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Tobacco Tax Policy in West Virginia

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ABSTRACT We consider the likely revenue effect of an increase in the cigarette excise tax rate in West Virginia. We begin with a consideration of the existing literature on how US state cigarette excise tax policy affects cigarette consumption and cross-border cigarette shopping. Second, we examine 80 cigarette excise tax increases that have occurred in the US since 2000. There we find a wide range of responses, but declines in cigarette purchases associated with any increase in the state cigarette excise tax rate typically fall within a range of 10 to 30 percent.

We close with the estimation of a full regression model that explains cigarette purchases as a function of the state cigarette excise tax rate, which controls for relevant factors in order to isolate the specific effect of state tax policy, abstracting from federal cigarette excise tax policy and the broader decline in smoking in the nation. We use data from the 48 contiguous US states for the years 2000 through 2014.

The actual number of cigarette packs purchased in West Virginia in FY 2015 was approximately 173 million. The results from our full model indicate that, with a $1 increase in the cigarette excise tax rate, West Virginia would be expected to collect an additional $101 million in cigarette excise tax revenue under our most pessimistic scenario, or $134 million under our most likely scenario. This $134 million estimate reflects an anticipated 14 percent decline in cigarette purchases attributable to the higher tax rate, to around 148 million packs purchased annually.

Because the cigarette tax is levied at the wholesale level, we must also consider the net effect of this change on the consumer sales tax. Netting the effects of reduced pack sales against the higher retail cigarette prices resulting from the excise tax increase indicates a modest increase

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in consumer sales tax revenue as well, producing overall tax revenue growth of $135 million under our most likely scenario.

We also considered a $0.45 increase in the cigarette excise tax rate. Here we estimate that cigarette purchases will decline between 6 and 12 percent and that the overall revenue gain will fall between $60 and $69 million.

We also include information for policymakers on e-cigarette and other tobacco products (OTP) tax policy in other states as well as previous economic research conducted to examine the responsiveness of these products to price changes. Finally, we provide suggestions for introducing a tax on e-cigarette products and an increase in tax rates for OTP.

1. Introduction

To help lessen the depth of continued budget shortfalls in West Virginia, state policymakers are considering the efficacy of raising cigarette and other tobacco product (OTP) excise tax rates. In this brief report we estimate how much additional excise tax revenue will be generated following an increase in cigarette and OTP excise tax rates. We consider the existing literature on the revenue effects of cigarette and OTP excise tax rates and ultimately estimate a pair of statistical models to explain the likely revenue effects of a $1 per pack increase in the cigarette excise tax rate in West Virginia.

