2.8 | 4.6 | 8.2 | 0.4 | 0.6 |

*Packs of cigarettes.

Appendix Table 2

The Effects of Four Hypothetical Cigarette Excise Tax Increases on Total Cigarette Sales and Tax Revenue in Alabama (FY 1994)

| Tax Increase (cents per pack) | Estimated Sales* (Millions) | Estimated Gross State Tax Collections (Thousands) |
|----------------------------------|--------------------------------|--|
| 0 | 438.7 | \$ 72,382 |
| 8 | 405.2 | 99,276 |
| 10 | 396.8 | 105,142 |
| 12 | 388.3 | 110,671 |
| 16 | 371.4 | 120,715 |

*Packs of cigarettes.

Bibliography

Advisory Commission on Intergovernmental Relations. *Cigarette Bootlegging: A State and Federal Responsibility*. (Washington, DC: U.S. Government Printing Office, 1977).

Advisory Commission on Intergovernmental Relations. *Cigarette Tax Evasion: A Second Look*. (Washington, D.C.: US Government Printing Office, 1985).

Baltagi, Badi H. and Dan Levin. "Estimating Dynamic Demand for Cigarettes Using Panel Data: The Effects of Bootlegging, Taxation and Advertising Reconsidered," *The Review of Economics and Statistics*, 68:148-55.

Bartlett, Bruce. *Cigarette Taxes, Smuggling, and Revenues*. (Arlington, VA: Alexis de Tocqueville Institution, 1994).

Coats, R. Morris. "A Note on Estimating Cross-Border Effects of State Cigarette Taxes." *National Tax Journal*. 68:573-84.

Christoff, Chris. "Smugglers Win." *Detroit Free Press*. February 17, 1995.

Dowell, Stephen. *A History of Taxation and Taxes in England*. (London: Longmans, Green, 1884).

Farnsworth, Clyde. "Canada Cuts Cigarette Taxes to Fight Smuggling," *New York Times*. February 9, 1994.

Felgner, Brent H. "An Open Road For Smuggled Smokes?" *U.S. Distribution Journal*. April, 1988. pp. 26-32.

Fujii, Edwin T. "The Demand for Cigarettes: Further Empirical and Its Implications for Public Policy." *Applied Economics*. 12:479-89.

Hamilton, James L. "The Demand for Cigarettes: Advertising, the Health Scare, and the Cigarette Advertising Ban." *The Review of Economics and Statistics*. 54:401-11.

Horwitz, Tony. "Europe's Borders Fade, and People and Goods Can Move More Freely." *Wall Street Journal*. May 18, 1993.

Lyon, Herbert L. and Julian L. Simon. "Price Elasticity of Demand for Cigarettes in the United States," *American Journal of Agricultural Economics*. 50:881-893.

Munk, Nina. "Smuggled Smokes." *Forbes*. December 7, 1992. pp. 47-48.

Newton, Jon. "Sin Tax Creates Jobs - for Bootleggers." *Wall Street Journal*. June 4, 1993.

Pechman, Joseph A. *Federal Tax Policy*. 4th ed. (Washington, DC: Brookings Institution, 1987).

Quinn, Bernard, Herman Anderson, Martin Bradley, Paul Goetting, and Peggy Shriver. *Churches and Church Membership in the United States 1980: An Enumeration by Region, State, and County*. (Atlanta, GA: Glenmary Research Center, 1982).

Rand-MacNally. *1994 Road Atlas: United States, Canada, and Mexico*. (Skokie, IL: Rand-McNally Publishing Group).

Simon, Bernard. "Canadian Tobacco Taxes Cut Sharply to Curb Smuggling." *Financial Times*. February 9, 1994.

Smith, Adam. *The Wealth of Nations*. (New York: Modern Library, 1937).

Tamburri, Rosanna. "Canada May Cut Its Tobacco Taxes To Curb Smuggling." *Wall Street Journal*. December 8, 1993.

Tobacco Institute. *The Tax Burden on Tobacco: Historical Compilation*, Volume 29, 1994, (Washington, DC: Tobacco Institute).

Trueheart, Charles. "Canada Cuts Tobacco Tax to Halt Smuggling." *Washington Post*. February 9, 1994.

Urquhart, John. "Canada Tries to Stem Tide of Tax Evasion." *Wall Street Journal*. January 4, 1994.

Warner, Kenneth E. "Cigarette Excise Taxation and Interstate Smuggling: An Assessment of Recent Activity." *National Tax Journal* 35:483-490.

Wasserman, Jeffery, Willard G. Manning, Joseph P. Newhouse, and John D. Winkler. "The Effects of Excise Taxes and Regulations on Cigarette Smoking." *Journal of Health Economics* 10:43-64.