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Memorandum

To: Steve Klein, Sara Teachout - Joint Fiscal Office

From: Tom Kavet

CC: Nic Rockler

Date: April 22, 2013

Re: Revenue Impacts Associated With Proposed Cigarette Tax Rate Changes

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OVERVIEW

As requested, below are estimated revenue impacts in FY2014 associated with four proposed Vermont cigarette tax increases, effective July 1, 2013.

Table 1 - Estimates of Expected Total Net Incremental Cigarette Tax Revenue from Proposed Increases in the Current Vermont Cigarette Tax Rate

FY14	Cigarette Tax Rate	Tax Rate Increase	Total Revenue ($ Millions)	Difference from Current Law ($ Millions)
	$2.62	$0.00	65.6	0.0
	$3.12	$0.50	69.9	4.3
	$3.62	$1.00	73.0	7.4
	$3.87	$1.25	74.1	8.5
	$4.12	$1.50	74.9	9.3
	$4.37	$1.75	75.5	9.9
	$4.62	$2.00	75.9	10.3

It should be noted that there is considerable uncertainty associated with any cigarette tax revenue estimate due to the numerous external factors that can affect Vermont yields. The primary variables affecting Vermont cigarette tax revenues are:

1) Vermont's effective (cigarette and sales taxes) cigarette tax rate,
2) New Hampshire's effective tax rate,
3) New York's effective tax rate,

4) Massachusetts' effective tax rate,

5) The federal government's effective cigarette tax rate, and last, but not least,

6) Industry pricing (primarily manufacturers, but also including wholesalers and retailers).

In addition to these primary factors, there are also significant secondary factors such as the growing effectiveness of anti-smoking campaigns, the potential for significant mail order and internet-based cigarette sales, unregulated Indian reservation sales, the potential for illegal smuggling, Canadian and Quebec provincial effective tax rates, new smokeless tobacco systems and various enforcement policies that may also affect Vermont tax rate yields at various times.

Because accurately forecasting all of these changing variables is extremely difficult, *it is important to monitor developments related to these factors on a regular basis (at least once a year) and review and adjust Vermont cigarette tax policy in response.*

BACKGROUND AND ANALYSIS

Two of the most important variables affecting State revenue yields from cigarette tax increases are competitive substitution from nearby tax jurisdictions with lower effective rates and consumption declines as the real price of cigarettes rises.
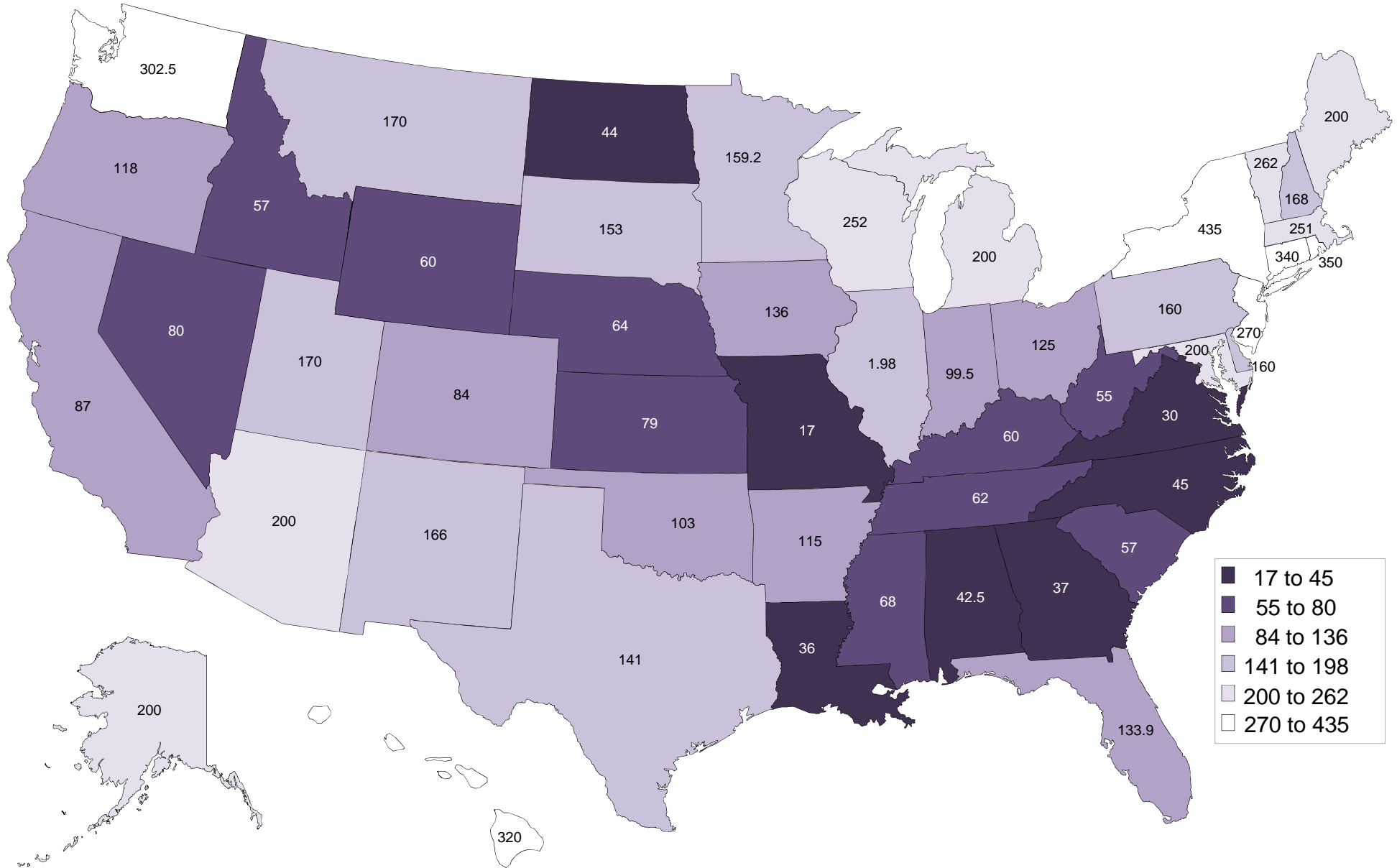
Competitive Substitution

Cigarette tax rates vary widely across the United States (see map on page 3), from a low of 17 cents per pack in Missouri to a high of $4.35 in New York. As a result of this, cross-state sales can be significant where large population centers are located near state borders and substantial and persistent price differentials exist between contiguous states. When sales taxes are included with cigarette taxes, total price differentials can be even more pronounced, especially with respect to states without sales taxes, such as New Hampshire.

This competitive substitution explains much of the per capita sales differentials between states exhibited in the U.S. map on page 4. With the exception of a few states such as Utah, where cigarette consumption is exceptionally low due to social and religious influences, and tobacco producing states where generally lower prices and more accommodative social norms encourage above-average consumption, most of the differentials are caused by cross-border sales from higher tax political jurisdictions to lower ones (see, for example, DE, MO, ND, NV, WY and NH).