CIGARETTE CONSUMPTION ACROSS STATES Consider Figure 1, in which we report overall cigarette purchases per capita by state for 2014. West Virginia reported the highest number of cigarette purchases among the 50 states at 97 packs per person. West Virginia's cigarette purchases figure is more than double the national average of 47 packs per person.
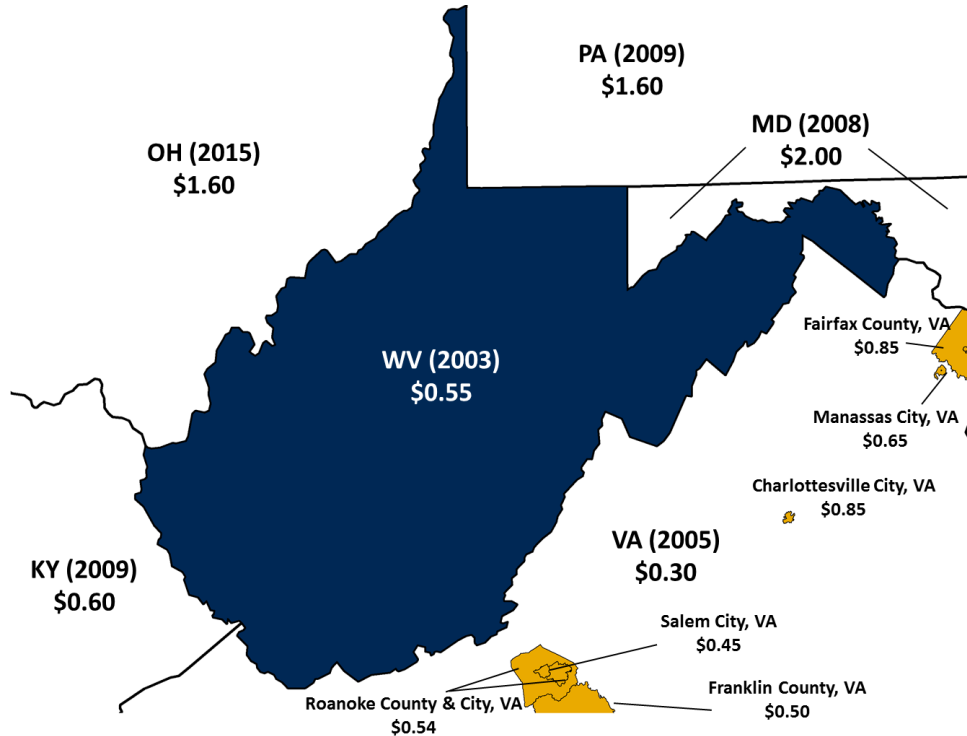
Figure 1: Cigarette Purchases per Person, 2014
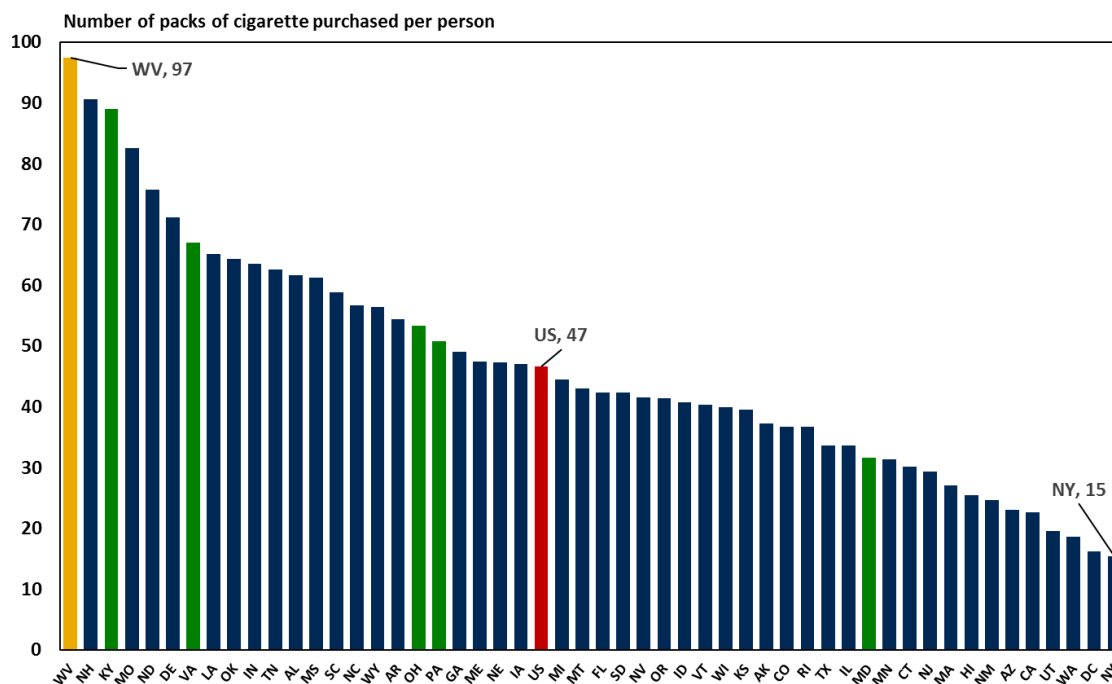
Source: The Tax Burden on Tobacco Volume 49, 1970-2014, Centers for Disease Control and Prevention

NEIGHBORING CIGARETTE EXCISE TAX RATES The way in which changes in cigarette excise tax rates affect cigarette purchases in a state is multifaceted. First, unsurprisingly, individuals typically alter their cigarette consumption in response to tax-induced price changes. Second, it is almost certain that cross-border shopping behavior responds to changes in tax policy. Consider, Figure 2, which reports the current cigarette excise tax rates for West Virginia and its bordering states. It is likely that West Virginia has benefitted from residents from Pennsylvania, Ohio, and Maryland coming into West Virginia to purchase cigarettes given the state's lower cigarette excise tax rate. West Virginia has perhaps also lost some cigarette purchases to Virginia in a similar way, although the tax differential is relatively small. If West Virginia's cigarette excise tax were increased to $1.55 from $0.55, these cross-state purchases

from West Virginia's northern neighbors could cease and more West Virginians would have some incentive to travel to Virginia or Kentucky to purchase cigarettes.

Figure 2: Cigarette Excise Tax Rates, West Virginia and Neighboring States

PA (2009)
$1.60

MD (2008)
$2.00

OH (2015)
$1.60

Fairfax County, VA
$0.85

WV (2003)
$0.55

Manassas City, VA
$0.65

Charlottesville City, VA
$0.85

VA (2005)
$0.30

KY (2009)
$0.60

Salem City, VA
$0.45

Franklin County, VA
$0.50

Roanoke County & City, VA
$0.54

DISTRIBUTIONAL IMPACTS In addition to changes in consumption patterns, the distributional effects associated with increases in cigarette and OTP tax rates also merit some attention. For example, the Centers for Disease Control[2] finds that adults with incomes below the official federal poverty line smoke at a rate of 29.2 percent, nearly 13 percentage points greater than those at or above the poverty level. As a result, given that adults in West Virginia smoke at demonstrably higher rates (27.3 percent) compared to the national average[3] (17.8 percent) and are also somewhat more likely to earn incomes below the official poverty line, increases in tobacco and OTP tax rates would tend to have larger distributional impacts in the state.

