The State and Local Impact of Tobacco Prices on Smuggling and Black Market Tobacco Sales

September 23, 2013

Andrew Chang & Company, LLC

1301 H Street Sacramento ■ CA 95814 ■ 916-538-6091

About the Report Sponsors:

The California Foundation for Commerce and Education is dedicated to preserving and strengthening the California business climate and private enterprise through education of the public and policy makers on the virtues of private enterprise and a strong economic base; accurate, impartial and objective research and analysis of public policy issues of interest to the California business and public policy communities; and education and outreach efforts in support of the research and public policy findings and recommendations.

About Andrew Chang & Company, LLC:

The professionals at Andrew Chang & Company work with our clients to achieve tangible results by combining our best-in-class research and analyses with unique insights into public policy and business and government strategy and operations. Using advanced economic, statistical and business administration techniques, we provide strategy and operations consulting to Fortune 1000 firms and provide policy, economic, fiscal and operations consulting for public sector agencies and non-profit organizations to improve operations.

The State and Local Impact of Tobacco Prices on Smuggling and Black Market Tobacco Sales

(Table of Contents)

The State and Local Impact of Tobacco Prices on Smuggling and Black Market Tobacco Sales
(Key Findings)

- Approximately 1 out of every 5 cigarettes consumed in California is smuggled[1], as of 2011. In total, this amounts to approximately 220 million smuggled cigarettes annually – roughly equivalent to the total annual cigarette consumption in the state of Arizona.
- A $2 tax increase would increase the price of cigarettes to nearly $8 per pack and make California the sixth highest priced state in the United States to purchase cigarettes.
- The $2 tax increase would double California's current smuggling rate to 39% of total cigarettes consumed. This would leave California with the third highest smuggling rate in the United States, behind New York and Washington, D.C.
- By failing to account for smuggling, proponents overestimate tax revenue from tobacco products by $500 million annually due to smuggling caused by the tax increase.
- In addition, lost legitimate retail sales will eliminate approximately 11,000 direct retail jobs. Note that these 11,000 jobs lost are due only to the loss in retail sales of legitimate tobacco sales. It does not account for any loss in retail jobs due to overall decrease in tobacco consumption from increased prices in legitimate sales via the proposed tax increase."
- Though tobacco smuggling would increase in all regions of the state, the burden of smuggling is concentrated in Southern California, especially Los Angeles, and the Bay Area. The impact of the $2 excise tax increase would have the following impact on regions of the state:
  - Los Angeles County will increase its consumption of smuggled cigarettes to 130 million packs, losing $6.7 million in local sales tax revenue and 4,100 legitimate retail jobs.
  - The Bay Area will increase its consumption of smuggled cigarettes to over 90 million packs, losing $4.7 million in local sales tax revenue and 2,900 legitimate retail jobs.
  - Other areas will increase consumption of smuggled cigarettes to over 100 million packs, losing $5.5 million in local sales tax revenue and destroying 3,500 legitimate jobs.
- The literature suggests that the $2 excise tax increase may create the unintended consequence of increasing organized crime in California.

[1] We define smuggling as any tax evasion strategy for tobacco consumption, whether for personal use or distribution.

The State and Local Impact of Tobacco Prices on Smuggling and Black Market Tobacco Sales
(Executive Summary)

A number of proposals to increase the excise tax on cigarettes have recently been discussed in California. Most prominently, a proposal by State Senator Kevin de León proposes to triple California's cigarette excise tax (SB 768) from $0.87 to $2.87. This would increase the price of cigarettes to approximately $8 per pack and would reportedly generate an additional $1.4 billion in additional state revenues. Proponents of the bill argue that increasing the tax would decrease demand for cigarettes overall and that the increased revenues would help defray the public cost of tobacco related illnesses. However, others have suggested that the benefits to the state would not be as significant as reported. Critics point out that a dramatic increase in the excise tax may create an enhanced market for smuggled cigarettes in the state and that sales revenues would be diverted from a legitimate retail to a black market economy.

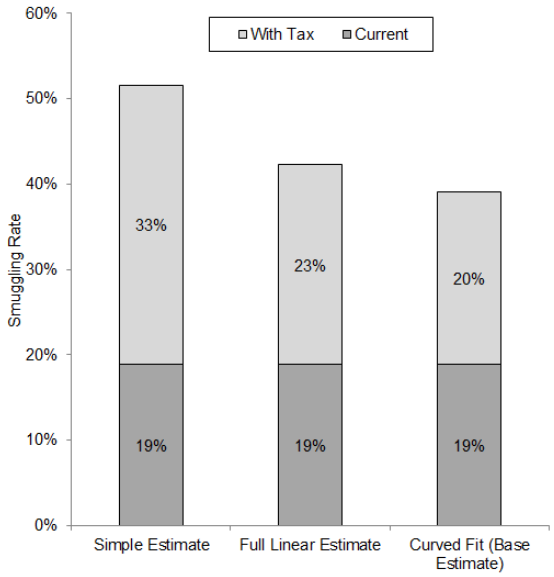
A limited amount of research on tobacco prices and its impact on black market sales is currently available. However, none has examined the specific proposal that is currently being discussed. Using the most recently available data, this study addresses the following questions:

- How much would the black-market trade of cigarettes increase as a result of the proposed tax?
- What is the state revenue impact of the proposed tax increase?
- What is the local revenue impact of the proposed tax increase?
- What is the impact to California's legitimate jobs?
- How will different regions of the state be impacted by the proposed tax increase?

Our approach is to use state-by-state experience over recent years to conduct a pooled time series regression analysis, which estimates the role that state specific cigarette prices play in smuggling rates. We define smuggling as any tax evasion strategy for tobacco consumption. We use the results of this regression to estimate the impact of a $2 tax increase in California on

smuggling. Three regression estimates were produced as summarized in Figure ES.1. Our results demonstrate that smuggling will increase between double and 2.5x, depending on the overall model parameters and the shape of the curve as a result of a $2 increase in prices. Though the Full Linear estimate produced the strongest overall results, we chose to focus on the Curved Fit estimate to ensure conservative results because of its lower estimate.

Figure ES.1
Smuggling Results by Methodology



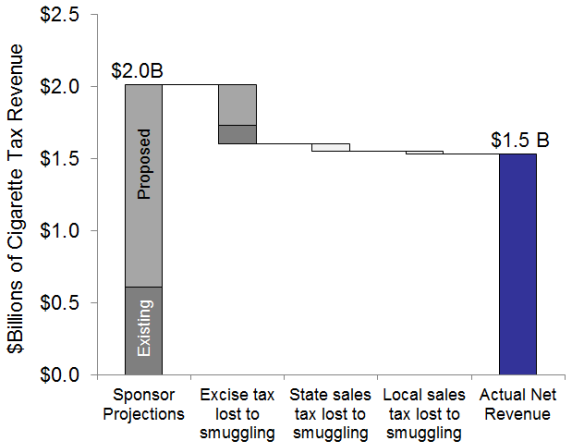
Revenue Impacts

In recent years, California has received approximately $900 million annually from the existing excise tax. Senator de León estimates that his proposal will bring in $1.4 billion annually in additional revenue. Though some adjustments in usage may have been factored, it appears that this revenue estimate does not adequately account for sales and excise tax lost as a result of increases in the smuggling rate.

Focusing on our most conservative estimate, we find that the current estimates overstate net revenue by at least $500 million, as shown in Figure ES.2. This is the result of a decline in

existing excise tax and sales tax revenue because a decline in legal consumption, due to smuggling.

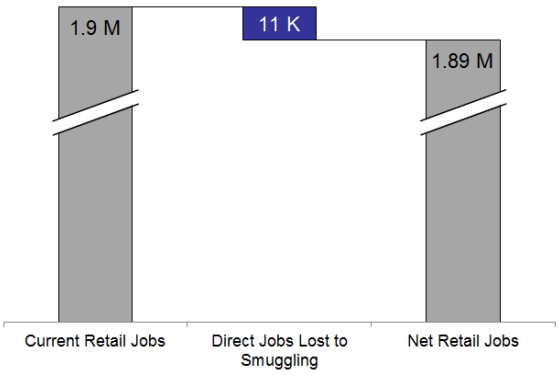
Figure ES.2
Revenue Estimate



Jobs Impacts

Using RIMS II multipliers from the United States Bureau of Economic Analysis, we calculate that such a tax increase could eliminate 11 thousand direct legitimate retail jobs. This only includes jobs directly lost by legitimate retailers due to lost sales. This is displayed in Figure ES.3.

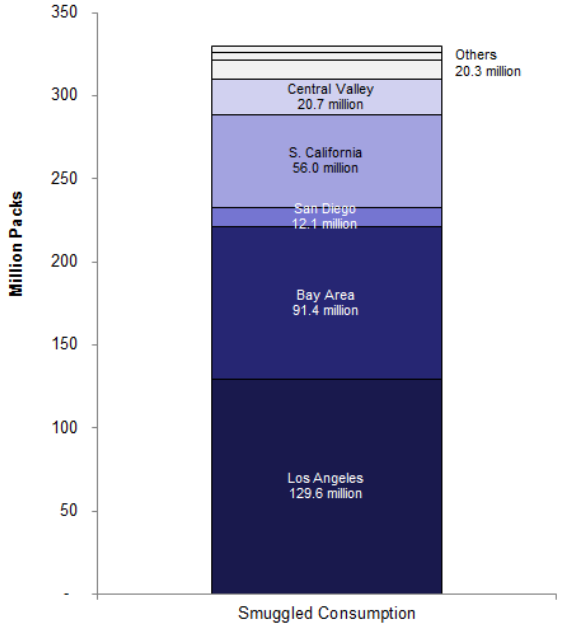
Figure ES.3
Legitimate Retail Employment Estimate



Local Impacts

Though black market activities will increase in all regions of the state, tobacco smuggling is currently concentrated in Southern California, especially Los Angeles, and the Bay Area. After a $2 increase, Los Angeles County will consume nearly 130 million smuggled cigarettes, losing $6.7 million in local sales tax revenue and 4,100 legitimate retail jobs. The Bay Area will consume over 90 million smuggled cigarettes, losing $4.7 million in local sales tax revenue and 2,900 legitimate retail jobs. This is displayed in Figure ES.4.

Figure ES.4
Total Region
(after increase)



The State and Local Impact of Tobacco Prices on Smuggling and Black Market Tobacco Sales

> "No sooner does the new tax go into effect, my street contacts tell me, than Indian tribes will open tobacco shops at their casinos, where buyers can escape state taxes and buy cigarettes on the cheap. Just as quickly, smugglers will start rolling in truckloads of smokes from Nevada, Arizona and Oregon, as street dealers realize there is more money to be made selling hot cigarettes than there is selling dope."
>
> Willie Brown
> Former Mayor of San Francisco &
> California State Assembly Speaker
> June 3, 2012[2]

1. Background

There is a clear body of literature showing that smokers are extremely resilient and will continue purchasing the product, even as prices increase. An increasing body of literature shows that this is partially because smokers find more cost-effective measures to purchase tobacco, specifically, smuggling. As the California Department of Public Health writes, "Following a tax increase, many smokers will find a way to buy cheaper cigarettes. Some smokers will try to find cheaper cigarettes on the internet; others will buy their cigarettes on Indian reservations and in casinos or even travel across state lines. This type of individual 'casual' evasion does not have a significant fiscal impact on the illicit cigarette market whereas, large-scale bulk tobacco smuggling can be a problem."[3] As Stanford Professor Keith Humphreys describes it, "Such smuggling is not driven by cash-strapped college kids with a few

[2] Willie's World, San Francisco Chronicle, June 3, 2012, retrieved from: http://www.sfgate.com/bayarea/williesworld/article/Prop-29-will-win-cigarette-smuggling-will-rise-3604861.php

[3] Department of Public Health, California (2012). Questions About Tax Evasion and Smuggling. Pg 1. Retrieved from: http://www.cdph.ca.gov/programs/tobacco/Documents/Questions%20About%20Tax%20Evasion%20and%20Smuggling.pdf

cartons in their backpacks. Organized crime groups, and even terrorist organizations, are the big players in the lucrative trade."[4]

Moreover, Canada's experience with smuggling is telling. Having dramatically increased taxes in the early 1990s, smuggling skyrocketed. "Hundreds of millions of dollars' worth of illegal cigarettes enter Canada every month, chiefly through Mohawk Indian reservations that straddle the border with the U.S. in Ontario and Quebec." Prime Minister Jean Chretien described the problem, "Smuggling is threatening the safety of our communities and the livelihood of law-abiding merchants." Canada responded by cutting their excise tax in half.[5]

While economic theory and previous experience suggest it is likely that a tax increase would lead to increased smuggling, there is relatively little literature showing how much it does either generally or in California specifically. This study addresses this gap and estimates the increase in smuggling projected under a proposed tax increase, as well as the local and statewide impact on revenue and legitimate jobs. We define smuggling as any tax evasion strategy employed to facilitate consumption of tobacco in California. In practice, this can range widely. This includes casual smuggling, for personal use, by individuals traveling across state or national borders, through the internet or through Indian Reservations or military bases. It also includes smuggling by organized criminal enterprises, bringing large quantities of tobacco by truck or ship and circumventing taxation through a number of means. Additionally, it includes other, less common or smaller scale enterprises, such as street vendors.