Of note, New Hampshire has the third highest per capita sales of cigarettes in the nation, despite an adult smoking prevalence that is significantly below the U.S.
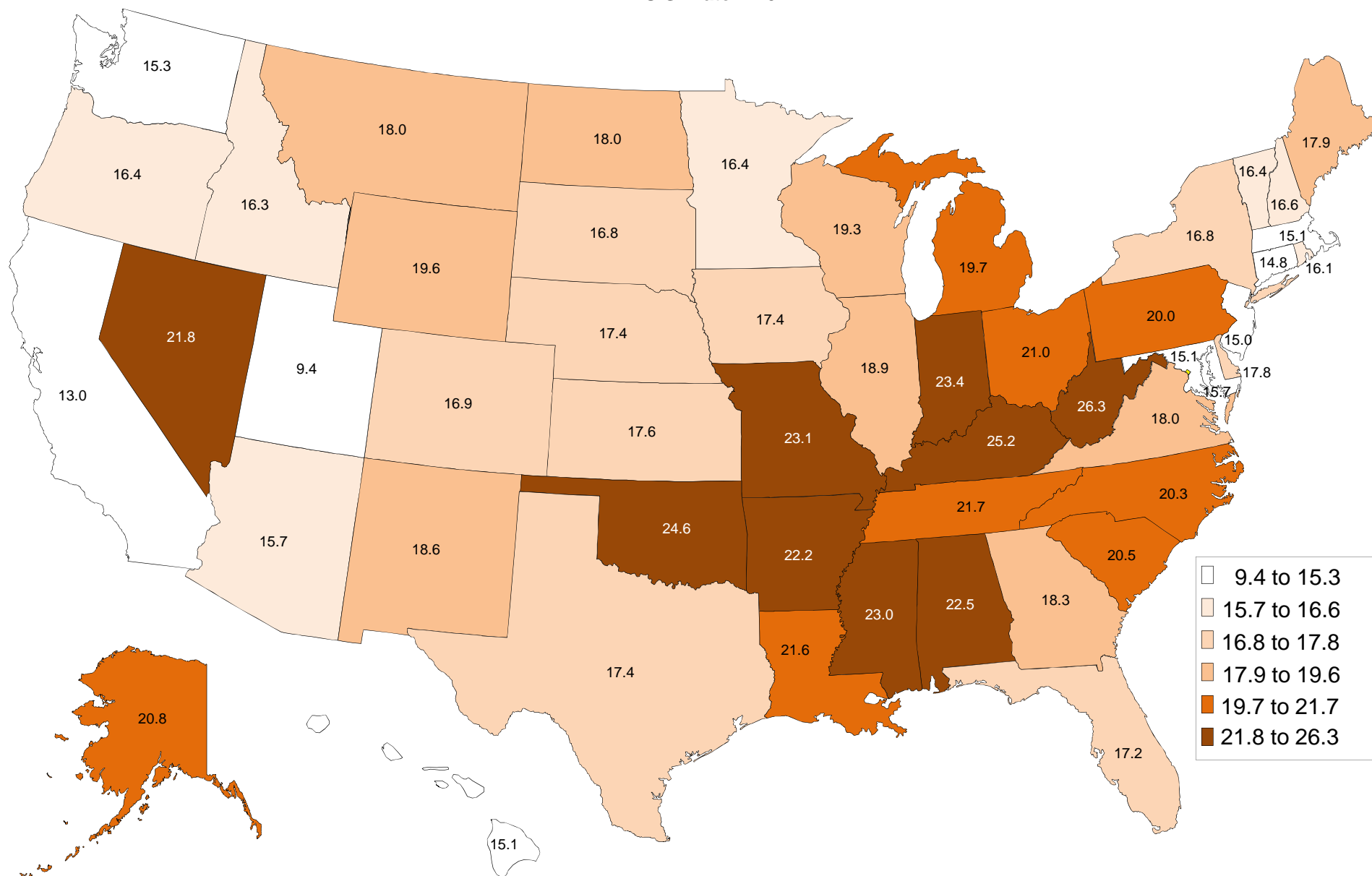
State Cigarette Tax Rates Per Pack

Cents Per Pack, Excluding State Sales Taxes - January 2013; Sources: Orzechowski & Walker, "The Tax Burden on Tobacco," FTA

302.5
170
200
44
159.2
118
57
262
168
60
153
252
435
251
200
340
350
80
64
136
160
270
87
170
84
1.98
99.5
125
200
160
79
17
60
55
30
103
115
62
45
166
68
42.5
37
57
141
36
133.9
200
320

Legend:
- 17 to 45
- 55 to 80
- 84 to 136
- 141 to 198
- 200 to 262
- 270 to 435

Prevalence of Adult Smoking: 2008-2010 Average

Percent of persons aged 18 and over who reported having smoked at least 100 cigarettes and smoke every day or some days, Source: CDC

U.S. Rate = 20.2

Legend	
☐	9.4 to 15.3
☐	15.7 to 16.6
☐	16.8 to 17.8
☐	17.9 to 19.6
☐	19.7 to 21.7
☐	21.8 to 26.3

2012 Per Capita Cigarette Sales (packs)

U.S. Average = 52.9 packs per person, Source: Orzechowski and Walker, "The Tax Burden on Tobacco"