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[2] http://www.cdc.gov/tobacco/campaign/tips/resources/data/cigarette-smoking-in-united-states.html
[3] http://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/

2. Existing Literature on U.S. State Cigarette Excise Taxation

OVERALL EFFECT OF CIGARETTE EXCISE TAXES ON CIGARETTE PURCHASES Goel and Nelson (2012) use a sophisticated econometric approach to examine cigarette purchases in US states as a function of cigarette prices and a host of other appropriate control factors.[4] They estimate that the price elasticity of demand for cigarette purchases is approximately -0.4 over their entire dataset which spans the years 1956 through 2008, meaning that a 10 percent rise in cigarette prices in a given state leads to a 4 percent drop in cigarette purchases in that state. The authors also assert that this estimate is very much in line with the previous literature, citing several earlier studies. However, when restricting their study to more recent data, Goel and Nelson find a much higher elasticity: -0.9 when the dataset includes only the years 1990 through 2008 and -1.2 when the dataset is restricted to the years 2000 through 2008.

Figure 3: Relationship between Cigarette Excise Tax Rates and Per Capita Cigarette Purchases
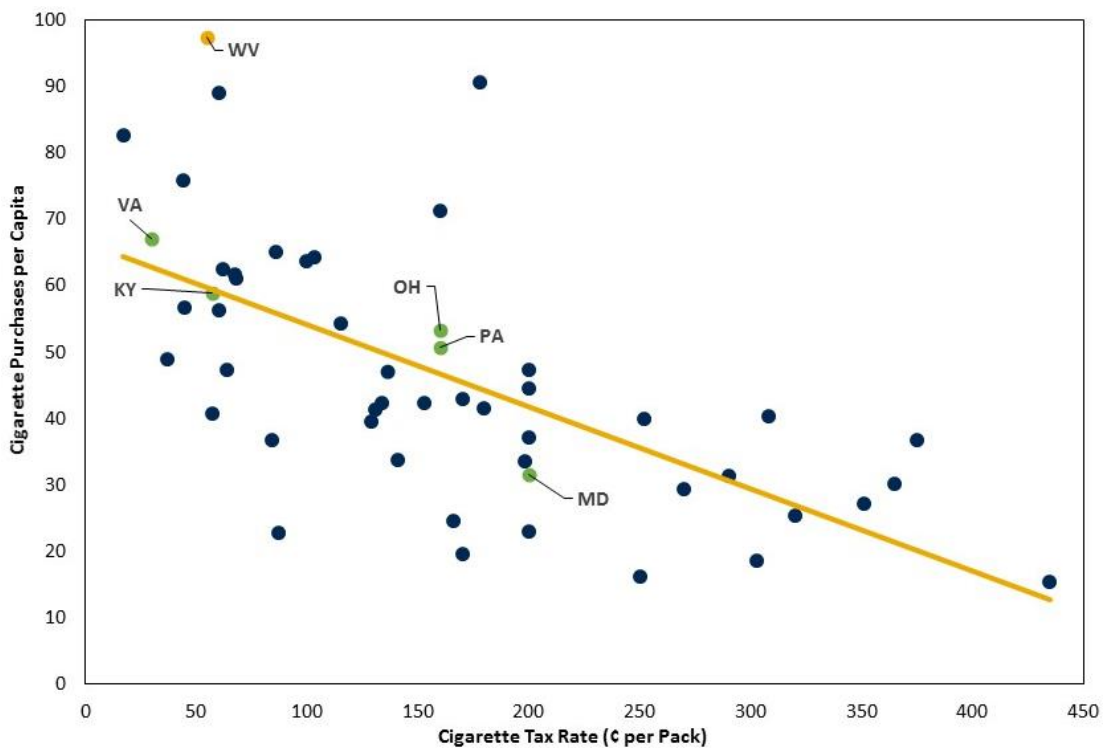
WEST VIRGINIA-SPECIFIC ESTIMATES In addition to their primary analysis that considers all 50 states, Goel and Nelson (2012) also conduct separate analysis using time series data specific to each state. The elasticity estimates discussed in the previous paragraph represent average effects across all US states, and it is reasonable to expect that behavioral patterns vary across states, given differences in cultural preferences toward cigarette consumption and given differences in cross-border shopping opportunities. In the portion of their analysis that is specific to West Virginia, the authors estimate an elasticity of cigarette purchases with respect to cigarette prices of -0.1, compared to the overall effect of

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[4] See R.K. Goel and M.A. Nelson. 2012. "Cigarette demand and effectiveness of U.S. smoking control policies: State-level evidence for more than half a century." *Empirical Economics*, 42: 1079-1095. This is consistent with other recent studies, such as Andrew Nicholson, Tracy Turner, and Eduardo Alvarado. 2014. "Cigarette Taxes and Cross-border Revenue Effects: Evidence Using Retail Data." *Public Finance Review*, pg. 1-44.

-0.4. While this state-specific analysis is not as statistically reliable as the broader analysis, it does provide some evidence that West Virginia would exhibit a relatively low behavioral response.

PERSONAL CHARACTERISTICS THAT AFFECT RESPONSIVENESS TO TAXES Other studies that have examined individual data have found that an individual's responsiveness to increases in cigarette prices depend on several factors. For example, Farrelly et al. (2001) find that this responsiveness tends to be higher for younger smokers, female smokers, and people with lower income. Given that West Virginia's population is older and lower income compared to the national average, this finding is consistent with Goel and Nelson's (2012) finding of a lower overall responsiveness in West Virginia.