[4] Humphreys, K. (2013). What Tobacco Tax Advocates Can Learn From American Drug Policy. *Huffington Post*. Retrieved from: http://www.huffingtonpost.com/keith-humphreys/what-tobacco-tax-advocate_b_3697565.html

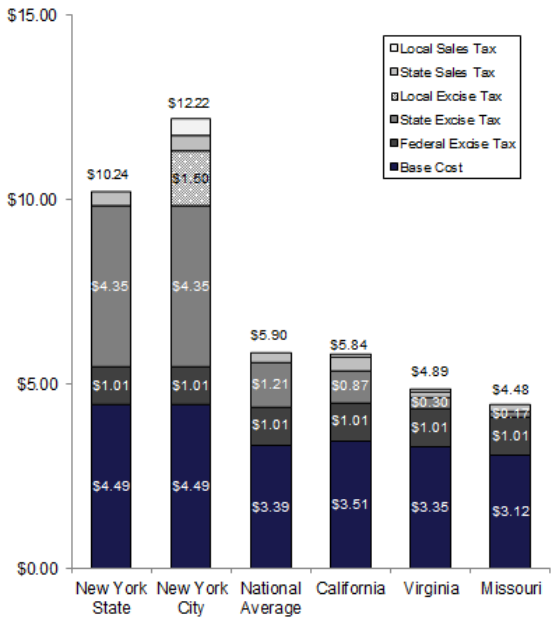
[5] Rowley, S.H. (2004). Canada Cuts Cigarette Tax To Fight Smuggling. *Chicago News*. Retrieved from: http://articles.chicagotribune.com/1994-02-09/news/9402090139_1_cigarettes-taxes-prime-minister-jean-chretien

The Price of Cigarettes in California

Californians pay $5.84 per pack of cigarettes, as of 2011. This is similar to the national average, which is $5.90, and is inclusive of the federal excise tax, the state excise tax, state and local sales tax, as well as the base cost of retail tobacco. California's cigarette excise tax currently stands at $0.87 per pack. This means that, when combined with the federal excise tax and sales tax, 40% of the price Californians pay for cigarettes goes to taxation.

California established the $0.87 tax in 1998, going into effect in 1999. While at the time it was among the higher taxes in the nation, many other states have since increased their excise taxes and California's rate is now modestly below average. As displayed in Figure 1.1, California's total cigarette price is in line with the national average.

Figure 1.1
Cigarette Cost by State



Related Law Enforcement in California

"There is no doubt that there's a direct relationship between the increase in a state's tax to an increase in illegal trafficking," according to ATF spokesman John D'Angelo.[6] In the ATF's experience:

> *Throughout the years ATF has seen the development and advancement in this criminal activity. We have seen the traditional state-to-state diversion schemes, the grey market schemes (exportation of the product and illegal re-importation), elaborate counterfeiting schemes of cigarettes and tax stamps-and of special interest today, we have seen the funding of terrorist organizations.*[7]

Beyond the opinions of law enforcement experts, though, there have been a significant number of arrests related to tobacco smuggling in California. This comes despite reports that law enforcement devotes little resources to tobacco enforcement. We have identified select cases which show the equivalent (combined cigarettes and other tobacco products) of over thirty million packs of cigarettes smuggled in California in recent years. The identified cases involved a wide range of smuggling methods. Several were established retailers that primarily sold untaxed cigarettes, but also paid taxes on a portion of their business, possibly to help disguise the illegal activity. Many others involved mail order retail. Another case involved smuggling around customs, in which the perpetrator marked the goods as destined for another country, simply passing through the port. Instead they planned to secretly unload and distribute the products in the area. These select cases of reported criminal activity are outlined in Appendix A and summarized in Table 1.1.

[6] Shultz, M. (2002). Raised Tax On Smokes May Stoke Illicit Sales. *The Detroit News*
[7] Alcohol, Tobacco, Firearms and Explosives, Bureau of (2008). Cigarette Smuggling — States Lose Millions In Tax Revenue

Table 1.1
Select Cases of Reported Criminal Activity in California

Defendant	Location	Volume
Adolfo Reyes aka “El Huero”	Los Angeles, CA	4,000+ Cartons
Gerardo Chavez	Los Angeles, CA	6,000 Cartons
Jack Haroun	Burbank, CA	$1.2 million OTP (other tobacco products)
Classic Wholesale/House of Tobacco	Los Angeles, CA	$3.3 million OTP
South Bay Wholesale	Carson, CA	$1.1 million OTP
Payless Wholesale	Los Angeles, CA	$5.3 million OTP
IIG	Los Angeles, CA	$27 million OTP
CTC Distribution/T&T Tobacco	Los Angeles, CA	$20+ million in tobacco products (estimated)
M&D Tobacco	Los Angeles, CA	$2+ million in tobacco products (estimated)
A to Z Cash and Carry	Los Angeles, CA	$8+ million in tobacco products (estimated)
Pisces International	2 L.A. Area Locations	$20+ million in tobacco products (estimated)
ISA Chicago Wholesale	Yuba City, CA	$2+ million in tobacco products (estimated)
K&L Tobacco Industries	San Bernardino, CA	$5+ million in tobacco products (estimated)

Literature Review

As part of our assessment, we examined existing literature to find governmental, academic, and industrial cost estimates on the impact of cigarette cost changes on consumption patterns. We discovered that there is limited literature assessing and quantifying smuggling volume, however a richer body of literature exists on cost avoidance broadly and significant literature exists on the relationship between price and consumption. In addition, California’s Board of Equalization, which is charged with collecting California’s Cigarette Excise Tax, has conducted analysis on the de León proposal, as well as smuggling broadly.

Smuggling Volume

A limited number of studies exist on the level of smuggling in California. They range widely from Alamar's low estimate of 1%[8] to Mackinac's[9] estimate of 36.1% as displayed in Figure 1.2. California's Board of Equalization (BOE) has issued occasional estimates of smuggling in the state, most recently in 2007. Their methodology is built on two estimates. The first is a fixed estimate of casual smuggling in the state, which they peg at 5%. The second is an estimate of smuggling through otherwise legitimate retail sources. This is based on audits of retailers, in which the BOE found that approximately 10% of cigarettes sold are smuggled. "We estimate that cigarette excise tax revenue evasion was $182 million in fiscal year 2005-06. This estimate is comprised of $57 million in casual evasion by consumers and $125 million by retailers who purchase and distribute untaxed cigarettes to consumers."[10]

The Mackinac Center for Public Policy produces regular estimates of smuggling across all states. Their thorough study employs a similar structure to our work, but focuses more on geographic distributions of relative pricing. This nuanced methodology finds that 36.1% of California's consumption is currently fulfilled through smuggling.[11] Emery found that 6.2% of cigarettes consumed in California following the last tax increase were purchased through tax evasive measures.[12] A number of problems with her methodology suggest this should be considered an extreme lower bound. First, the study is based on only a six month sample shortly following the tax increase. It is possible, if not likely, that smuggling would continue to increase as consumers learned and habitualized alternative, tax evasive, behaviors.

[8] Alamar, B. et al (2003). Cigarette Smuggling in California: Fact and Fiction. Tobacco Control Policy Making: United States, Center for Tobacco Control Research and Education, UC San Francisco. Pg 14. Retrieved from: http://www.escholarship.org/uc/item/4fv0b2sz

[9] Mackinac Center for Public Policy (2013). Higher Cigarette Taxes Create Lucrative, Dangerous Black Market. Retrieved from: http://www.mackinac.org/18128

[10] Board of Equalization (BOE), California (2007). Revenue Estimate: Cigarette and Tobacco Products Tax Evasion. Pg 1. Retrieved from: http://www.boe.ca.gov/pdf/cig-evasion-07.pdf

[11] Mackinac, 2013

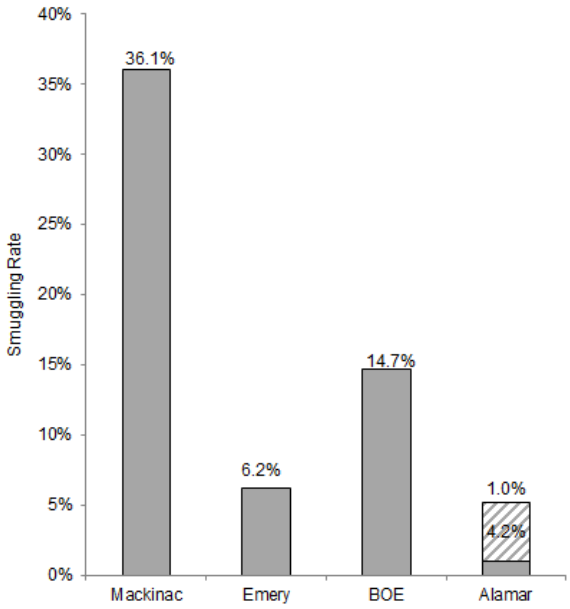
[12] Emery, et al (2002). Was there significant tax evasion after the 1999 50 cent per pack cigarette tax increase in California? Tobacco Control. Pg. 131. Retrieved from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1763842/

Furthermore, the study is entirely based on responses to a survey. This is problematic in two respects. It entirely omits any smuggling in which the final consumer is unaware of the tax evasive status of their product. BOE[13] found that a substantial majority of smuggling passes through legitimate retail establishments, in which case the consumer would be unlikely to be aware of the evasion. Furthermore the survey method relies on respondents self-reporting an illegal behavior. McAllister[14], Zhang[15], Jensen[16] and countless others have demonstrated, surveys have a strong tendency to under report undesirable activity. As Lee points out, "respondents are hesitant to answer questions that deal with illegal activities."[17]

Alamar estimates smuggling between 1% and 4.2% in California.[18] These low estimates are based on the assumption that no smuggling existed in California prior to 1999, which they offer no evidence to support. Beyond the low estimates, they make the conflicting argument that the industry both opposes tax increases through grass roots efforts and profits from them, using them to mask price increases that increase profits.