Legend	
	18.0 to 31.6
	33.5 to 41.2
	42.8 to 45.9
	46.5 to 55.0
	60.5 to 67.2
	71.3 to 105.0
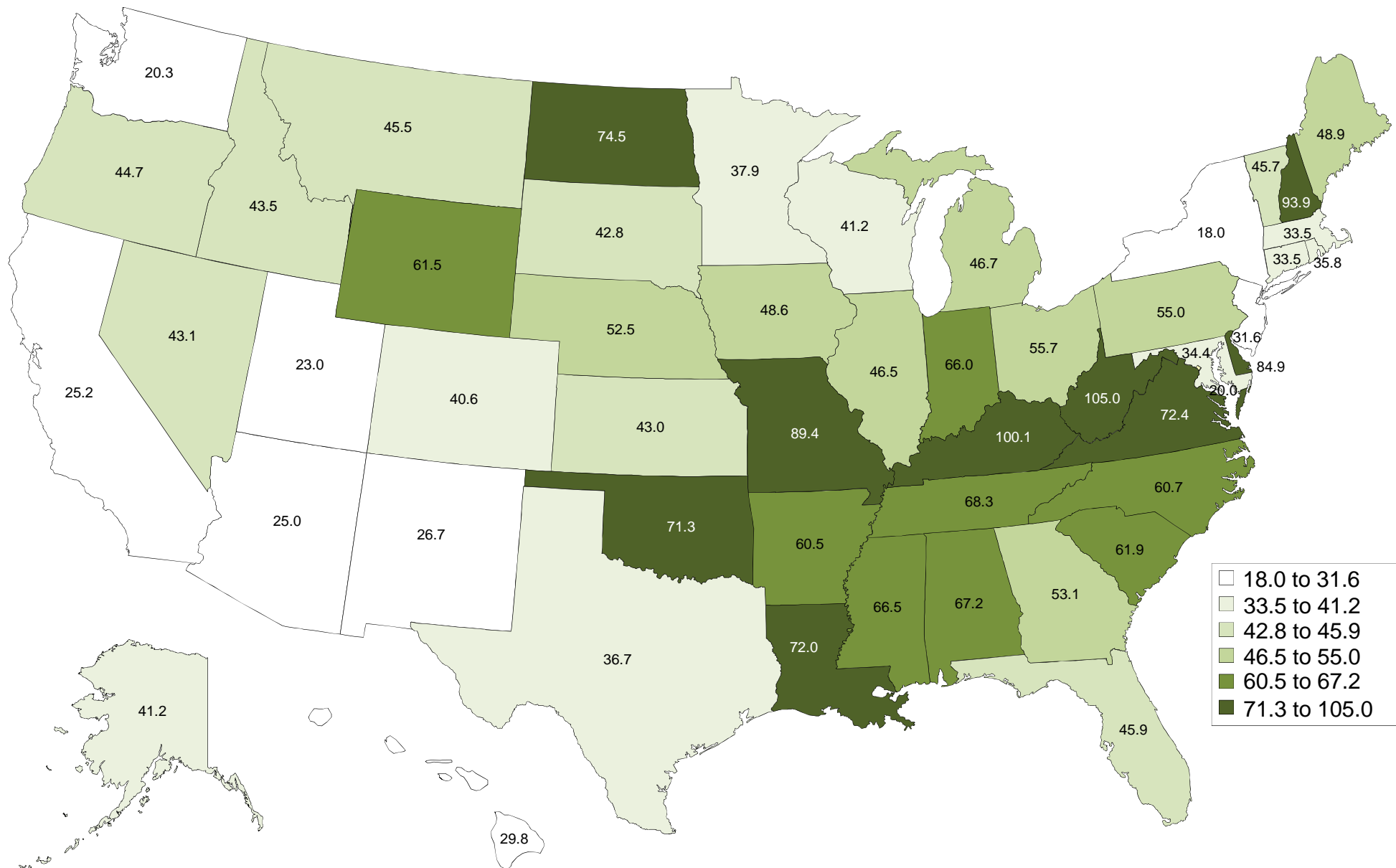
average.[1] This is almost entirely due to the sustained cigarette tax rate differential between New Hampshire and Massachusetts, which has rendered retail cigarette prices in NH 5% to 25% lower than in MA over the past 58 years (see below chart). This price differential, along with the presence of a large population center (Boston) with easy access to NH, a sizable and persistent sales tax advantage, and more relaxed liquor regulations in NH, has resulted in per capita cigarette sales in NH of nearly 94 packs vs. 34 in MA.

Border State Cigarette Price Differentials Relative to Vermont
(as a percentage of retail price, including state sales taxes)
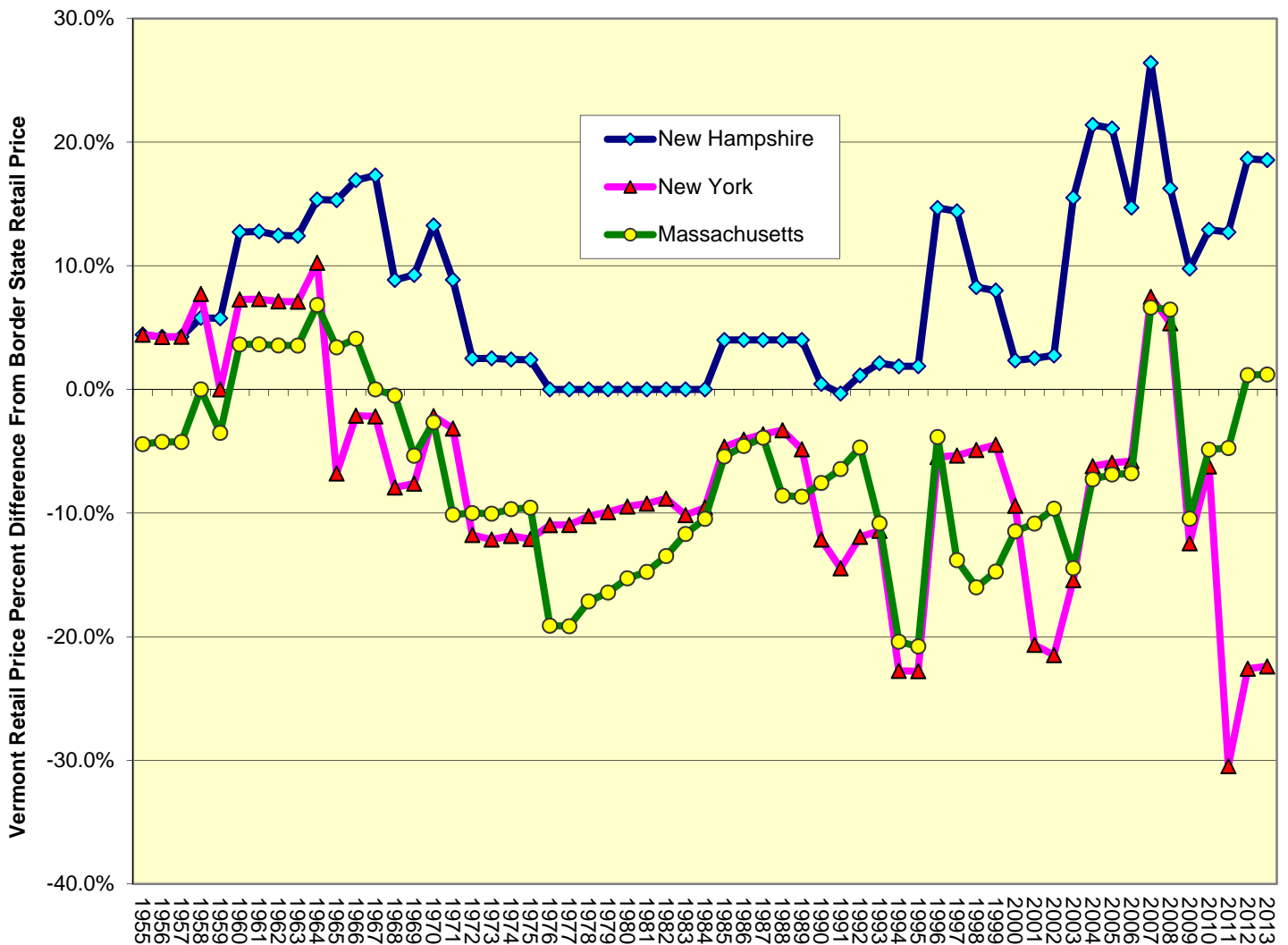
Sources: Orzechowski and Walker; Kavet, Rockler & Associates for the Vermont Joint Fiscal Office

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[1] See U.S. map on page 5. The prevalence of cigarette smoking among adults in New Hampshire was 16.6% vs. a U.S. rate of 20.2% over the period from 2008-2010, according to the Center for Disease Control and Prevention, Behavioral Risk Factor Surveillance System surveys, U.S. Department of Health and Human Services.