CROSS BORDER SHOPPING EFFECTS While Goel and Nelson (2012) focus on overall cigarette purchases, some studies focus on cross-border shopping specifically. In general, the overall change in cigarette purchasing in a state that follows a tax rate change results from the combination of two separate effects: First, consumption may actually fall in response to higher prices. Second, individuals may travel to lower-tax jurisdictions to purchase cigarettes, thereby reducing purchases in the home state but not reducing overall consumption. In many cases, measuring the two effects separately can be difficult since data generally do not distinguish whether the cigarettes purchased by an out-of-state consumer. However, a few studies do focus on cross-border shopping specifically and find generally that cross border shopping accounts for a large share of the overall purchasing response.[5]

Given the importance of cross-border shopping, we consider LaFaive and Nesbit (2014)[6], who estimate what share of all cigarettes sold in a state are being consumed in that state in 2013. Their cigarette smuggling rate is positive if the state experiences a net inflow, where the amount of cigarettes smuggled into the state is larger than those smuggled outside of the state. For instance, according to the report, New York has the highest cigarette smuggling rate of 58 percent, indicating that 58 percent of the cigarettes smoked in New York came from outside of the state.

West Virginia is estimated to have a negative cigarette smuggling rate. In particular, West Virginia's cigarette smuggling rate in 2013 was -19.5 percent, meaning that on net, nearly 20 percent of cigarettes sold in West Virginia during 2013 were purchased by consumers from outside of the state. In other words, on balance, the state "imports" tobacco tax revenue, largely as a result of possessing a lower cigarette tax rate compared to three of the five bordering states. Further, this report indicates the rate of cigarette tax importation has more than doubled from 2006 estimates (-8.4%), at least due in part to the recent cigarette excise tax increase in Maryland.

These findings imply that West Virginia would actually observe an above-average responsiveness to an increase in the cigarette excise tax rate since it receives a larger-than-normal share of cross-border shopping coming into the state. This result runs in contrast to our earlier discussion. It should be noted that the LaFaive and Nesbit study does carry with it considerable uncertainy, particularly with respect to the data set used to create these estimates.

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[5] See, for example, Michael Lovenheim. 2008. "How Far to the Border? The Extent and Impact of Cross-Border Casual Cigarette Smuggling." *National Tax Journal*, 41(1).
[6] Michael LaFaive and Todd Nesbit, Cigarette Smuggling Still Rampant in Michigan, Nation, 2014, Mackinac Center for Public Policy, http://www.mackinac.org/20036

LOCAL CIGARETTE EXCISE TAX POLICY Most counties and cities in the US are prohibited by their respective states' laws to have localized cigarette tax rates. In other words they are required to apply the same cigarette tax rates as the rates imposed by the state government. However, more than 600 local jurisdictions in the US apply their own cigarette excise tax rates in addition to their state rate. The reasons for why they are allowed to do so may vary, but they appear to stem from a similar characteristic. Most of them are highly populated cities such as San Francisco, New York City, and Philadelphia. These local rates vary widely and can be as low as one-fifth the state rate in San Francisco, or as high as nearly four times the state rate in Alexandria, Virginia.

Local jurisdictions in the state of Arkansas are also allowed to apply cigarette excise tax rates that differ from the state rate. However, what makes Arkansas unique is that local rates are determined based upon the rates in the neighboring states and are not simply additions to the state rate – termed "border zone policy." In 2009 the state of Arkansas increased the standard state cigarette tax rate from 59 cent to $1.15 per pack. The 2009 law states that:

> "whenever there are two adjoining towns separated by the state line, the cigarette tax in the Arkansas town is required to be equal to the cigarette tax in the adjoining town outside of Arkansas plus 3 cents, as long as the resulting tax rate is not greater than Arkansas's standard tax rate."

The main reason for imposing such a policy is because the new rate of $1.15 per pack would put Arkansas' rate considerably higher than the rates in most neighboring states, except Texas. That would give the incentives for Arkansas residents in border counties to buy cigarettes in towns located in neighboring states. By setting the local rates comparable to the rates of neighboring states, they expect they would lessen the incentive for cross-border shopping.

In theory, the border zone cigarette tax policy should help the state maximize its potential revenue gain. However, this policy also has several drawbacks that should be considered. First, it makes the rates in those affected local jurisdictions dependent on the rates in the neighboring states. In other words, those local jurisdictions have no control over when the rates will change and by how much will the rates increase. Second, the policy carries with it a relatively high administrative cost given added complexity.

3. Revenue Estimate of a Cigarette Excise Tax Rate Increase in West Virginia

In this section we estimate the change in cigarette excise tax collections in West Virginia that would result from a $1 per pack increase in the state's cigarette excise tax rate. To begin, we provide a casual examination of patterns observed across the entire US from 2000 through 2014. Over these years we examine 79 cigarette tax increase episodes, ignoring a few instances where the hikes were 5 cents or lower. In instances in which increases were phased-in over multiple years, we consider the entire sequence of events as one episode rather than each step in the phase-in individually.