[13] BOE, 2007, Pg 3
[14] McAllister, I. and Makkai, T. (1991). Correcting for the Underreporting of Drug Use in Opinion Surveys. Substance Use and Misuse. Retrieved from: http://informahealthcare.com/doi/abs/10.3109/10826089109058932
[15] Zhang, Z. (2009). Modeling Nonresponse and Underreporting in Response in Surveys of Arrestees. Section on Survey Research Methods – JSM 2009. Retrieved from: http://www.amstat.org/sections/srms/proceedings/y2009/Files/305170.pdf
[16] Jensen, N.M. and Rahman, A. (2012). The Silence of Corruption: Identifying Underreporting of Business Corruption through Randomized Response Techniques. Retrieved from: http://pages.wustl.edu/files/pages/imce/nathanjensen/jensenrahman_may_2012.pdf
[17] Lee, J.M., et al (2009). Price sensitivity and smoking smuggled cigarettes. European Journal of Public Health. Retrieved from: http://eurpub.oxfordjournals.org/content/19/1/23.long
[18] Alamar, 2003, Pg 14

Figure 1.2
Comparison of Literature Estimates



Joosens finds "According to available estimates, the size of the illicit trade varies between countries from 1% to about 40–50% of the market, 11.6% globally, 16.8% in low-income and 9.8% in high-income countries. The total lost revenue is about $40.5 billion a year. If this illicit trade were eliminated governments would gain at least $31.3 billion a year ..."[19] Previously, Joossens estimated that 13-25% of US Market is illicit.[20]

Cost Avoidance

The literature is clear that, beyond quitting smoking, tobacco consumers engage in a variety of means to deal with higher costs, including tax evasion, discount seeking and switching to lower cost brands.

[19] Joosens, L. and Raw, M. (2010). From cigarette smuggling to illicit tobacco trade. Tobacco Control. Retrieved from: http://tobaccocontrol.bmj.com/content/21/2/230.full
[20] Joosens, L., et al (2009). How Eliminating the Global Illicit Cigarette Trade Would Increase Tax Revenue and Save Lives. mpower. Retrieved from: http://global.tobaccofreekids.org/files/pdfs/en/ILL_global_cig_trade_full_en.pdf

Focusing on internet options, Goolsbee shows that alternative options to avoid taxation increase the sensitivity of consumers to tax increases.[21] Chiou found that consumers undertook a number of strategies for cost avoidance, ranging from switching brands to crossing state lines in reaction to a tax increase in Illinois.[22] Hyland found that 34% of consumers engage in tax evasion strategies.[23]

Elasticity of Consumption

There is a clear consensus surrounding the low elasticity of price for tobacco consumption. Gruber estimated elasticity in the range of -0.45 to -0.47 after accounting for smuggling.[24] Chiou found a similar elasticity of -.4,[25] as did Stehr.[26] Sylvain found, "Taxes have no significant effect on the percentage of adult smokers in a state population. This occurs because adult smokers are most likely experienced smokers who have smoked for many years and who consequently have low price elasticity in their demand for cigarettes."[27] Loveheim found that price increases have virtually no impact on consumption, pushing sales to tax evasive markets and in some cases, actually leading to increased consumption.[28] In a related

[21] Goolsbee, A., et al (2009). Playing With Fire: Cigarettes, Taxes and Competition From The Internet. The National Bureau on Economic Research. Retrieved from: http://www.nber.org/papers/w15612.pdf
[22] Chiou, L. and Muehlegger, E. (2010). Consumer Response to Cigarette Excise Tax Changes. M-RCBG Faculty Working Paper Series. Pg 20. Retrieved from: http://www.hks.harvard.edu/var/ezp_site/storage/fckeditor/file/pdfs/centers-programs/centers/mrcbg/publications/fwp/mrcbg_fwp_2010-06_Muehlegger_cigarettetax.pdf
[23] Hyland, A., et al (2005). Higher cigarette prices influence cigarette purchase patterns. Tobacco Control. Retrieved from: http://tobaccocontrol.bmj.com/content/14/2/86.full
[24] Gruber, J., et al (2002). Estimating Price Elasticities When There Is Smuggling: The Sensitivity Of Smoking To Price In Canada. Pg 2. The National Bureau on Economic Research. Retrieved from: http://www.nber.org/papers/w8962.pdf
[25] Chiou, 2010
[26] Stehr, M. (2005). Cigarette Tax Avoidance and Evasion. Journal of Health Economics
[27] Sylvain, S. (2008). The Effects of Excise Tax on Cigarette Consumption: A Divergence in the Behavior of Youth and Adults. The Michigan Journal of Business. Pg 100. Retrieved from: http://www.michiganjb.org/issues/2/article4.pdf
[28] Loveheim, M.F. (2007). How Far to the Border?: The Extent and Impact of Cross-Border Casual Cigarette Smuggling. Stanford Institute for Economic Policy Research. Pg 20. Retrieved from: http://www-siepr.stanford.edu/papers/pdf/06-40.pdf

study, Farrelly noted that increased taxes in low tax southern states would lead to a decrease in smuggling exports from those states.[29]

The Congressional Budget Office showed that taxes have relatively little impact on consumption by smokers over 40 and in the long term their main impact is discouraging new smokers from beginning.[30] This is in line with Callison who wrote, "Estimates indicate that, for adults, the association between cigarette taxes and either smoking participation or smoking intensity is negative, small and not usually statistically significant. Our evidence suggests that increases in cigarette taxes are associated with small decreases in cigarette consumption and that it will take sizable tax increases, on the order of 100%, to decrease adult smoking by as much as 5%."[31] The evidence is clear that, while price sensitive smokers are likely to engage in cost avoidance strategies, they are highly unlikely to curtail their consumption.

Populations Impacted

As the data clearly shows, smokers tend to be lower income and less educated than the population as a whole and, thus, these populations will bear the brunt of any new taxes. This idea is supported by the California Department of Public Health, "Higher tobacco taxes do impact a higher portion of smokers' with lower income; however, low-income consumers are usually more responsive to price changes."[32] Further, Gallup wrote, "From the Gallup-Healthways smoking data reviewed here, it's clear the new 62-cent federal tax increase on a

[29] Farrelly, M.C. (2003). Impact of Cigarette Excise Tax Increases in Low-Tax Southern States on Cigarette Sales, Cigarette Excise Tax Revenue, Tax Evasion, and Economic Activity. Tobacco Technical Assistance Consortium. Pg 12/ Retrieved from: http://www.rti.org/pubs/8742_southern_neighbors_fr_9-18-03.pdf

[30] Congressional Budget Office (2012). Pg 7. Raising the Excise Tax on Cigarettes: Effects on Health and the Federal Budget. Retrieved from: http://www.cbo.gov/sites/default/files/cbofiles/attachments/06-13-Smoking_Reduction.pdf

[31] Callison, K. and Kaestner, R. (2012). Do Higher Tobacco Taxes Reduce Adult Smoking? New Evidence of the Effect of Recent Cigarette Tax Increases on Adult Smoking. The National Bureau on Economic Research. Retrieved from: http://www.nber.org/papers/w18326

[32] CDPH, 2012

pack of cigarettes will have a disproportionately heavy financial impact on lower-income Americans."[33]

Localities Impacted

While the literature is limited, it consistently finds that smuggling is consolidated within lower income, less educated, highly addicted populations. Taylor finds, "People who have bought smuggled tobacco are heavy smokers with high levels of addiction, living in socially deprived areas."[34] Lee writes, "Low-income, poorly-educated smokers are most likely to purchase smuggled cigarettes."[35] Similarly, Richardson finds that smuggling is concentrated in lower income, higher crime neighborhoods.[36] She also notes, "Once smuggling has taken hold in a community, it is more difficult for those purchasing cigarettes illegally to quit – because it brings the residents into an 'anti-legal sub culture where typically lone parents for example will trade cigarettes for services such as baby sitting and where the anti-legal nature of the group is self-reinforcing."

Recent Policy Discussions

Most recently, in 2012, voters defeated Proposition 29 to increase the tobacco excise tax by $1 per pack. The measure was projected to initially raise over $800 million, which would have been earmarked for Cancer research, smoking cessation and funds for law enforcement to combat tobacco smuggling. The measure lost by over 24 thousand votes.

Previously, in 2006, voters defeated Proposition 86, which would have increased the tobacco excise tax by $2.60 per pack. Proposition 86 was projected to initially raise $2.1 billion, to fund health programs, including emergency services, children's health care, cancer research

[33] Gallup (2009). Cigarette Tax Will Affect Low-Income Americans Most. Retrieved from: http://www.gallup.com/poll/117214/cigarette-tax-affect-low-income-americans.aspx
[34] Taylor, A.J. et al (2005). Smuggled tobacco, deprivation and addiction. European Journal of Public Health. Pg 401. Retrieved from: http://eurpub.oxfordjournals.org/content/15/4/399.full.pdf+html
[35] Lee, 2009
[36] Richardson, K. (2001). Smoking, Low Income and Health Inequalities: Thematic Discussion Document. Report for Action on Smoking and Health and the Health Development Agency. Pg 14. Retrieved from: http://www.gserve.nice.org.uk/nicemedia/documents/smoking_low_income.pdf

and smoking cessation, as well as funds for law enforcement. The measure lost by nearly 300 thousand votes.

Currently, SB 768 (de León) proposes to triple taxes on cigarettes and related products from $0.87 to $2.87 per pack. This would increase the price of cigarettes to approximately $8 per pack and reportedly generate approximately $1.4 billion in additional tax revenues per year.

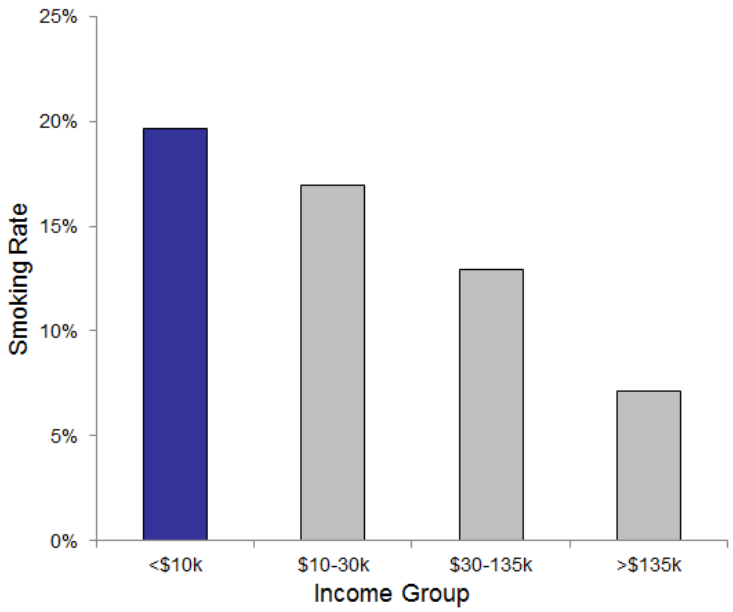
Supporters of the bill argue that taxpayers pay $3.1 billion per year for tobacco related illnesses. However, opponents argue that the burden of the tax would be disproportionately borne by the poor and that the proposed tax would have severe unintended consequences increasing the black-market trade for cigarettes in the state. Moreover, the increased black-market trade would have significant impact on California's legitimate retailers.