As depicted in the preceding chart, Vermont cigarette tax rates resulted in relatively low average retail prices during the period from 1972 to 2002, as compared to neighboring states. While the retail price of cigarettes in New Hampshire was at or slightly below that in Vermont in almost every year during this 30 year period, New York and Massachusetts were consistently between 10% to 20% above Vermont prices, due primarily to tax rate differentials. Since 2002, substantial tax rate increases in Vermont (and in the region) have widened the disparity in price between NH and surrounding states. New York's tax increase to a national high of $4.35 per pack in 2011 created the largest price differential in Vermont history and has resulted in significant additional Vermont cigarette revenue in FY11 and FY12.

Despite relatively low cigarette taxes and retail prices over much of the past 50 years, Vermont's distance from any major population center in a higher tax jurisdiction limits any such competitive gains. Higher real gasoline prices also discourage current cross-border sales gains and losses. Although per capita sales in Vermont at 45.7 are lower than the U.S. average of 52.9, it is roughly consistent with a lower smoking prevalence in Vermont, indicating relatively minor net competitive gain or loss from neighboring states at current prices. Still, sustained cigarette tax rate differentials in surrounding states are important factors in assessing Vermont cigarette tax yields.

JFO econometric models and related analyses indicate that among the border states with Vermont, the greatest sensitivity to price differentials is with NH and NY. It also indicates that it takes several years for the full impact of price differentials to be felt and that those persisting over a longer period of time lead to greater substitution than shorter term price differentials.

It is unlikely, however, that surrounding states will maintain current tax rates over the next several years. Past tax rate pricing behavior has shown that following tax increases by a "leader" state (usually New York or Massachusetts in the New England region), other states move rates close to or proportionally higher in response. New Hampshire currently has ample room to raise its rate - possibly encouraging higher rates in all surrounding states - and heightened budgetary pressure for measures that can generate additional revenue exists in virtually every state. Any such response, or combination of responses, of course, could diminish the competitive loss to Vermont from any tax increase and result in revenue yields that are several million dollars per year above the estimates presented herein.

**Cigarette Prices, Price Elasticity and Cigarette Demand**

As important as competitive gains and losses from surrounding states are to the potential revenue yield from a Vermont tax increase, the response by consumers to rising cigarette prices is at least as significant. Retail price increases may be

prompted by state or federal tax rate increases that the industry chooses to pass through to consumers and/or general industry pricing strategies.

Until the Tobacco Settlement Agreement, most of the increase in the retail price of cigarettes in Vermont had been the result of industry price increases. As shown in the below chart, between 1975 and 1998 (prior to the Tobacco Settlement Agreement) State and federal taxes on cigarettes (including application of the State sales tax to cigarettes) increased by a factor of 3.9. Industry prices during this same period increased by a factor of 6.8.

Components of Vermont Retail Cigarette Price Per Pack, Selected Years
(based on non-generic average retail price, includes state sales taxes and tobacco settlement payments)

Fiscal Year, Source: Orzechowski and Walker (formerly The Tobacco Institute)
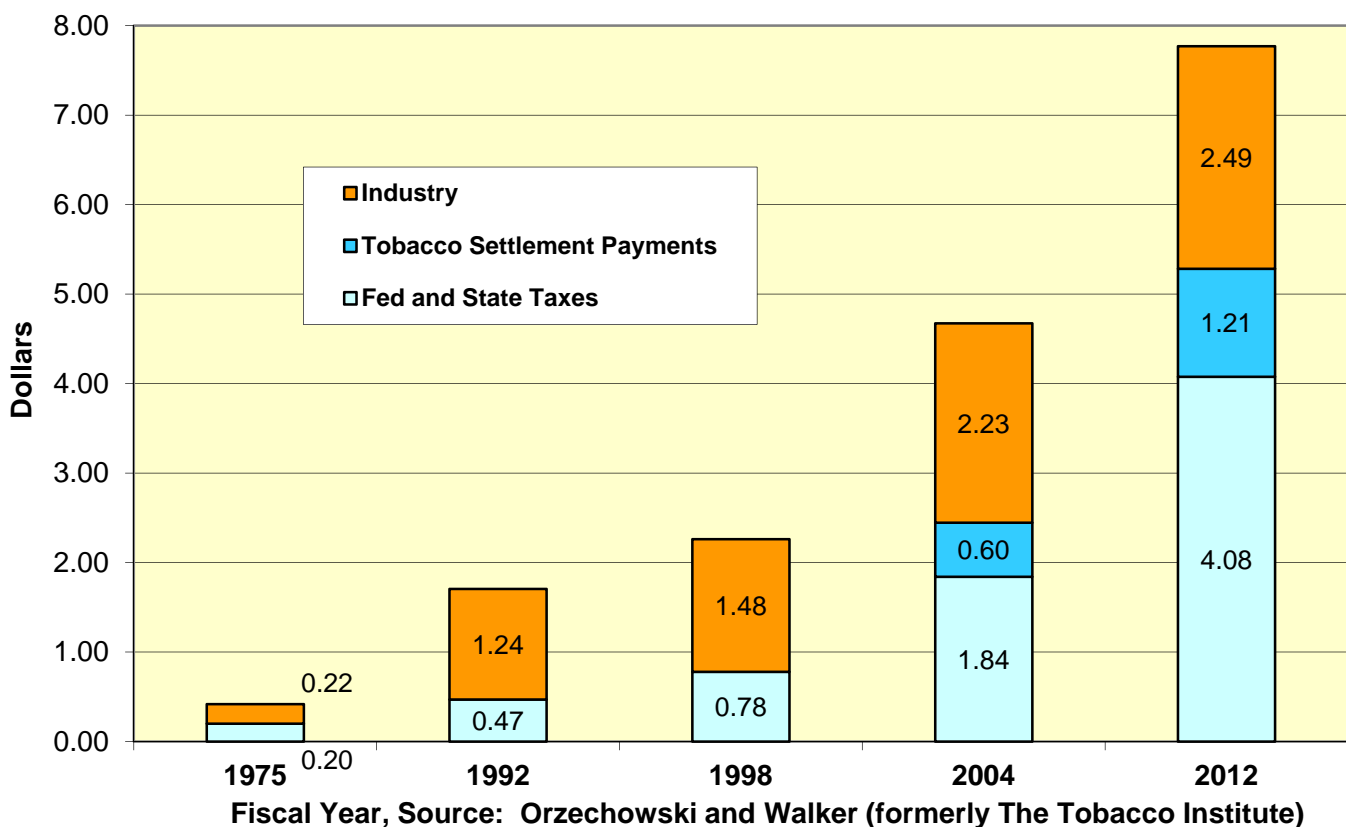
Only when costs associated with the Tobacco Settlement Agreement are treated as effective State taxes (about 60 cents per pack in FY04), did state and federal tax increases match the nine-fold industry price increases between fiscal 1975 and 2004. This kind of industry pricing power and behavior can only occur under monopolistic or oligopolistic conditions, as is the case in the tobacco manufacturing sector (see Table 2, page 16). Between 2004 and 2012, industry prices increases slowed (+12%), in response to increasing price pressure from "generic" and other cigarette manufacturers not affected by Tobacco Settlement costs.