In Figure 4 we report the 79 cigarette excise tax rate increase episodes that we consider. Markers represent each tax rate increase, which range from $0.05 to $1.60, along with the decrease in cigarette purchases between the year before and the year after the episode. As illustrated, a significant amount of variation exists in the raw data, as decreases in purchases range from basically zero up to nearly 34 percent. Seventeen of the 79 episodes depicted involve decreases in cigarette purchases of less than 10 percent. West Virginia's $0.38 cigarette excise tax rate increase in 2003 is highlighted in gold. During that episode West Virginia experienced an 8.1 percent drop in cigarette purchases between 2002 and 2004 while cigarette excise tax revenue increased by approximately $67 million. However, at this time Ohio and Pennsylvania also increased their cigarette excise tax rates by more than the increase in West Virginia, which may have encouraged some cross-border shopping into West Virginia.

Figure 4: Observed Changes in Cigarette Purchases Nationwide, 2000-2014, Select Cigarette Excise Tax Rate Increases
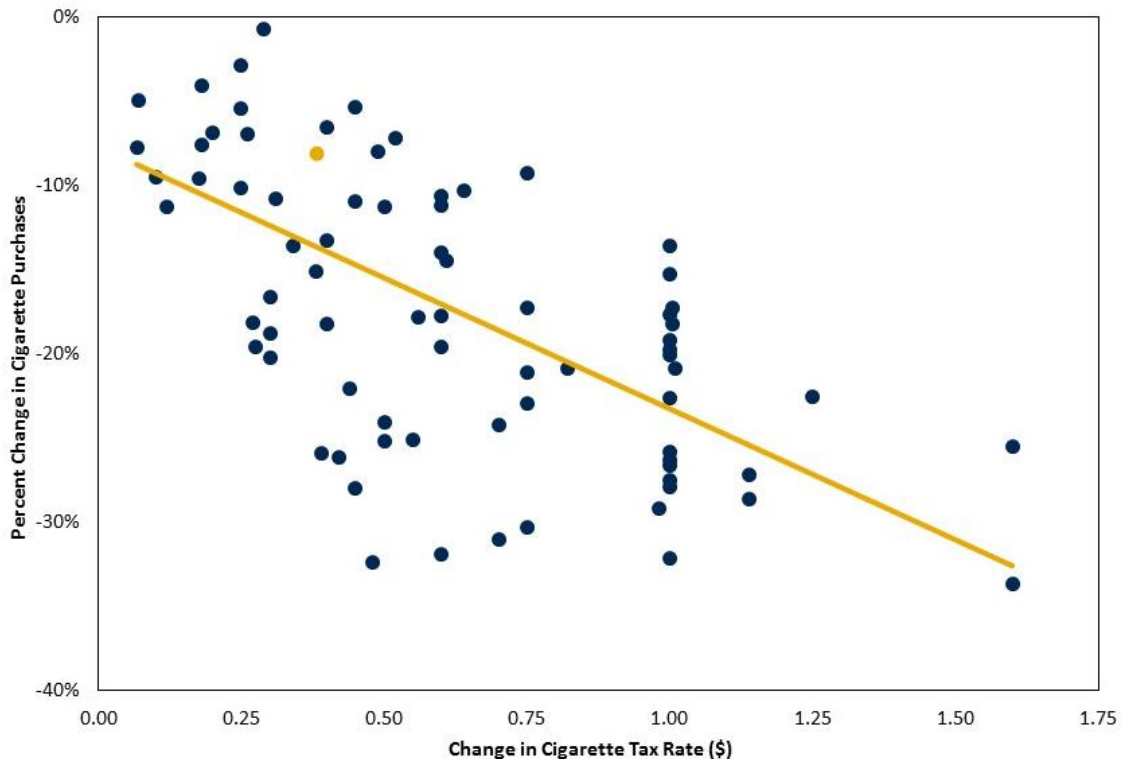
The casual examination depicted in Figure 4 is useful in providing a general sense of the magnitude of cigarette excise changes observed in the US over the past decade or so along with the associated purchase decreases. However, this simple examination is imprecise. In particular, the cigarette

purchases depicted in the figure almost certainly exaggerate the drop in cigarette purchases that is caused by increases in cigarette tax rates for two reasons. First, this analysis does not account for the overall downward trend in smoking nationwide that is not directly related to cigarette excise tax increases and, second, it also does not explicitly control for the federal cigarette excise tax rate.

As such, we estimate a series of regression models to more carefully estimate the degree to which increases in cigarette excise tax rates lead to decreases in cigarette purchases in a fashion similar to that in the literature discussed above. We examine data from all 48 contiguous US states. Because we believe that the responsiveness of cigarette purchasing behavior to tax policy has increased over time, as discussed in Goel and Nelson (2012), we only consider data from the years 2000 through 2014. Overall, this approach results in 672 observations. Our general econometric approach is similar to Goel and Nelson. Our approach is careful to separate the long-run downward trends in cigarette consumption as well as federal tax policy from effects associated with state tax policy.

Overall, our results indicate that a $1 per pack increase in the state cigarette excise tax rate results in a drop of approximately 14 percent. The result is highly statistically significant and robust across several specifications. To couch our results within the context of the literature above, our results translate into an elasticity of approximately -0.7, meaning that a 10 percent increase in the per pack cigarette price results in a 7 percent drop in cigarette purchases.