Consumer Factors

Tobacco consumption and, thus, tax incidence is not spread evenly across the population. As illustrated in Figure 1.3, people in the lowest income grouping are nearly three times as likely to smoke as people in the highest income grouping. As Gallup wrote about the recent Federal increase, "It's clear the new 62-cent federal tax increase on a pack of cigarettes will have a disproportionately heavy financial impact on lower-income Americans."[37]

[37] Gallup, 2009

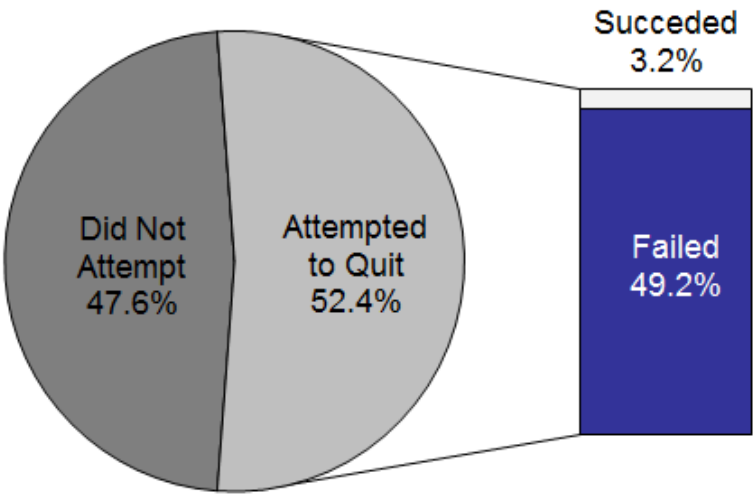
Figure 1.3
Smokers by Income



Source: Centers for Disease Control

Tobacco is highly addictive. This is supported by both health research and the data. Polls show that more than two-thirds of smokers would like to quit smoking if they were able. As displayed in Figure 1.4, most of those smokers (52%) attempted to quit in the last year. Despite this broad desire and effort for quitting, only 3.2% of smokers succeeded in quitting. Moreover, this likely understates the true difficulty, since the 3.2% who quit includes those who will subsequently restart.

Figure 1.4
Smoker Quitting Attempts



Source: Centers for Disease Control

The research clearly shows that cigarette consumption is highly inelastic. For example, the BOE's extensive literature review found an elasticity of price between -.3 and -.5[38] and this can be quite a bit lower for high risk groups.[39] As discussed in the literature review, existing smokers' demand is highly inelastic and they rarely quit smoking. Rather, declines over time have primarily been driven by a lack of new, younger consumers.

This data sets the backdrop for the realities of policies impacting smokers. This population is both highly addicted and highly price sensitive. Despite their efforts, quitting has proven to not be a realistic option for most smokers. Moreover, paying increasing costs to fund their habit is increasingly not possible. Faced with this reality, many smokers will seek out alternative paths to price avoidance, namely: smuggling.

[38] BOE, 2007
[39] Bader, P. et al (2011). Effects of Tobacco Taxation and Pricing on Smoking Behavior in High Risk Populations: A Knowledge Synthesis. International Journal of Environmental Research and Public Health. Retrieved from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3228562/

2. Approach

Our approach is to use state-by-state experience over recent years to conduct a pooled time series regression analysis, which will estimate the role that state specific cigarette prices play in smuggling rates. In order to accomplish this, we must first define and estimate our dependent variable (smuggling rate) as well as define additional independent variables that will allow us to better compare the relationship of price and smuggling across states with differing traits. Finally, we use the results of this regression to estimate the impact of a $2 tax increase in California.

Smuggling Estimates

Tobacco smuggling is an illegal activity. Whether undertaken by organized criminal enterprises or by individuals seeking tax relief for their personal consumption, the activity is ultimately illegal. As such, it is difficult to assess the market size accurately. As Sylvain writes, "Controlling for black market activities is difficult since black markets are not easily observed. This causes a flaw in the data set. Indeed, part of the black market supply of cigarettes comes from the internet. Cigarettes can be purchased from parties all over the world without paying taxes, while bypassing the laws on minimum age for cigarette smoking. There exists no reliable measure of the volume of cigarettes purchased via the internet and the data set does not have any variable that attempts to control for it."[40]

The lack of clear data creates uncertainty in any analysis. A number of researchers have proposed a wide range of methodologies for creating the dependent variable for their analyses. There are tradeoffs in every methodology, as discussed in Table 2.1. Notably, Emery and Alamar employ methodologies that unavoidably understate the amount of smuggling within the state. Emery's methodology omits any smuggling that the consumer is unaware of as well as any illegal activity the consumer is unwilling to admit to. Alamar assumes that, prior to 1999,

[40] Sylvain, 2008, Pg 93

there was no smuggling what-so-ever, without offering evidence for this assumption. Mackinac, on the other hand, employs a more inclusive methodology that results in the highest estimate for smuggling in California.

Table 2.1
Smuggling Results by Methodology

Study	Variable	Discussion
Andrew Chang & Co (2013)	Calculated estimate based on the difference between estimated consumption and taxed sales as reported by state tax agencies	Simple calculation based on straightforward assumptions that are supported by the literature
Mackinac (2013)	Residual analysis based on the difference between estimated consumption and taxed sales as reported by state tax agencies	More complex calculation based on straightforward assumptions that are supported by the literature
BOE (2007)	Estimated a variable based on a combination of an extrapolation from retail auditing and assumed rate for casual smuggling	A robust methodology for counterfeit cigarettes passed through otherwise legitimate retailers. Casual estimate is in line with other research. Omits smuggling through non-standard retail distribution.
Alamar (2003)	Total Tax Paid Sales	Calculates an elasticity based on the relationship between the ratio of state taxes to total taxes. In order to translate elasticity to a given year's estimate, applies elasticity to various inputs and assumes smuggling was zero prior to 1999.
Emery (2002)	Used respondent reported data from the California Tobacco Survey	Only includes tax evasion the consumer was aware of. Likely at risk for under reporting, since respondents are being asked if they are engaging in an illegal activity.

Our definition of smuggling is any tobacco purchased through a tax evading source, which could include:

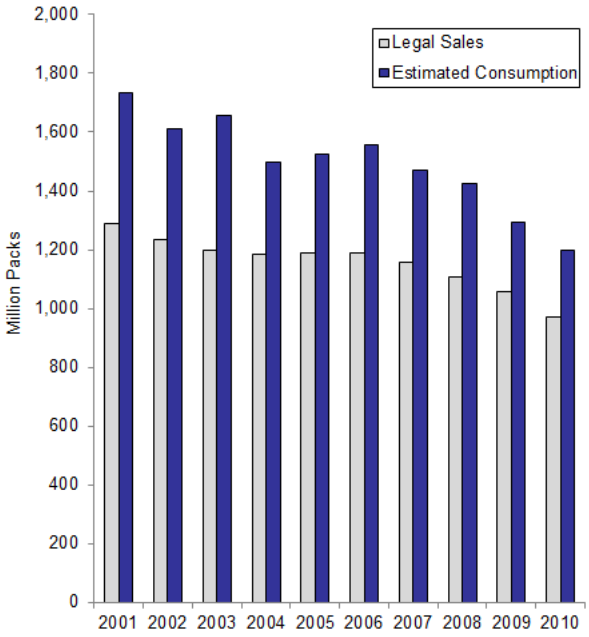
- Casual smuggling by consumers who travel to low/no tax areas to purchase their tobacco (such as a bordering state, a reservation or military base within the state or a neighboring country); or
- Counterfeit smuggling through legitimate or black market retail by organized smugglers. These smugglers generally apply a counterfeit "tax paid" stamp to cigarettes that may have been produced legally for sale elsewhere or may be counterfeit themselves.

In order to estimate smuggling levels based on this definition, we focus on what we do know. In this case there is excellent data on key points. Using state tax collection agency data, we know how many legal packs of cigarettes were sold in each state, each year. Taxed purchases are collected by state tax agencies and reported by the Federation of Tax Administrators.

In addition, the Centers for Disease Control issues an extensive annual survey that estimate how many smokers reside in each state and how much the average smoker consumes annually. Combining these two figures, we can estimate total consumption by state. While this figure is calculated from two figures with statistical margins of error, the large size of the data set should account for any small discrepancies from one year to the next. Moreover, this methodology is extremely conservative, since, as discussed in the literature review, smokers tend to underreport in surveys, so the real consumption level is likely higher. While this factor may bias our estimate downward, however, in order to maintain a conservative approach, we will not correct for it.

Figure 2.1 shows legal taxed sales and estimated consumption for California by year from 2001 through 2010. This is the period included in our study.

Figure 2.1
California's Legal and Total Consumption per Year



Having established the level of legal sales and total consumption in the state, there is consistently a gap between these figures that is relatively stable in each state from year-to-year. In some states (exporters) legal sales exceeds (sometimes drastically) total consumption. In others, like California (importers), total consumption exceeds legal sales. This consumption is filled through smuggling. Figure 2.2 shows consumption and sales data for the top 5 smuggling importers and exporters.

Figure 2.2
Legal and Total Consumption (2010)

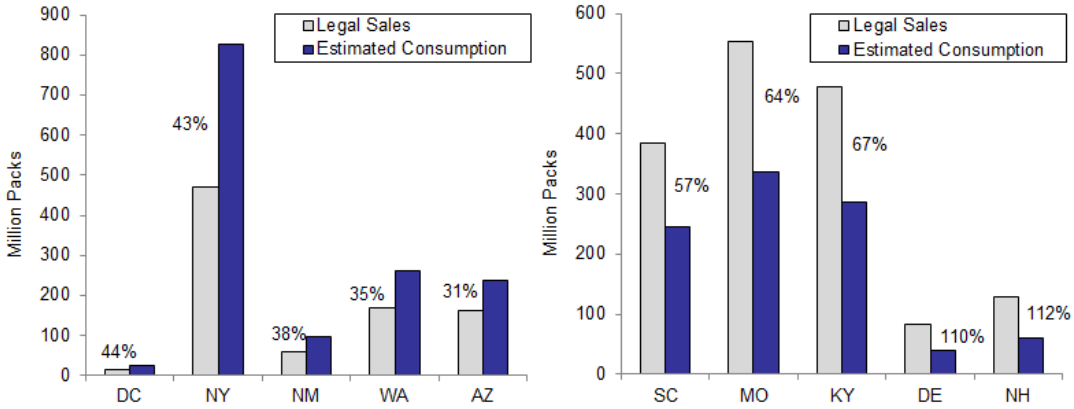
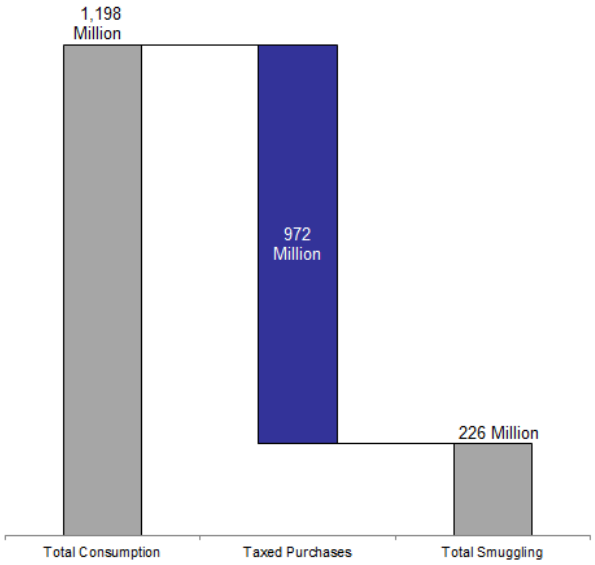


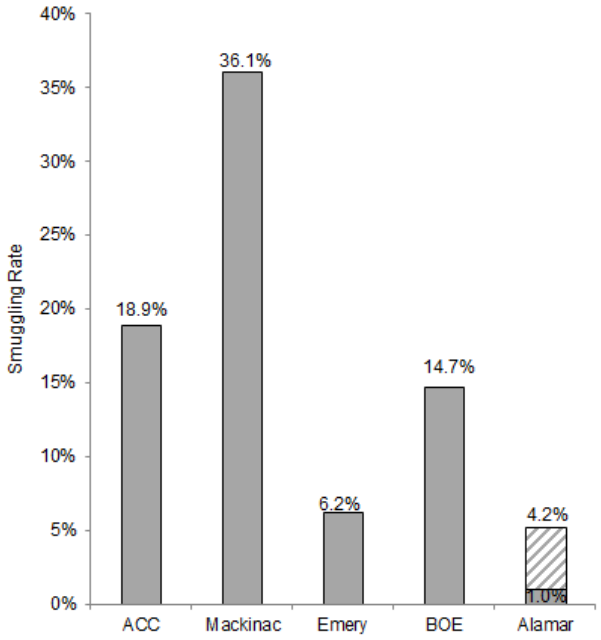
Figure 2.3 shows the smuggling calculation for California in 2010.