As shown in the below chart, between 1955 and 1973, state and federal taxes consistently represented at least 50% of the retail price of a pack of cigarettes in Vermont. Industry pricing practices after 1974, however, steadily eroded the State and federal share to a low of about 20% by 1993. An industry price roll-back in 1994 and a 1996 Vermont tax increase to 44 cents returned the State and federal share to about 30% in 1998. The inclusion of Tobacco Settlement payments as an effective State tax, along with the State increase to $1.19 in FY04 raised State and federal taxes as a share of the retail price back to 46.5% in FY2004.

Industry pricing following the Tobacco Settlement agreement continued to be relatively aggressive through 2006, with increases above and beyond what was required to pay Settlement costs. In recent years, the industry price share has dropped to about 40%, amidst greater competition from generic brands and growing Settlement payments. Without the Settlement payments, the State and federal share of the retail price of cigarettes in 2012 would be about 45%, close to the average rate over the past 58 years.

State and Federal Taxes as a Percent of Average Vermont Retail Cigarette Price
(Fiscal Year Basis, Source: Orzechowski and Walker, Vermont Joint Fiscal Office)
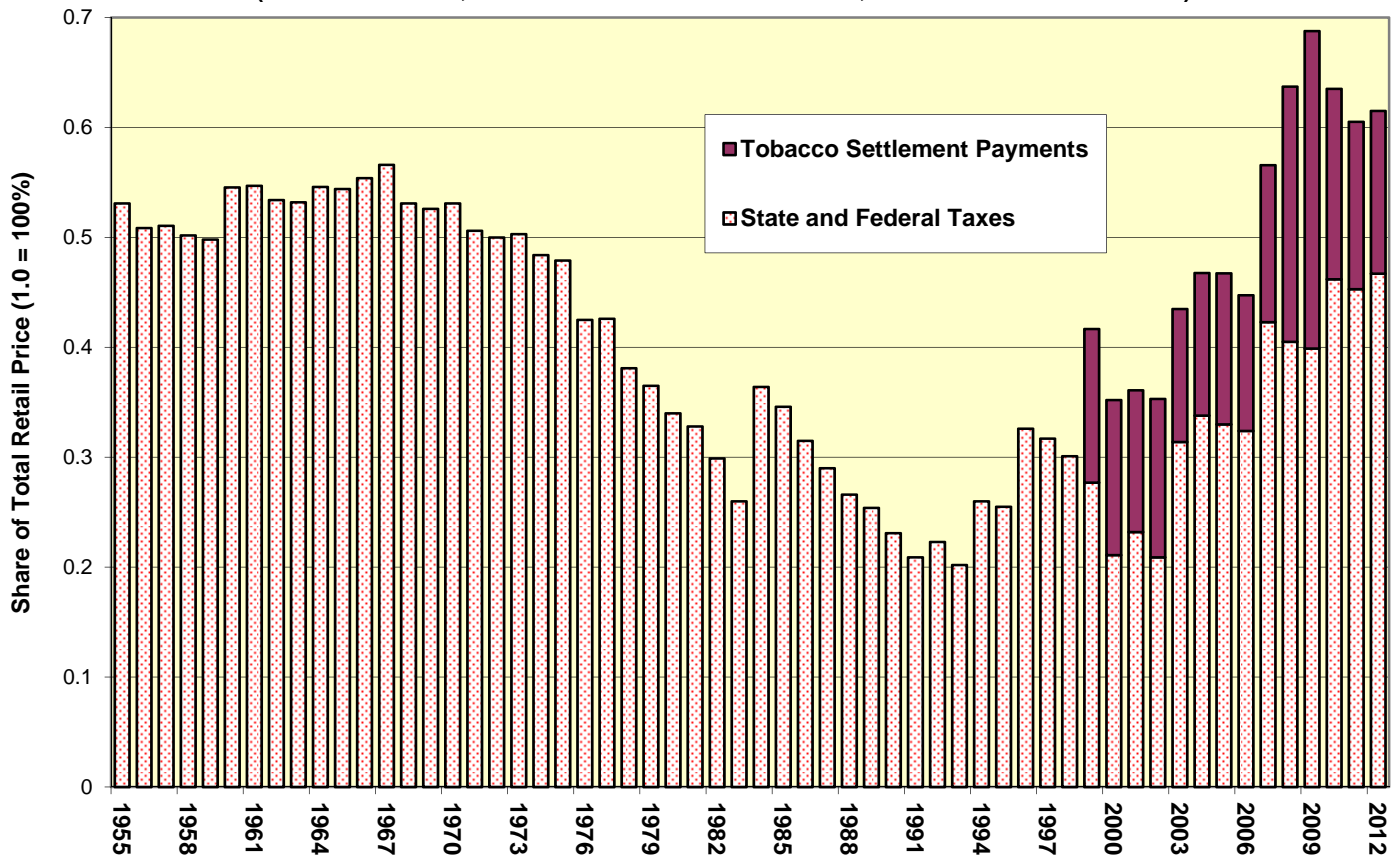
The aggressive industry pricing over most of the past 40 years and its continued ability to dictate prices has important implications for State (and federal) tax revenue yields. The reason for this is that a price increase from any source will reduce consumption and therefore tax revenues from any tax that is not an ad valorem tax (such as the current cigarette tax, which is a unit tax per pack of cigarettes).

This common sense economic principal, that the higher the price of an item, the less of it will be consumed, is called the price elasticity of demand (see below chart). Price elasticities are usually expressed as a percentage decline in consumption for each percentage increase in price or vice-versa. Thus, if the price elasticity of a product is −0.5, a price increase from $1.00 to $1.01 will lead to a 0.5% decrease in consumption.