In Figure 5 we apply our results to the question of various increases in the cigarette excise tax rate, for a range of 45 cents up to $1 per pack. Larger tax hike scenarios were not considered in the context of this study. Only five of the previous 79 tax rate increases since 2000 have involved hikes in excess of $1.01 per pack and the rate of decline in cigarette purchases during each of these tax increases occurred along a fairly large range. As a result, any estimated gains in excise tax revenue stemming from an increase of $1.25 or $1.50 per pack would be subject to a great deal of uncertainty.

Our results are based off the 2015 fiscal year, during which the state generated just above $95 million in cigarette excise tax revenue from nearly 173 million packs sold. For illustrative purposes, we begin with an elasticity of zero, which indicates that cigarette purchases do not change after any of the selected tax increases. In this simplistic (and extremely unlikely) scenario, the state would collect additional cigarette excise tax revenue of $78, $130 and $173 million, respectively. This can be obtained by simply multiplying the level of purchases by the absolute change in the tax rate.

We anticipate the most likely scenario will likely come from an elasticity estimate of -0.7, which is based on our regression analysis and is consistent with the literature discussed above. In this setting, we estimate a tax rate increase of **45 cents per pack** will likely lead to over a 6 percent drop in cigarette purchases and yield approximately $67 million in additional excise tax collections. Using a rate increase of **$1 per pack**, we project a 14 percent loss in cigarette purchases and a net increase of $134 million in excise tax revenue. For the purposes of comparison, a **75 cents per pack** tax rate hike is expected to cause an 11 percent fall in purchases, but an additional $105 million in excise tax collections.

Figure 5. Estimated Effect of Selected Increases in WV Cigarette Excise Tax Rate, FY 2015

Excise Tax Increase (cents per pack)	Possible Behavioral Elasticity	Cigarette Packs Purchased (millions)	Change in Cigarette Packs Purchased (%)	Cigarette Excise Tax Revenue ($, millions)	Change in Cigarette Excise Tax Revenue ($, millions)	Net Change in Revenue, Includes Sales Tax ($, millions)
45	0.0	173	0	173	78	82
	-0.7	**162**	**-6**	**162**	**67**	**69**
	-1.3	152	-12	152	57	60
75	0.0	173	0	225	130	134
	-0.7	**154**	**-11**	**201**	**105**	**107**
	-1.3	138	-20	180	85	86
100	0.0	173	0	268	173	183
	-0.7	**148**	**-14**	**229**	**134**	**135**
	-1.3	127	-27	196	101	101

Notes: Actual FY2015 consumption is 172.9 million packs, generating $95.1 million in cigarette excise tax

Outcomes for an elasticity estimate of -1.3 are also reported in Figure 5. An elasticity estimate of this magnitude lies well outside the range found in most of the academic literature and is significantly larger than our preferred estimate. Nonetheless, in this scenario which should generally be regarded as a lower bound, we estimate declines of 12, 20 and 27 percent for the three hypothetical tax rate hikes that would create additional excise tax revenue of $57, $85 and $101 million, respectively.

Finally, after accounting for the incremental change in sales tax revenue that would occur due to fewer cigarette packs being purchased at a higher retail price, the overall net change in revenue for each hypothetical tax rate increase would equal roughly $69, $107 and $135 million, respectively, under the scenario of a -0.7 elasticity estimate. This result indicates gains in consumer sales tax revenue begin to evaporate as the excise tax rate increases and will eventually contract once the excise tax rate exceeds a specific level.

PHASE-IN OPTION Rather than raise the cigarette tax rate per pack by $1.00 at a single point in time, any hypothetical tax rate hike could take place over a period of two to four years. Phasing in the rate hike over time could mitigate the potential for revenue losses in the transition year from a lower rate to a higher rate, since consumers in West Virginia (and those in neighboring states with demonstrably higher tobacco taxes relative to WV) would have less incentive to "stockpile" by buying larger-than-normal quantities of cigarettes ahead of the rate change. Unfortunately, we lack the data needed to reliably estimate and fully evaluate the short-term impacts on purchases that would follow a phase-in of the selected increases discussed earlier in the report.

4. State Taxation of Electronic Cigarettes

POLICIES IN OTHER STATES As of late-2015, only three states and the District of Columbia levy an excise tax on electronic cigarettes (e-cigarettes) or the nicotine-containing liquid used to fill the devices. Minnesota currently applies the most aggressive excise tax, levying a rate of 95 percent of the wholesale price, equal to its excise tax on cigarettes and OTPs. This tax rate applies only to single-use e-cigarettes and cartridges containing nicotine for re-usable/re-fillable devices and components.

Two of the other states that authorize e-cigarette taxation, as well as Kansas (which will begin taxing the products by July 2016), apply the tax to the consumable nicotine liquid solution on a per milliliter basis. Kansas will tax the liquid solution for e-cigarettes at a rate of 20 cents per mL, or the equivalent of more than a 40 percent tax rate for a 15-mL bottle with a wholesale price of $6.95. Of interest here is that nicotine liquid products have varying concentrations of nicotine, so taxing on a per mL basis could incentivize consumers to buy bottles containing higher levels of nicotine.