Figure 2.2
Smuggling Calculation



The 226 million cigarettes we estimate were smuggled in 2010 works out to 18.9% of total consumption. This estimate is in the midrange of available estimates, as shown in figure 2.3.

Figure 2.3
Smuggling Results by Methodology



The lower estimates use a limited definition that omits key aspects:

- Emery only includes tax evasion the consumer is explicitly aware of and likely understates even this limited aspect because it relies on consumers self-reporting illegal behavior;
- The California Board of Equalization (BOE) omits smuggling through non-standard retail sources;
- Alamar's analysis makes the extreme assumption, without offering any defense or meaningful rationale, that there was no smuggling what-so-ever prior to 1999, when the last tax increase was passed. Despite this, the nature of their methodology, which was produced over ten years ago, suggests that their estimate would have increased subsequently and may be significantly higher today.

Adjusting for limited definitions may explain a portion of the difference between these estimates. For example, Emery finds a higher rate of casual smuggling than does BOE.

Conversely, Mackinac employs a nuanced but highly inclusive methodology. Given the nature of the smuggling markets and the reality of consumption under reporting, this may be appropriate. It does, however, have the risk of over estimating total smuggling.

Regression Methodology

We employed three regression estimates to calculate a range of possible outcomes. The three estimates account for different assumptions on model parameters and best fit curve. The estimates are summarized as follows:

- Simple Estimate: A simple pooled time series regression comparing just the price of cigarettes to the smuggling rate
- Full Linear Estimate: A more complex pooled time series regression that accounts for a number of additional variables
- Curved Fit (Base Estimate): Employs the same variables as the full linear estimate, but uses a methodology that allows the line to curve

Simple Linear Estimate

The basic estimate was derived through a time series bivariate: a simple regression comparing the price of cigarettes to levels of smuggling, with only the addition variables of dummy variables to account for each year. This is a simple methodology that fails to account for differences between states but produces a straightforward yard stick to compare other, more sophisticated measures against. The specific methodology was an OLS regression, with the estimated smuggling rate as the dependent variable, the inflation adjusted total cost of cigarettes as the explanatory variable along with dummy variables for each of the years included (2002-2010, with 2001 omitted).

Full Linear Methodology

This more nuanced estimate was derived through a linear regression with a number of additional factors accounted for. This more sophisticated estimate accounts for many differences between states. The methodology is the same as the basic estimate, with the addition of a number of independent variables, including:

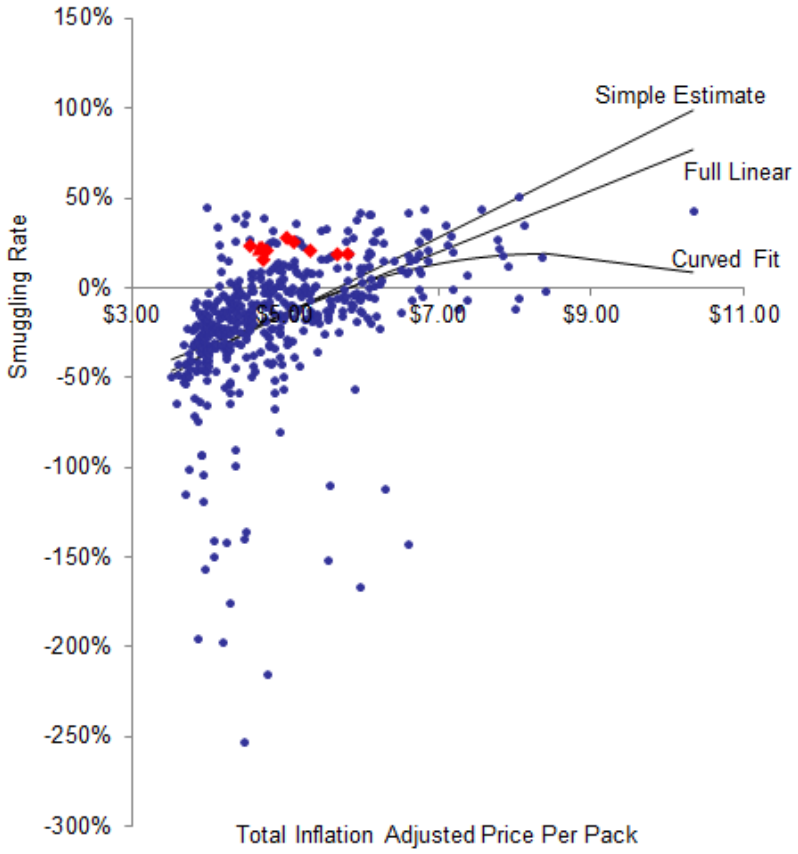
- Dummy variables for states sharing the Mexican and Canadian borders
- The percentage of the state's population in census designated urban areas
- The portion of smokers in poverty
- An interaction variable between the price of cigarettes and the period since Obama's signature tobacco legislation (2009 and subsequent)

- A dummy variable for California

Curved Fit Methodology

This methodology includes the same variables as the low estimate, but uses a quadratic OLS function, which calculates an impact for the key variable as a curve rather than a straight line. This method is often preferable because it allows for a curve throughout the spectrum of outcomes, rather than a straight line. Figure 2.4 displays these curves for the data in our analysis.

Figure 2.4
Smuggling Rate Distribution
(red indicates California)



Assumptions

In order to produce this model, we need to make several basic but reasonable assumptions. In order to account for this uncertainty and maintain conservative results, we repeatedly chose assumptions that would bias our results downward. Table 2.2 outlines these assumptions.

Table 2.2
Assumptions

Assumption	Discussion	Impact
Smokers do not under report smoking on surveys	A significant body of literature exists that shows individuals who engage in undesirable behavior, like smoking, tend to under report their behavior in surveys.	*Biases results downward* To ensure more conservative results, we do not correct for this factor.
Each state has zero net consumption from travelers	Smokers who visit a state will move a portion of their consumption from their state to the state they are visiting. We assume that, in net, for all states this cancels out.	*Biases results downward* Since California has a high number of visitors and its residents have low consumption rates, it is extremely likely that its visitors consume more tobacco in California than its residents do out of state.
State per Smoker Consumption = National Average	State by state average per smoker consumption data does not exist. Thus, in order to make a comparison of consumption, we assume that the average smoker in each state consumes the national average per year	*Unknown* While some variation is likely, it is unknowable if enough variation exists to bias the results. It could potentially bias any state in either direction, but, as such, would likely have little impact in aggregate.
Statewide impacts accurately represent jurisdictional impacts	Our analysis is based on full states, rather than specific markets, which, due to higher local taxes and/or significant cross border access, may have much higher rates of smuggling	*Biases Results Downward* Accounting for higher smuggling areas would increase the number of high smuggling/high cost points on the curve and, thus, likely increase the slope.

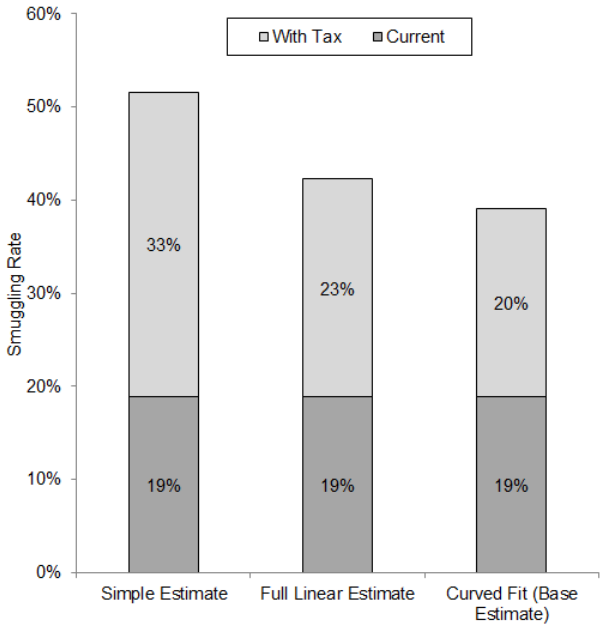
3. Statewide Impacts

We prepared estimates based on three methodologies, which produced relatively similar results, as displayed in Figure 3.1. The Curved Fit model method produced the lowest estimate of increased smuggling, at 20%, while the Simple Estimate method was the highest at 32%. All models were significant at the 99.9% level for the key explanatory variable. Additionally, both the Full Linear and Curved Fit models fit California's observed curve relatively well:

- The Full Linear model produced an average error of 4.9%
- The Curved Fit model produced an average error of 5.1%

While the Full Linear model appears to be slightly more accurate, we choose to focus on the Curved Fit model, because it produces the lowest estimates for California and allows us to maintain a conservative approach.

Figure 3.1
Smuggling Results by Methodology



While a smuggling rate of 39% may seem high, it is well below high levels found by research on other high tax localities. For example, Daudelin estimated that tobacco smuggling

exceeds 50% in certain Canadian provinces.[41] Lovenheim estimates that nearly 2/3 of cigarettes in Washington D.C. are smuggled.[42] Using a creative methodology, researchers found that most littered packs of cigarette found in New York City were purchased without NYC tax paid.[43] In a similar study, Merriman found that 75% of publicly discarded packs in Chicago were purchased without Chicago tax paid.[44] In light of this, our results appear not only reasonable, but quite a bit more conservative relative to other published research.

Revenue Impact

In recent years, California has received approximately $900 annually million from the existing excise tax and the proposal's authors estimate it will bring in $1.4 billion annually in additional revenue. This fails to account for smuggling. Hard hit smokers will seek cheaper alternatives, which will result in the loss of anticipated sales tax revenue.

Focusing on our most conservative estimate, we find that the author's estimates overstate net revenue by $500 million. This is the result of a decline in existing excise tax and sales tax revenue because a decline in legal consumption, due to smuggling. This does not include decreased volume, due to decreased consumption, which is accounted for separately.

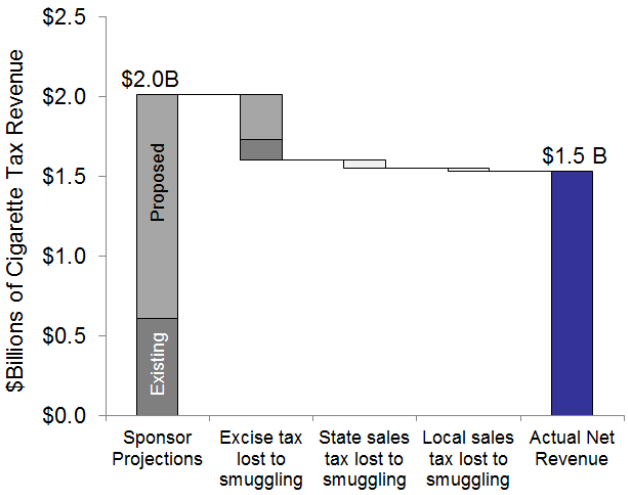
[41] Daudelin, J. (2013). Border Integrity, Illicit Tobacco, and Canada's Security. National Security Strategy for Canada Series. Pg 70. Retrieved from: http://www.macdonaldlaurier.ca/wp-content/uploads/2013/03/MLIBorder-Integrity-Illicit-Tobacco-Canadas-Security.pdf

[42] Loveheim, M.F. (2007). How Far to the Border?: The Extent and Impact of Cross-Border Casual Cigarette Smuggling. Stanford Institute for Economic Policy Research. Pg 24. Retrieved from: http://www-siepr.stanford.edu/papers/pdf/06-40.pdf

[43] Chernick, H. and Merriman, D. (2011). Using Littered Pack Data to Estimate Cigarette Tax Avoidance in NYC. Working Paper Series. Pg 26. Retrieved from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2192169

[44] Merriman, D. (2010). The Micro-geography of Tax Avoidance: Evidence from Littered Cigarette Packs in Chicago. *American Economic Journal: Economic Policy*. Retrieved from: http://ideas.repec.org/a/aea/aejpol/v2y2010i2p61-84.html

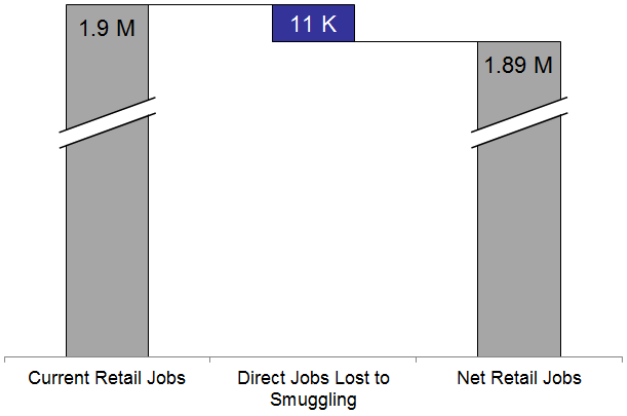
Figure 3.2
Revenue Estimate



Employment Impact

Using a similar methodology, based on United States Bureau of Economic Analysis, RIMS II data, we calculate that such a tax increase could eliminate 11 thousand direct legitimate retail jobs. This only includes jobs directly lost by legitimate retailers due to lost sales. This is displayed in Figure 3.3.