Vermont Cigarette Prices vs. Cigarette Sales, 1955 to 2012

(average real retail cigarette price per pack, red line, left scale vs. per capita sales, blue line, right scale)
Source: Orzechowski and Walker, The Tax Burden on Tobacco
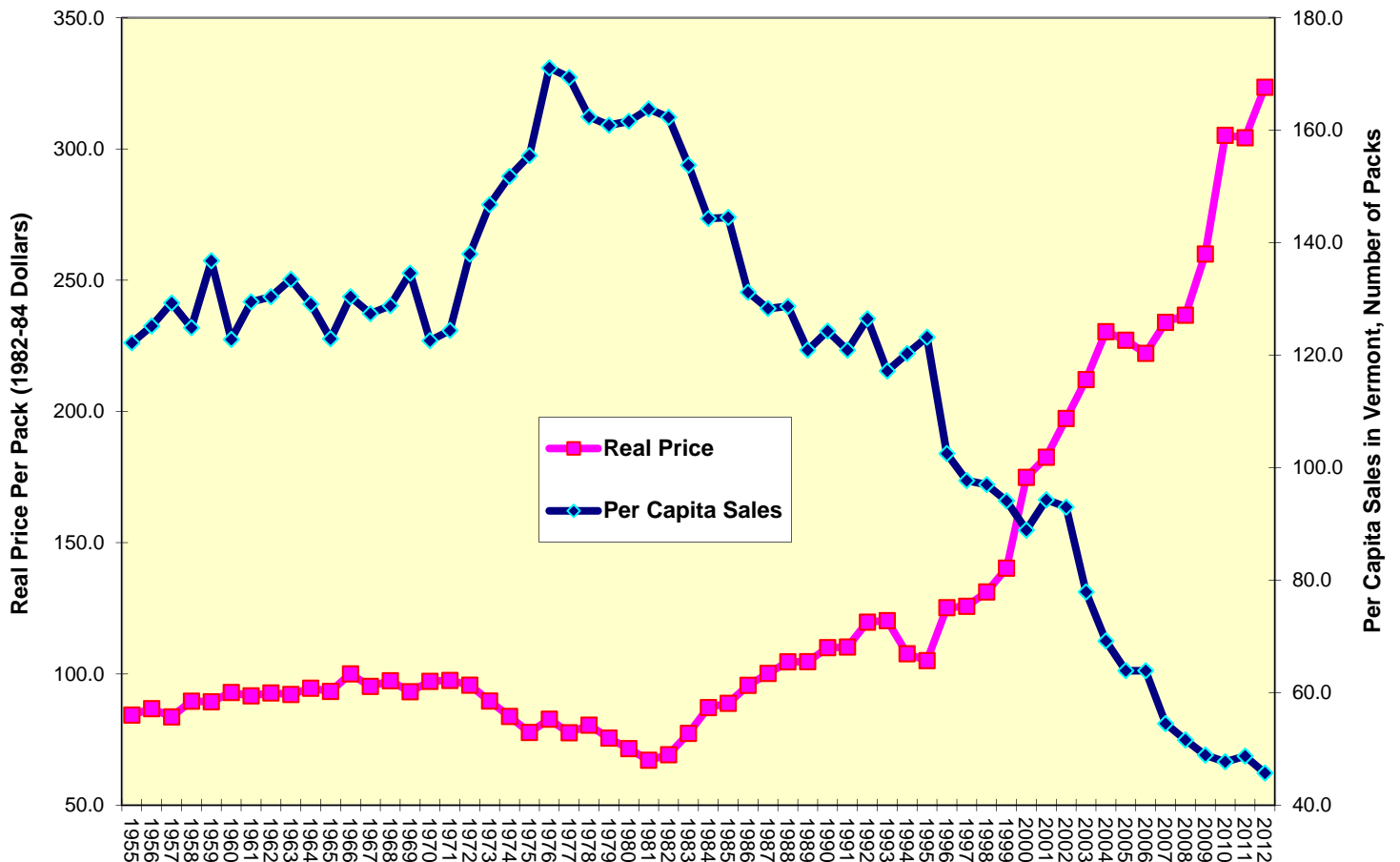
The price elasticities of very few consumer products have been analyzed as extensively as cigarettes, and yet there is a wide divergence in the empirical results. Recent studies range from about −0.14 to −1.12, but most credible estimates fall

between about –0.3 and –0.5.[2] What this means is that an industry price increase of 10% could result in a decrease in demand of 3% to 5%. A 4% decline in Vermont cigarette consumption, for example, would cost the State of Vermont about $2.9 million in net cigarette tax revenue.

Price elasticities, however, are more complex than a single estimate at a point in time. They may vary over time, at different absolute price levels, and between different groups of consumers. The addictive qualities of nicotine in tobacco also add complexity to price elasticity estimates for cigarettes.

For addictive goods, such as cigarettes, short term price elasticities are extremely low compared to most consumer goods and have been shown to be lower than (by as little as one-half) longer term elasticities.[3] This means that price increases have a relatively weak short term demand impact, with relatively few smokers quitting or reducing smoking immediately (usually only those that are less addicted), while among others it may take 6 months to a year or more for the same price increase to result in a reduction in or cessation of smoking.

Among different consumer groups, most studies have shown that young smokers are more price sensitive than adults and that the effect of price on this group works mainly through a reduced propensity to begin smoking.[4] The price elasticity to demand for young smokers has been estimated to be nearly double that of adult smokers.[5] This is usually attributed to the fact that young smokers generally do not have as much disposable income as adults nor are they likely to be as seriously addicted as adult smokers.

Of note, Vermont has a relatively high incidence of tobacco products use among youth, especially among 12-17 year olds (see U.S. map on following page). According to the 2010-2011 U.S. Department of Health and Human Services National Surveys on Drug Use and Health[6], Vermont had the 8th highest tobacco

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[2] See, for example, the Surgeon General's report, "Reducing Tobacco Use," Chapter 6, U.S. Department of Heath and Human Services, October 2000

[3] See, for example, "Cigarette Taxes to Fund Health Care Reform: An Economic Analysis," by J. Gravelle and D. Zimmerman, Congressional Research Service, Library of Congress, CRS Publication No. 94-214 E; See also, "New Evidence on Demand for Cigarettes: A Panel Data Approach," by Bwo-Nung Huang, Chin-wei Yang and Ming-jeng Hwang, International Journal of Applied Economics, 1 (1), September 2004, 81-97.