LIMITED DATA AVAILABILITY Several issues create difficulty in formulating tax policy for e-cigarette products. First, data on sales volume and price are limited due to the fact that the marketplace is fractured. In addition to traditional retail channels, a significant share of e-cigarettes and their products are sold online and at specialty shops. Without adequate data on pricing and sales, estimating changes in consumer behavior stemming from tax policy changes would make any resulting revenue forecasts less reliable compared to forecasts for more longstanding items.

PREVIOUS FINDINGS ON TAX-INDUCED BEHAVIORAL CHANGES Relatively few studies have examined the sensitivity of e-cigarette demand to price changes. The few studies that have been conducted point to higher levels of price sensitivity for disposable and re-usable e-cigarettes when compared to traditional cigarettes. Huang et al (2014)[7] estimate an own-price elasticity of -1.2 for disposables and -1.9 for re-usable e-cigarettes, indicating a 10 percent price increase will result in 12 percent and 19 percent respective declines in demand for each product. Recall that this compares to our estimated elasticity of -0.7 for traditional cigarettes, as discussed above. Huang et al. also note some substitutability between the two products as their estimates indicate that a 10 percent increase in re-usable e-cigarette prices yields a 5 percent increase in demand for disposables. Finally, the study was inconclusive with respect to the impact of cigarette taxes and prices on e-cigarette demand, but the authors suggest higher cigarette prices and taxes would lead to more experimentation and/or adoption of e-cigarettes by traditional cigarette smokers.

OTHER CONSIDERATIONS Policymakers should evaluate which e-cigarette products should be taxed and whether tax rates that are applied to regular cigarettes and/or OTPs should also be used for e-cigarettes. Since disposable and re-usable e-cigarettes are substitutes for one another, tax rates should be applied appropriately to the disposable e-cigarettes and the nicotine refills for re-usable devices so as to keep relative prices of the products aligned. In addition, data from the CDC[8] suggest that current smokers or smokers who quit (or attempted to quit) within the past year comprise the wide majority of e-cigarette users. Consequently, tax rates for e-cigarettes that are either too high or too low relative to

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[7] Huang J, et al. 2014. "The Impact of Price and Tobacco Control Policies on the Demand for Electronic Nicotine Delivery Systems," *Tobacco Control*, 23: 41-47.

[8] Schoenborn, Charlotte A. and Renee Gindi (2015). "Electronic Cigarette Use Among Adults: United States, 2014," *NCHS Data Brief,* 217. http://www.cdc.gov/nchs/data/databriefs/db217.htm

traditional cigarettes could significantly affect revenue collections for e-cigarettes and to a lesser extent tobacco cigarettes. With that in mind, it would be wise to begin taxing e-cigarette products at a relatively low rate, such as 3-5¢/mL, and subsequently examine the impacts on demand in the future.

5. Excise Taxation on Other Tobacco Products

POLICIES ACROSS STATES West Virginia was among the last states to begin applying excise taxes to other tobacco products (OTP), such as snuff and chewing tobacco, in 2002. Taxes were set at the same rates for all other tobacco products at 7 percent of the wholesale price. For comparison, these rates are in most cases lower than the neighboring states. For instance, Kentucky has a 19 cent tax per unit of dry snuff, while Maryland and Ohio have a 15 and 17 percent tax on the wholesale price, respectively, and Virginia has a tax of 10 percent of the manufacturer's price. For chewing and smoking tobacco, Kentucky, Maryland, and Ohio have a 15 percent, 15 percent, and 17 percent tax of the wholesale price, respectively, while Virginia has a 10 percent tax on the manufacturer's price.

The majority of states nationwide utilize a manufacturer or wholesale-based pricing system and generally considered the easiest to administer and most likely to minimize the potential for revenue losses that could occur under a weight-based system. For example, a weight-based tax system for OTP would put a lower per-pack or per-dose tax on many of the new lower-weight products available today such as snus and pouches. A tax levied on standardized sizing of OTP products, combined with an additional minimum tax levied on smaller (or higher-dosed) OTPs could also be used. However, this would likely present new complexities into administration due to the need in determining what constitutes a standard size as well as burden on the collection of taxes by businesses.

State	Snuff Tax	Chewing & Smoking Tobacco Tax	Cigar Tax	Date OTP tax last changed	Cigarette Tax (¢/pack)
DC	67% wholesale price	67% wholesale price	-	2015	250
Kentucky	19¢/unit	15% wholesale price	15% wholesale price	2009	60
Maryland	30% wholesale price	30% wholesale price	Non-premium: 70% w/s price; Premium: 15% w/s price	2012	200
Ohio	17% wholesale price	17% wholesale price	-	1993	160
Pennsylvania	None	None	*(the same rate as cigarette tax)*	2009	160
Virginia	18¢/oz.	Chewing: 21¢-70¢/unit Other: 10% mfr. price	10% mfr. price	2011	30
West Virginia	7% wholesale price	7% wholesale price	7% wholesale price	2002	55

OTP REVENUE IN WEST VIRGINIA Since 2002 the tax revenues collected from OTP sales in West Virginia have increased steadily from $2.2 million in 2002 to $7.1 million in 2015. This means OTP consumption is estimated to have increased from 31.7 million units to 100.9 million units during the same period. While this data is useful, it does not provide enough information about how the continued increase in the OTP consumption relates to shifts in cigarette usage during the same period.