Figure 3.3
Legitimate Retail Employment Estimate



Sensitivity Analysis

By adjusting our dependent variable, we can create an effective sensitivity analysis that accounts for a variety of potential variances or uncertainties, including the per smoker consumption rate, the typical under reporting of smokers in surveys or any factors in consumption that may have been omitted.

For the low estimate, we lower estimated smuggling by 25% and for the high estimate, we increase it by 25% before re-running the regression and calculating the effects and outputs.

The lower bound estimates smuggling after the tax increase at 29.3%. This is a 25% decrease from our primary model, but still represents a large portion of California's consumption.

The upper bound estimates smuggling after that tax increase at 46.2%. These results are displayed in Figure 3.4.

Figure 3.4
Sensitivity Analysis

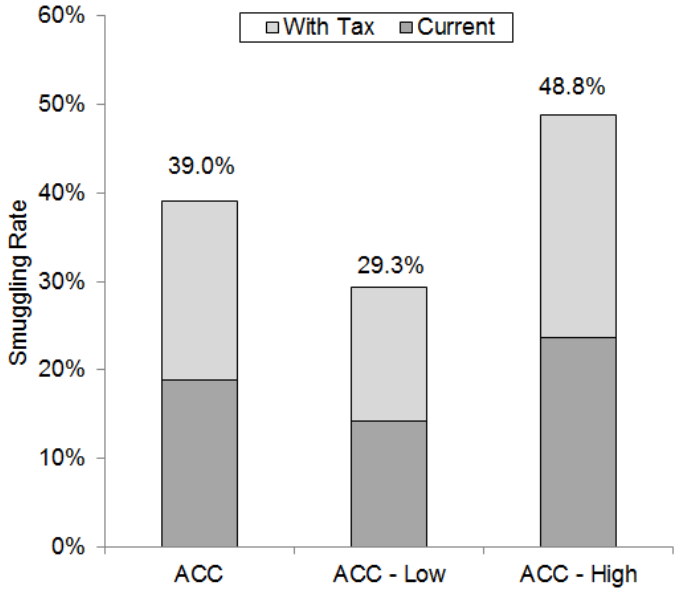
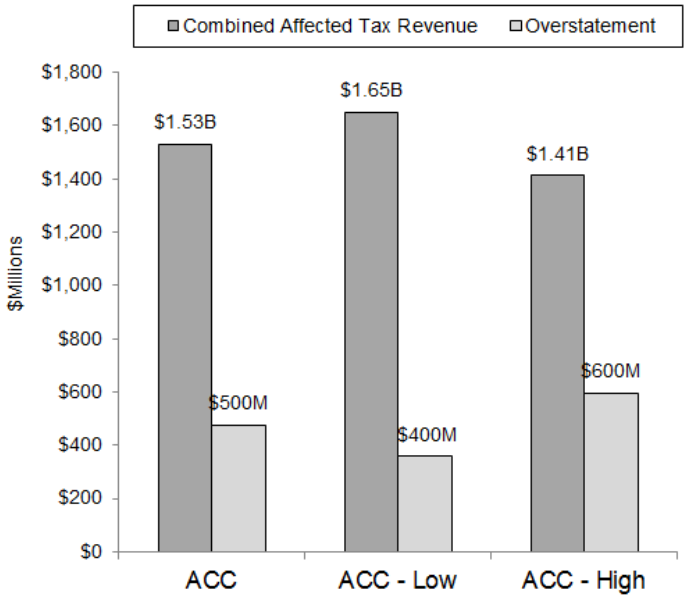


Figure 3.5 offers the sensitivity of revenue estimates. Despite the extremely conservative assumptions, even in the low estimate, proponents still overestimate revenue by nearly $400M.

It appears clear that even under this optimistic scenario, the tax revenue will not meet sponsor projections. While accounting for the significant uncertainty in analyzing black markets produces a range of potential results, the band is relatively narrow and confirms the conclusion that proponents are overestimating revenues by hundreds of millions of dollars.

Figure 3.5
Sensitivity Analysis: Revenue



While the nature of any analysis of black market economies necessarily implies significant uncertainty, this analysis clearly shows that whether the assumptions are extremely conservative or more aggressive, smuggling has real, meaningful impacts on revenue realized by the state of California from any new tax.

4. Local Impacts

We use a similar methodology to estimate the distribution of smuggling throughout the state. We use the California Health Interview Survey (CHIS) data as a proxy for consumption. We estimate the distribution of consumption in each region of the state based on the CHIS estimates of smokers by region. By doing so we assume that while the total number of smokers varies significantly between regions, the consumption levels of the average smoker does not. We combine this data with industry data on retail distribution among the regions. This data set accounts for the vast majority of retail sales in the state, only omitting a fraction of a percent sold through very small retailers. While we assume the omitted sales are distributed evenly, the volume is sufficiently small that a non-standard distribution would have no practical impact on the calculations.

We distribute known levels of legal sales and estimated levels of consumptions across the regions, based on the distributions calculated above for current levels and the after tax scenario. We then calculate smuggling rates for each region. Table 4.1 shows before and after smuggling rates for each region in the state.

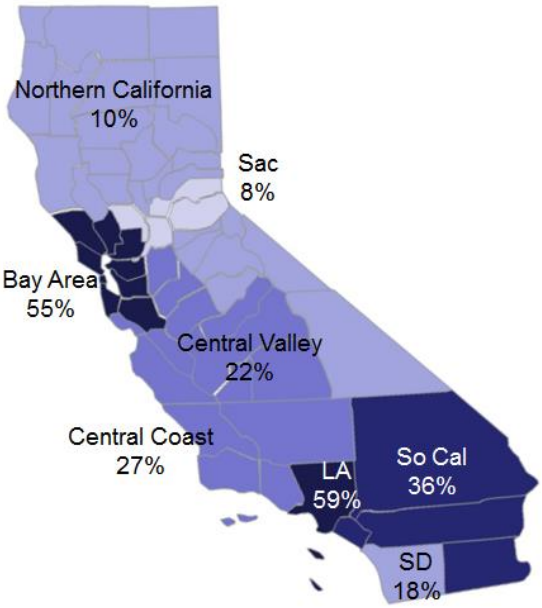
The regions are based on the regions defined in the CHIS, with San Diego broken out from Southern California to provide additional detail.

Table 4.1
Smuggling Change by Region

Region	Before	After
Los Angeles	28%	59%
Bay Area	26%	55%
So Cal	17%	36%
Central Coast	13%	27%
Central Valley	11%	22%
San Diego	9%	18%
Northern	5%	10%
Sacramento	4%	8%
State Average	*19%*	*39%*

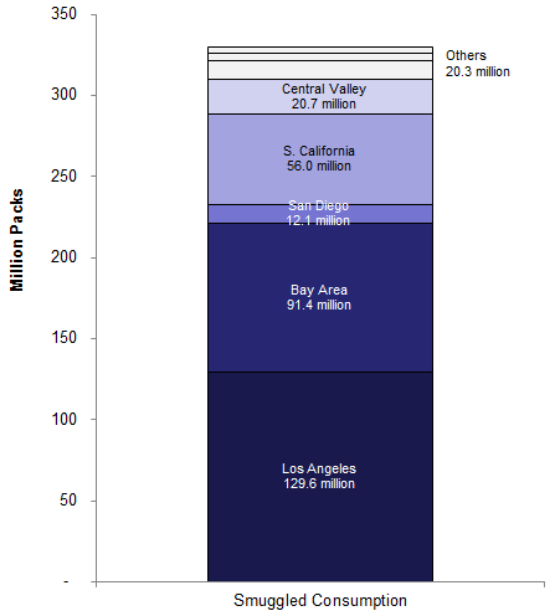
As shown in Figure 4.1, smuggling tends to be in areas that are urban and/or coastal. The largest share of smuggling occurs in Los Angeles, Southern California and the Bay Area, but every region is currently impacted and would see an increase if a tax were implemented.

Figure 4.1
Smuggling Rates by Region
(after increase)



The highest rates of smuggling are found in the most populous regions. In combination, these factors lead to a disproportionate share of total smuggling occurring in these regions.

Figure 4.2
Total Region
(after increase)

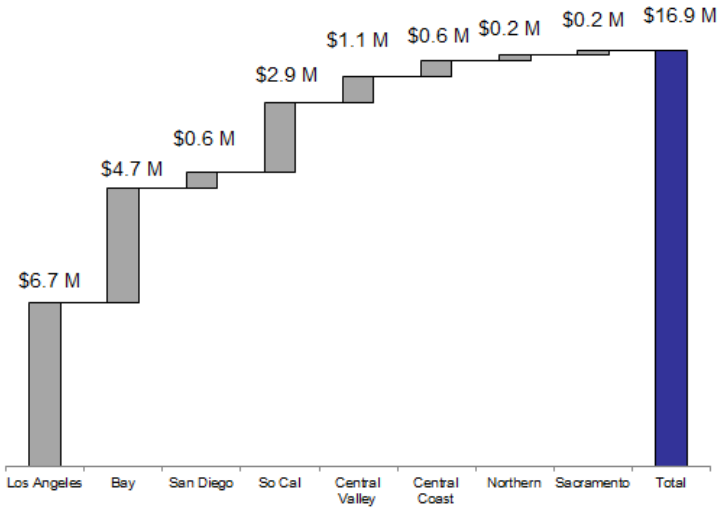


This data, combined with our subject matter expert interviews suggests that denser areas are likely to experience more smuggling than less dense suburban areas in the same counties. In addition, the literature suggests that less affluent areas are likely to experience more smuggling. Taken together, this suggests that poor, dense areas, such as Downtown, South and East LA, Oakland and Richmond are likely to experience more smuggling than less dense and more affluent areas in the same regions.

Revenue Impact

Lost legitimate retail sales will impact local government revenues through lost sales tax. To calculate revenue impacts, we assume that sales tax revenue is distributed at the same rate as smuggling overall.