[4] See, among others, "Price Elasticity in the Cigarette Industry," Phillip Morris U.S.A., document no. 2045540114, and, "Analysis of Cigarette Price Elasticities," February 1990, prepared by Policy Economics Group, KPMG Peat Marwick for internal use of Phillip Morris USA, document no. 2044982672 in State of Minnesota, et. al. v. Phillip Morris, Inc., et. al.
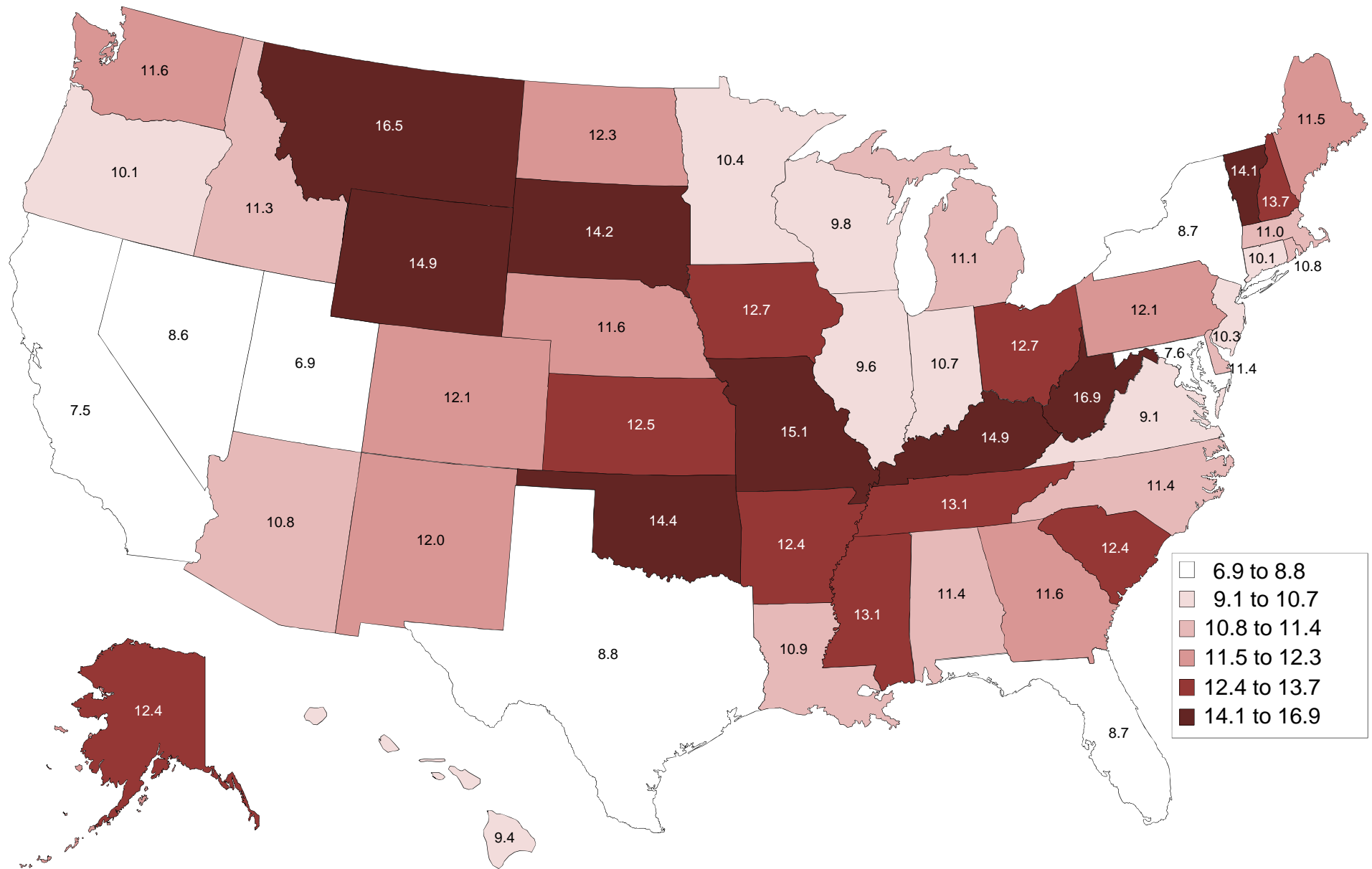
[5] See "Price, public policy and smoking in young people," by E.M. Lewit, A. Hyland, A. Kerrebrock and K. Cummings, *Tobacco Control,* 1997;6(Supplement 2):S17-S24.

[6] U.S. DHHS Substance Abuse and Mental Health Services Administration, State Estimates of Substance Use from the 2010-2011 National Surveys on Drug Use and Health. See also: http://www.samhsa.gov/data/#

Tobacco Products Use in Past Month by 12-17 Year Olds, 2010-2011

Percentage of 12-17 Year Old Population, Source: SAMHSA National Survey on Drug Use and Health, 2010-2011

Total U.S. = 10.3

Legend:
- 6.9 to 8.8
- 9.1 to 10.7
- 10.8 to 11.4
- 11.5 to 12.3
- 12.4 to 13.7
- 14.1 to 16.9

State values:
11.6, 16.5, 12.3, 10.4, 11.5, 10.1, 11.3, 9.8, 11.1, 8.7, 14.1, 13.7, 11.0, 10.1, 10.8, 14.9, 14.2, 11.6, 12.7, 12.1, 12.1, 10.3, 8.6, 6.9, 11.6, 9.6, 10.7, 7.6, 11.4, 7.5, 12.1, 12.5, 15.1, 16.9, 14.9, 9.1, 10.8, 12.0, 14.4, 12.4, 13.1, 11.4, 10.9, 11.4, 13.1, 11.6, 12.4, 8.8, 8.7, 12.4, 9.4

products usage rate among 12-17 year olds at 14.1% versus a U.S. average of 10.3%.

This same survey revealed distressing statistics associated with substance abuse among youth in Vermont in a number of other categories[7]. Based on the latest available data, Vermont registered:

- The highest incidence of marijuana use in the past year in the nation among both 12-17 year olds (20.8% vs. a 14.1% U.S. average) and 18-25 year olds (46.8% vs. a 30.4% U.S. average);

- The highest rate in the nation of illicit drug use (other than marijuana) in the past month among both 12-17 year olds (4.5% vs. a U.S. average of 4.3%) and 18-25 year olds (11.3% vs. a 7.5% U.S. average);

- The highest incidence in the nation of cocaine use in the past year among 18-25 year olds (9.0% vs. a U.S. average of 4.6%) and the second highest among 12-17 year olds (1.4% vs. a national average of 0.9%);

- The highest rate of alcohol use in the past month in the nation among 12-17 year olds (17.8% vs. a U.S. average of 13.5%); and the second highest rate in the nation among 18-25 year olds (73.9% vs. a U.S. average of 61.0%)

- The second highest binge drinking rate in the past month among 18-25 year olds in the nation (50.9% vs. a 40.1% average U.S. rate) and the seventh highest rate among 12-17 year olds (9.4% vs. a 7.6% U.S. average rate).

Relevant studies suggest that in addition to deterring youth smoking rates, higher cigarette prices (via higher taxes) may also reduce both the number of youth who smoke marijuana and the amount of marijuana consumed by those who continue its use[8].

At a minimum, however, these data suggest that enhanced tobacco and other substance abuse education targeted towards 12-25 year olds and possibly additional enforcement measures that could affect illegal distribution channels to these age cohorts may be meaningful State policy actions that should be considered in addition to tax rate changes.