EXISTING RESEARCH ON TAX POLICY AND OTP While there is a vast literature on the economic consequences of cigarette consumption, the same cannot be said for the consumption of OTP. Literature has done very little to examine the economic relationship between cigarette and OTP consumption. Gwarnicki et al. (2014)[9], for instance, examined the cross price elasticity of OTP consumption with respect to cigarette prices but was unable to produce consistent estimates.

HEALTH CONSIDERATIONS The majority of the literature on OTP available focuses more on the health consequences rather than the economic issues related to OTP consumption. Nonetheless, many of these studies have noted cigarette and OTP consumption are inter-related and changes in the relative prices of these products through taxes, as well as other tobacco control methods, can affect demand. For instance, Tomar et al. (2009)[10] finds cigarette smokers have a higher likelihood than non-smokers to also consume OTP. In addition, this article finds that dual users of cigarette and OTP are more prevalent among young smokers than adult smokers. Bombard et al. (2008)[11], who use data from the 2002 and 2004 National Youth Tobacco Surveys, find that 62 percent of male young smokers also use OTP, compared to 31 percent of female young smokers.

SUBSTITUTION BETWEEN CIGARETTES AND OTP Despite the fact that we do not have specific findings on the economic interaction between OTP and cigarettes, the fact that a significant number of cigarette smokers consume OTP simultaneously suggests that substituting OTP for cigarettes is something that some smokers sometimes do. If cigarette prices increase, we would expect to see some smokers reduce their cigarette consumption as they switch to consuming the relatively less expensive OTP.

PROPOSED OTP STRATEGY With the hypothetical $1 per pack cigarette tax increase and the lower tax rate currently levied on OTP, West Virginia should equalize tax rates for OTP relative to cigarettes. This would limit revenue losses that would occur under an unequal tax treatment. Specifically, as prices for cigarettes rise further relative to OTP, unequal tax treatment would encourage further substitution to these products primarily for dual-users, but could also incentivize some smokers to switch to these products.

The current parallel tax rate (based on wholesale price) for cigarettes is approximately 14 percent, or twice that of OTP. After raising the cigarette tax rate to $1.55 per pack, this would push the parallel rate for cigarettes to 39 percent of the average wholesale price. Consequently, equalizing the tax rates for OTP to cigarettes would push the wholesale tax rate for OTP up from 7 percent to 39 percent. Rather than equalizing rates outright, an alternative choice could be to raise OTP tax rates in a manner where the increase is proportional to that of the hike levied on cigarettes. In this case, the wholesale tax rate would be increased from 7 to 20 percent.

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[9] Gwarnicki, Cezary T., Jidong Huang, Frank J. Chaloupka, "A Comprehensive Examination of Price Elasticities of Tobacco Products: Evidence from Commercial Store Scanner Data," *Tobacconomics*, 2014.

[10] Scott L Tomar, Hillel R Alpert, Gregory N Connolly, "Patterns of dual use of cigarettes and smokeless tobacco among US males: findings from national surveys," *Tobacco Control*, 2010, v 19: 104-109.

[11] Bombard JM, Rock VJ, Pederson LL, Asman KJ., "Monitoring polytobacco use among adolescents: Do cigarette smokers use other forms of tobacco?" *Nicotine Tobacco Resources*, Nov 2008, 10(11): 1581-9.

ESTIMATED REVENUE GROWTH Due to limited data availability for state-level consumption and wholesale prices for the various types of OTP, inconsistent estimates for OTP price elasticities in other research studies, as well as the differing tax structures that states apply to OTP (i.e. weight-based, unit-based or ad valorem), we do not conduct a regression-based analysis of the marginal revenue gains that would be expected in West Virginia. Instead, we examine seven OTP tax rate hikes from the past decade for states that assess ad valorem taxes as a share of the wholesale or manufacturer's price. Four states increased their OTP tax rates by an average of 12 percentage points while the other three increased rates by an average of 27 percentage points.

Among the 7 specific states instituting the smallest percentage point increases in OTP tax rates, the amount of revenue collected was (on average) nearly proportional to the relative magnitude of the tax increase, i.e. a doubling of the tax rate yielded a roughly 90 percent increase in revenue. By comparison, those states raising OTP tax rates the most in absolute terms saw a doubling of the rate produce a revenue gain of approximately 80 percent.

Based upon these basic calculations, we estimate the additional OTP revenue the state of West Virginia could expect to collect for three new hypothetical tax rates: 12, 20 and 39 percent. Raising the OTP tax rate from 7 to 12 percent would yield an estimated $4.7 million increase in excise revenue to the state relative to fiscal year 2015. By contrast, an increase from 7 to 20 percent could be expected to boost OTP tax revenue by approximately $11.1 million, while raising the OTP wholesale tax rate to 39 percent, which would equalize rates with the hypothetical $1 per pack increase for cigarettes, would yield $24.4 million in additional revenue.

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