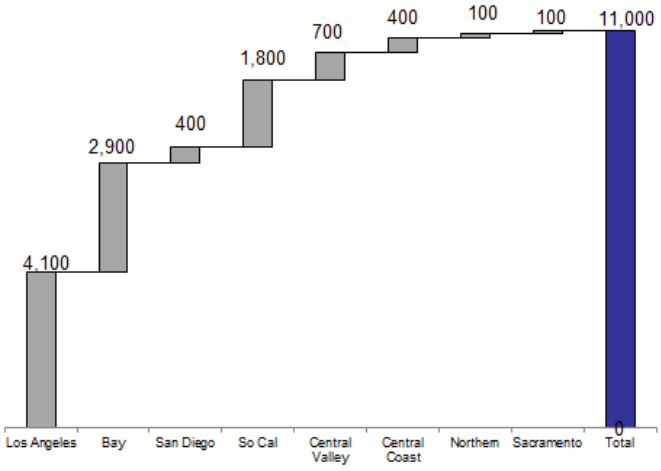
Figure 4.3
Lost Revenue by Region
(after increase)



Employment Impact

The distribution of legitimate retail jobs is calculated in the same manner as local revenue. Figure 4.4 displays the impact to each region. Los Angeles will lose over 4,000 jobs, while the Bay Area loses nearly 3,000. Retail has been among the hardest hit sectors in the recession.

Figure 4.4
Lost Legitimate Retail Jobs by Region
(after increase)



5. Key Policy Considerations

After analyzing the potential impact of the proposed tax increase, there are some key considerations that should be discussed. Each of these considerations could dramatically affect the cost-benefits of the tax as well as how it would be implemented.

Achieving Policy Priorities

All policies have a wide variety of impacts, including those the proponents intend and some that are unintentional. Generally, among these impacts, the proponents have one or two that they consider priorities. In the case of tobacco taxes, in our observation, these priorities have generally been discouraging smoking based on the increased cost and generating revenue for the state. Sometimes this revenue is for general purposes, but more often it is earmarked for smoking cessation programs or, as is ostensibly the case with the de León proposal, tobacco related health care costs.

While these priorities seem to be in conflict, when tobacco costs decrease consumption, they generally work to achieve a mutual goal. Although decreased consumption decreases funding for cessation programs and health care costs, it also decreases the need for them. However, when tobacco taxes increase smuggling, they fail at both priorities. In this case, rather than decreasing consumption, smokers find a tax evasive tobacco source. Thus, they continue to smoke but do not generating funding. In this case, policy makers should consider whether there is a point at which increased taxes are not only less efficient at achieving policy priorities are instead counterproductive.

Unintended Consequences

Generally innocuous activities, when criminalized often create markets that legitimate businesses are unable to fill. Because of this, underground economies have long been tied to violent, organized criminals, using trade in prohibition era alcohol, drugs, gambling and prostitution to fund their illegal organizations. As the Bureau of Alcohol, Tobacco, Firearms and

Explosives noted, "Traditional organized crime is involved, terrorist groups are involved, and street gangs are involved."[45]

Today there is a mounting body of evidence tying some smuggling organizations to terrorist groups. Billingsley showed that there has been a number of multi-million dollar smuggling cases linked to terrorists. He writes, “Because of the immense profits in the illicit cigarette trade, as well as the potentially low penalties for getting caught, illicit cigarette trafficking now rivals drug trafficking as the method of choice to fill the bank accounts of terrorists and terrorist groups. Investigators have discovered that traffickers in the United States and the United Kingdom are providing material support to the Hezbollah and the Real IRA (RIRA), among other terrorist groups.”[46] This is made possible because, Law enforcement has typically focused on smuggling of diamonds and oil, according to Shelley, who adds that significant evidence shows that tobacco smuggling is also used to fund terrorist organizations.[47] While cigarette sales may not be banned in California, excessive taxation can create an effective prohibition, regardless of intentions. In this case, it may make black markets easier to operate, since it requires law enforcement, before they can address smuggling, to identify it and differentiate it from legitimate sale, possession and use.

[45] Cigarette Taxes Are Fueling Organized Crime, Wall Street Journal, May 7, 2008, Retrieved from: http://online.wsj.com/article/SB121012081570272357.html

[46] Billingsley, W. (2004) Illicit Cigarette Trafficking and the Funding of Terrorism. The Police Chief. Pg 1. Retrieved from: http://www.thecre.com/ccsf/wp-content/uploads/2011/06/Illicit-Cigarette-Trafficking-and-the-Funding-of-Terrorism.pdf

[47] Shelley, L.I. and Melzer, S.A. (2008) The Nexus of Organized Crime and Terrorism: Two Case Studies in Cigarette Smuggling. International Journal of Comparative and Applied Criminal Justice. Pg 1. Retrieved from: http://traccc.gmu.edu/pdfs/publications/illicit_trade_publications/Shelley_Melzer.pdf

6. Conclusion

Increasing California's tobacco excise tax by two dollars will double cigarette smuggling in the state to 39% of total cigarettes consumed. This impact is consistent with both economic theory and the experience of other high tax localities. By not accounting for risk of smuggling, proponents overstate net tax revenue by $500 million dollars. Additionally, such a tax could eliminate 11,000 legitimate retail jobs. Moreover, policy makers should consider the unintended consequences inherent in a quasi-prohibitionist taxation scheme. Forcing addicted consumers to alternative, underground markets will undercut revenues to the state and legitimate retailers, instead redirecting them to criminal enterprises.

Appendix A:
Select Criminal Cases

Defendant/Location	Arrest Date	Charges/Seizure
Adolfo Reyes aka "El Huero" Los Angeles, CA	4/10/13	Felony Possession for Sale: ▪ 1 carton of counterfeit duty free Marlboro; ▪ 293 cartons and 46 packs of duty free Marlboro; ▪ 130 cartons and 20 packs of duty free Benson & Hedges; ▪ 554 cartons of duty free Mexican Marlboro; and ▪ 3,020 cartons and 122 packs of non-PM USA branded unstamped product
Gerardo Chavez Los Angeles, CA	Guilty Plea: 11/15/2012	Plead Guilty (sealed): ▪ 6,000 cartons of cigarettes
Jack Haroun Wholesale Palace Burbank, CA	Filed: 7/8/2010	Purchased and sold $1.25 million in other tobacco products, without reporting and paying tax
Shehata Henan/ Samy Girgis/ Soheir Girgis Classic Wholesale/House of Tobacco Los Angeles, CA	Guilty Plea: 1/25/2012	Purchased and sold $3.3 million in other tobacco products, without reporting and paying tax
Galiom Mansour/ Naeim Hanno South Bay Wholesale Carson, CA	Guilty Plea: 2/12/2013	Purchased and sold $1.1 million in other tobacco products, without reporting and paying tax
Adib Sirope/ Rimoun Mansour Payless Wholesale Los Angeles, CA	Guilty Plea: 2/14/2012	Purchased and sold $5.3 million in other tobacco products, without reporting and paying tax
Rajnish Makkad/ Charanjit Singh/ Amrit Singh IIG Los Angeles, CA	Guilty Plea: 10/3/2011	Purchased and sold $27 million in other tobacco products, without reporting and paying tax
Mohammed Halaweh CTC Distribution/T&T Tobacco Los Angeles, CA	Filed: July 28, 2010	13 counts of mail fraud and eight counts of trafficking in contraband tobacco. Estimated losses to the state of $5.3 million in unpaid tobacco product taxes
Mehdi Mohammed Humkar M&D Tobacco Los Angeles, CA	Filed: July 28, 2010	15 counts of mail fraud and seven counts of trafficking in contraband tobacco. Estimated losses to the state of $528,000 in unpaid tobacco product taxes.

Defendant/Location	Arrest Date	Charges/Seizure
Abdurrahman Yousuf A to Z Cash and Carry Los Angeles, CA	Filed: July 28, 2010	17 counts of mail fraud and 13 counts of trafficking in contraband tobacco. Estimated losses to the state of $2.3 million in unpaid tobacco product taxes.
Salam S. Kalasho/ Anil Malhi Pisces International Inc El Cajon, CA and Los Angeles, CA	Filed: December 18, 2008	20 counts of mail fraud. Estimated losses to the state of $6.5 million in unpaid tobacco product taxes.
Kultar Sing/ Muhammad Inayat/ Muhammed Saeed Malik Isa Chicago Wholesale Yuba City, CA	Filed: April 3, 2010 and September 10, 2009	27 counts of mail fraud. Estimated losses to the state of $650 thousand in unpaid tobacco product taxes.
Nina Nguyen/ Luan Tran K&L Tobacco Industries San Bernardino, CA	Filed: November 21, 2012	19 counts of trafficking. Estimated losses to the state of $1.6 million in unpaid tobacco product taxes

Appendix B:
Variables

Variable	Source	Explanation
Annual Dummy Variables	Defined by ACC	It is the accepted standard to include dummy variables for the years included in a pooled-time series regression
Mexican and Canadian Border Dummy Variables	Defined by ACC. States which border Mexico (CA, AZ, NM, TX) and State which border Canada (AK, ID, ME, Ml, MN, MT, ND, NH, NY, VT)	As indicated by the literature ( ), Mexico is a source for low cost cigarettes in some states, while Canada is a destination for cigarettes from some lower cost states
% Urban	US Census, American Community Survey (2001-2010)	As indicated by the literature and SME interviews, urban areas, especially those near borders, are more likely to have high levels of smuggling
% Smokers with less than HS education	Centers for Disease Controls and Prevention, STATE Data (2001-2010)	Used as a proxy for income. As indicated by the literature, lower income smokers tend to be more price sensitive than smokers overall
Interaction variable between years 2009/10 and Price Variable	Calculated by ACC by multiplying the year dummy variables by the price for that state/year	President Obama passed two major national policy changes that went into effect in 2009, a national tax and a bill to expand the powers of the FDA's ability to impose labeling and other regulatory requirements. This variable identifies the combined impact of price and consumer information increase
Inflation Adjusted, Tax Inclusive Price Per Pack	Price per pack: Federation of Tax Administrators, "Tax Burden on Tobacco" 2011 Sales tax rates: Tax Foundation, "State Sales, Gasoline, Cigarette, and Alcohol Tax Rates by State, 2000-2010" Inflation: Bureau of Labor Statistics, CPI-U, May 2013	Consumers generally will not differentiate between what portion of the price they are paying is due to taxes or other fees and what portion is the price of the good itself, especially when it is paid before reaching the consumer and included in the final retail price. Therefore, we focus on the total cost of the good by state, rather than the tax in isolation.
California Dummy Variable	Defined by ACC,	California is geographically, politically and socially unique. This variable accounts for this.

Appendix C:
Estimate Calculation (for CA 2010)

Constant	Year Dummy	09-10 Interaction	Infl Adjusted Total Cost	Cost Quadratic	Mexico Dummy	Canada Dummy	% Population Urban	% Smokers Non HS Grads	California Dummy
1.427	.305	-0.00…	-0.005	0.000…	-0.239	0.007	-0.196	1.232	0.116
X									
1	1	582	582	338,416	1	0	95%	14%	1
=									
1.427	.305	-0.08	-2.75	0.96	-0.24	0	.18	.12	0.116
Sum									
-0.27									

(Negative numbers imply net smuggling, positive numbers imply net exports)

Appendix D:
Regression Results

Figure D.1
Basic Linear Regression Results

Model 1: OLS, using observations 1-490				
Dependent variable: Smuggled				
	coefficient	std. error	t-ratio	p-value
const	1.137	0.106	10.683	0
Two	0.088	0.069	1.275	0.203
Three	0.117	0.069	1.698	0.09
Four	0.069	0.069	1.007	0.314
Five	0.121	0.069	1.759	0.079
Six	0.057	0.069	0.835	0.404
Seven	0.107	0.069	1.547	0.123
Eight	0.124	0.069	1.802	0.072
Nine	-0.007	0.211	-0.032	0.974
Ten	-0.024	0.216	-0.109	0.913
NineTen_Interaction	0.001	0	1.647	0.1
InfAdj_Total_Cost	-0.002	0	-10.301	0
Mean dependent var	0.172	S.D. dependent var	0.379	
Sum squared resid	54.706	S.E. of regression	0.338	
R-squared	0.223	Adjusted R-squared	0.205	
F(11, 478)	12.456	P-value(F)	0	
Log-likelihood	-158.133	Akaike criterion	340.266	
Schwarz criterion	390.599	Hannan-Quinn	360.033	

Figure D.2
Full Linear Regression Results

Model 2: OLS, using observations 1-490				
Dependent variable: Smuggled				
	coefficient	std. error	t-ratio	p-value
const	0.733	0.170	4.324	0.000
Two	0.049	0.064	0.762	0.446
Three	0.094	0.064	1.472	0.142
Four	0.048	0.064	0.753	0.452
Five	0.103	0.064	1.612	0.108
Six	0.033	0.064	0.520	0.603
Seven	0.079	0.064	1.222	0.222
Eight	0.104	0.064	1.616	0.107
Nine	(0.119)	0.198	(0.603)	0.547
Ten	(0.143)	0.203	(0.705)	0.481
NineTen_Interaction	0.001	0.000	1.951	0.052
InfAdj_Total_Cost	(0.002)	0.000	(7.681)	0.000
Mexico	(0.258)	0.062	(4.127)	0.000
Canada	0.004	0.042	0.091	0.927
Urban	(0.204)	0.121	(1.680)	0.094
Smokers_NonGrad	1.201	0.277	4.332	0.000
California	0.108	0.118	0.914	0.361
Mean dependent var	0.172	S.D. dependent var	0.379	
Sum squared resid	46.619	S.E. of regression	0.314	
R-squared	0.338	Adjusted R-squared	0.315	
F(16, 473)	15.072	P-value(F)	0.000	
Log-likelihood	(118.944)	Akaike criterion	271.888	
Schwarz criterion	343.193	Hannan-Quinn	299.892	

Figure D.3
Quadratic Regression Results

Model 1: OLS, using observations 1-490				
Dependent variable: Smuggled				
	coefficient	std. error	t-ratio	p-value
const	1.427	0.382	3.733	0.000
Two	0.050	0.064	0.784	0.434
Three	0.096	0.064	1.507	0.133
Four	0.045	0.064	0.707	0.480
Five	0.101	0.064	1.588	0.113
Six	0.028	0.064	0.432	0.666
Seven	0.079	0.064	1.231	0.219
Eight	0.098	0.064	1.533	0.126
Nine	0.331	0.297	1.112	0.267
Ten	0.305	0.300	1.018	0.309
NineTen_Interaction	(0.000)	0.001	(0.250)	0.803
InfAdj_Total_Cost	(0.005)	0.001	(3.277)	0.001
CostQuad	0.000	0.000	2.023	0.044
Mexico	(0.239)	0.063	(3.800)	0.000
Canada	0.007	0.042	0.178	0.859
Urban	(0.196)	0.121	(1.621)	0.106
Smokers_NonGrad	1.232	0.277	4.448	0.000
California	0.116	0.117	0.988	0.324
Mean dependent var	0.172	S.D. dependent var	0.379	
Sum squared resid	46.219	S.E. of regression	0.313	
R-squared	0.343	Adjusted R-squared	0.320	
F(17, 472)	14.519	P-value(F)	0.000	
Log-likelihood	(116.829)	Akaike criterion	269.659	
Schwarz criterion	345.158	Hannan-Quinn	299.310	

Appendix E:
Bibliography

Alamar, B. et al (2003). Cigarette Smuggling in California: Fact and Fiction. *Tobacco Control Policy Making: United States, Center for Tobacco Control Research and Education, UC San Francisco*. Retrieved from: http://www.escholarship.org/uc/item/4fv0b2sz

Bader, P. et al (2011). Effects of Tobacco Taxation and Pricing on Smoking Behavior in High Risk Populations: A Knowledge Synthesis. *International Journal of Environmental Research and Public Health*. Retrieved from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3228562/

Billingsley, W. (2004) Illicit Cigarette Trafficking and the Funding of Terrorism. *The Police Chief.* Retrieved from: http://www.thecre.com/ccsf/wp-content/uploads/2011/06/Illicit-Cigarette-Trafficking-and-the-Funding-of-Terrorism.pdf

Board of Equalization (BOE), California (2007). Revenue Estimate: Cigarette and Tobacco Products Tax Evasion. Retrieved from: http://www.boe.ca.gov/pdf/cig-evasion-07.pdf

Callison, K. and Kaestner, R. (2012). Do Higher Tobacco Taxes Reduce Adult Smoking? New Evidence of the Effect of Recent Cigarette Tax Increases on Adult Smoking. *The National Bureau on Economic Research*. Retrieved from: http://www.nber.org/papers/w18326

Chernick, H. and Merriman, D. (2011). Using Littered Pack Data to Estimate Cigarette Tax Avoidance in NYC. *Working Paper Series*. Retrieved from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2192169

Chiou, L. and Muehlegger, E. (2010). Consumer Response to Cigarette Excise Tax Changes. *M-RCBG Faculty Working Paper Series*. Retrieved from: http://www.hks.harvard.edu/var/ezp_site/storage/fckeditor/file/pdfs/centers-programs/centers/mrcbg/publications/fwp/mrcbg_fwp_2010-06_Muehlegger_cigarettetax.pdf

Cooper, A. and Witt, D. (2012). The linkage between tax burden and illicit trade of excisable products: the example of tobacco. *World Customs* Journal. Retrieved from: http://www.worldcustomsjournal.org/media/wcj/-2012/2/WCJ_Volume_6_Number_2.pdf#page=47

Congressional Budget Office (2012). Raising the Excise Tax on Cigarettes: Effects on Health and the Federal Budget. Retrieved from: http://www.cbo.gov/sites/default/files/cbofiles/attachments/06-13-Smoking_Reduction.pdf

Daudelin, J. (2013). Border Integrity, Illicit Tobacco, and Canada's Security. *National Security Strategy for Canada Series.* Retrieved from: http://www.macdonaldlaurier.ca/wp-content/uploads/2013/03/MLIBorder-Integrity-Illicit-Tobacco-Canadas-Security.pdf

Department of Public Health, California (2012). Questions About Tax Evasion and Smuggling. Retrieved from: http://www.cdph.ca.gov/programs/tobacco/Documents/Questions%20About%20Tax%20Evasion%20and%20Smuggling.pdf

Emery, et al (2002). Was there significant tax evasion after the 1999 50 cent per pack cigarette tax increase in California? *Tobacco Control*. Retrieved from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1763842/

Farrelly, M.C. (2003). Impact of Cigarette Excise Tax Increases in Low-Tax Southern States on Cigarette Sales, Cigarette Excise Tax Revenue, Tax Evasion, and Economic Activity. *Tobacco Technical Assistance Consortium*. Retrieved from: http://www.rti.org/pubs/8742_southern_neighbors_fr_9-18-03.pdf

Framework Convention Alliance (2008). How big was the global illicit tobacco trade problem in 2006? Retrieved from: http://www.fctc.org/dmdocuments/fca-2008-inb-illicit-trade-inb1-factsheet-how-big-was-illicit-trade-2006-en.pdf

Gallup (2009). Cigarette Tax Will Affect Low-Income Americans Most. Retrieved from: http://www.gallup.com/poll/117214/cigarette-tax-affect-low-income-americans.aspx

Goolsbee, A., et al (2009). Playing With Fire: Cigarettes, Taxes and Competition From The Internet. *The National Bureau on Economic Research*. Retrieved from: http://www.nber.org/papers/w15612.pdf

Gruber, J., et al (2002). Estimating Price Elasticities When There Is Smuggling: The Sensitivity Of Smoking To Price In Canada. *The National Bureau on Economic Research*. Retrieved from: http://www.nber.org/papers/w8962.pdf

Humphreys, K. (2013). What Tobacco Tax Advocates Can Learn From American Drug Policy. *Huffington Post*. Retrieved from: http://www.huffingtonpost.com/keith-humphreys/what-tobacco-tax-advocate_b_3697565.html

Hyland, A., et al (2005). Higher cigarette prices influence cigarette purchase patterns. *Tobacco Control.* Retrieved from: http://tobaccocontrol.bmj.com/content/14/2/86.full

Jensen, N.M. and Rahman, A. (2012). The Silence of Corruption: Identifying Underreporting of Business Corruption through Randomized Response Techniques. Retrieved from: http://pages.wustl.edu/files/pages/imce/nathanjensen/jensenrahman_may_2012.pdf

Joosens, L., et al (2009). How Eliminating the Global Illicit

Cigarette Trade Would Increase Tax Revenue and Save Lives. *mpower*. Retrieved from: http://global.tobaccofreekids.org/files/pdfs/en/ILL_global_cig_trade_full_en.pdf

Joosens, L. and Raw, M. (2010). From cigarette smuggling to illicit tobacco trade. *Tobacco Control*. Retrieved from: http://tobaccocontrol.bmj.com/content/21/2/230.full

Lee, J.M., et al (2009). Price sensitivity and smoking smuggled cigarettes. *European Journal of Public Health*. Retrieved from: http://eurpub.oxfordjournals.org/content/19/1/23.long

Loveheim, M.F. (2007). How Far to the Border?: The Extent and Impact of Cross-Border Casual Cigarette Smuggling. *Stanford Institute for Economic Policy Research*. Retrieved from: http://www-siepr.stanford.edu/papers/pdf/06-40.pdf

Mackinac Center for Public Policy (2013). Higher Cigarette Taxes Create Lucrative, Dangerous Black Market. Retrieved from: http://www.mackinac.org/18128

McAllister, I. and Makkai, T. (1991). Correcting for the Underreporting of Drug Use in Opinion Surveys. *Substance Use and Misuse*. Retrieved from: http://informahealthcare.com/doi/abs/10.3109/10826089109058932

Merriman, D. (2010). The Micro-geography of Tax Avoidance: Evidence from Littered Cigarette Packs in Chicago. *American Economic Journal: Economic Policy*. Retrieved from: http://ideas.repec.org/a/aea/aejpol/v2y2010i2p61-84.html

Reynolds, L. and McKee, M. (2010). Organised crime and the efforts to combat it: a concern for public health. *Globalization and Health*. Retrieved from: http://www.biomedcentral.com/content/pdf/1744-8603-6-21.pdf

Richardson, K. (2001). Smoking, Low Income and Health Inequalities: Thematic Discussion Document. *Report for Action on Smoking and Health and the Health Development Agency*. Retrieved from: http://www.gserve.nice.org.uk/nicemedia/documents/smoking_low_income.pdf

Rowley, S.H. (1994). Canada Cuts Cigarette Tax To Fight Smuggling. *Chicago News*. Retrieved from: http://articles.chicagotribune.com/1994-02-09/news/9402090139_1_cigarettes-taxes-prime-minister-jean-chretien

Sankin, A. (2012) Prop 29: Willie Brown Says Cigarette Tax Will Be A Boon To Smugglers. *The Huffington Post*. Retrieved from: http://www.huffingtonpost.com/2012/06/04/prop-29-willie-brown-cigarette-smuggling_n_1569428.html

Shelley, L.I. and Melzer, S.A. (2008) The Nexus of Organized Crime and Terrorism: Two Case Studies in Cigarette Smuggling. *International Journal of Comparative and Applied Criminal Justice*. Retrieved from: http://traccc.gmu.edu/pdfs/publications/illicit_trade_publications/Shelley_Melzer.pdf

Stehr, M. (2005). Cigarette Tax Avoidance and Evasion. *Journal of Health Economics*

Sylvain, S. (2008). The Effects of Excise Tax on Cigarette Consumption: A Divergence in the Behavior of Youth and Adults. *The Michigan Journal of Business*. Retrieved from: http://www.michiganjb.org/issues/2/article4.pdf

Taylor, A.J. et al (2005). Smuggled tobacco, deprivation and addiction. *European Journal of Public Health.* Retrieved from: http://eurpub.oxfordjournals.org/content/15/4/399.full.pdf+html

Zhang, Z. (2009). Modeling Nonresponse and Underreporting in Response in Surveys of Arrestees. *Section on Survey Research Methods – JSM 2009*. Retrieved from: http://www.amstat.org/sections/srms/proceedings/y2009/Files/305170.pdf