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[7] Ibid., See Appendices B and C, Tables B and C

[8] Chaloupka, et al., National Bureau of Economic Research, Working Paper number 6369, 1999, "Do Higher Cigarette Prices Encourage Youth to Use Marijuana?" See also: http://www.nber.org/papers/w6939.pdf?new_window=1

FY2014 Hypothetical Vermont Cigarette Tax Yield Curve
(Source: Vermont Joint Fiscal Office)

PROJECTED

Y-axis: Total Revenue ($Millions)
X-axis: Tax Rate in Cents
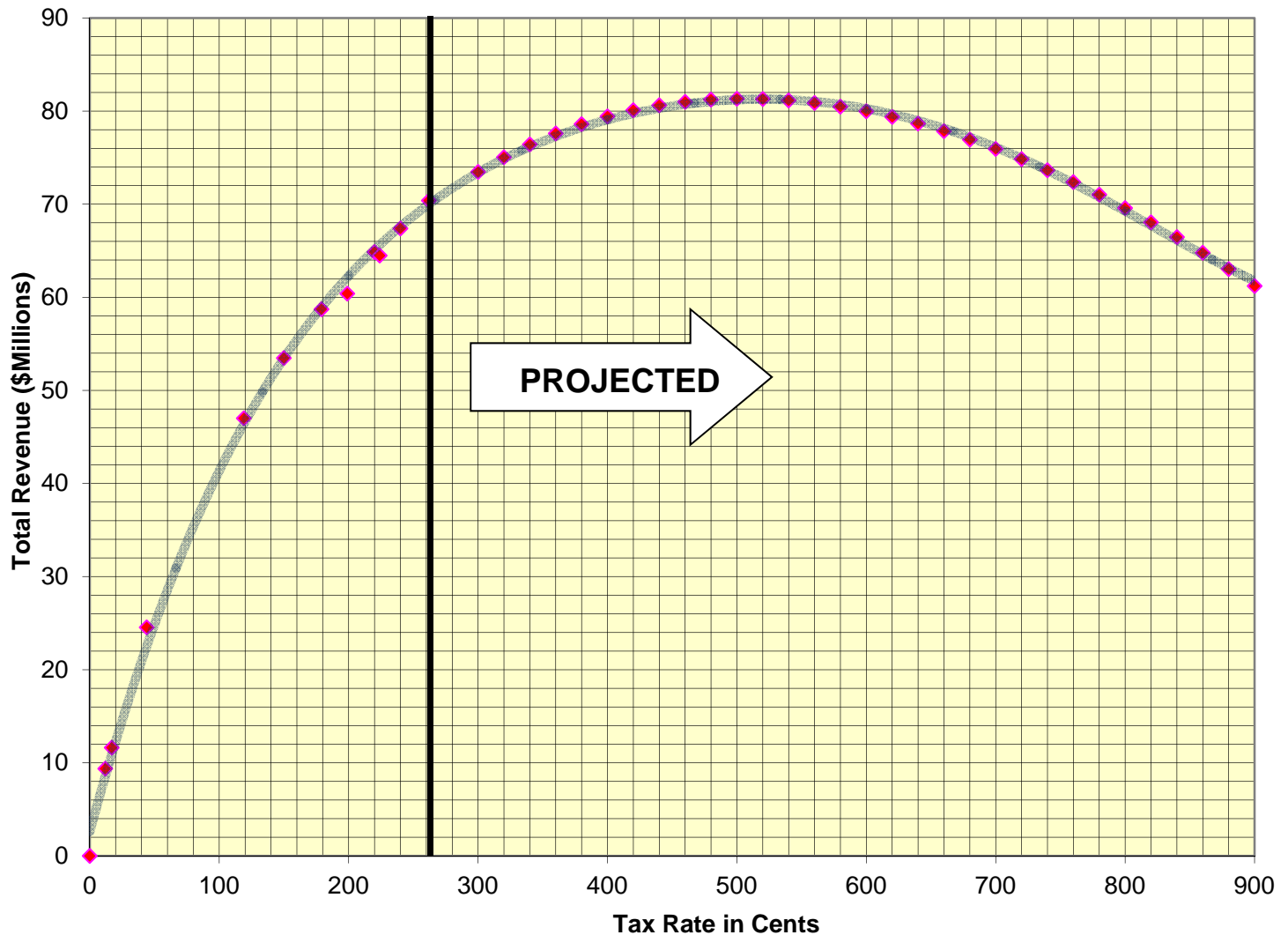
Several studies have shown that as the real price of cigarettes increases, the price elasticity is also likely to increase.[9] At some point, the price elasticity will increase to a point of inflection whereby any price increase will yield less profit to the manufacturer or less tax revenue to the state than at the prior lower price. This relationship between tax rates (or price) and revenues can be expressed by an inverted "U," such as in the above chart. The shape of this curve, which has yet to be fully defined by empirical measurement, is among the most critical pieces of information in setting cigarette prices and tax rates.

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[9] See, among others, "For Best Revenues, Tax Cigarettes $1.26," by M. Grossman, *New York Times*, June 18, 1993; Section A:26 (col 4)

The chart on the preceding page expresses hypothetical estimates of Vermont tax yields for FY14 at various tax rates, assuming constant industry, federal and neighboring state tax rate and pricing policies. This analysis predicts that any Vermont tax rate (or equivalent price increase) above about $5.00 per pack would result in a reduction in total revenues. A proposed rate of $9.00 per pack, for example, would yield only about $61 million, about $20 million less than the estimated revenue maximizing rate of about $5.00. It should be noted that because average retail prices have not yet reached levels at which total tax revenues have actually declined in any major U.S. tax jurisdiction, it is impossible to know the exact price point at which a decline in net revenue would occur. Few doubt that there is a price point beyond which net revenues will decline, but we are not there yet. The estimates provided herein rely to some extent on the experience of similar states who have initiated tax rates at or above those proposed in Vermont.

It should be noted that over time, revenue yields will be expected to steadily decline, as industry and federal taxes rise, and anti-smoking measures continue to lower participation rates among both new entrants and existing smokers. Proposed State expenditure increases for health care services based on these tax revenues will offset some of these declines and related sales tax losses, as income and other tax revenues will be positively affected by such expenditures.

Compliance

If significant State tax rate increases are contemplated, especially at rates higher than any surrounding state, a review of current and "best practice" enforcement laws and methods should be undertaken. Experience in Canada and elsewhere indicates that as absolute prices increase, legal and illegal tax avoidance tends to proliferate, at times encouraged or even sponsored by major manufacturers. At higher tax rates, some enforcement expenditure increase may be cost effective in maximizing State revenues.

Tax Incidence

Although a steep State cigarette tax may meet health policy goals and State revenue needs, the cigarette tax is currently a regressive tax, falling more heavily on lower income households (as a percentage of both income and expenditures) than higher income households. It has been estimated that more than 50% of all cigarette taxes in the U.S. were paid by households with incomes below $30,000 in 1993.[10]

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[10] "Measuring the Impact of Increasing Excise Taxes on the Progressivity of the Federal Tax System," The Policy Economics Group, KPMG Peat Marwick, March 1993. See, also: "Poor Smokers, Poor Quitters, and Cigarette Tax Regressivity," Dahlia K. Remler, Mailman School of Public Health, Columbia University, as published in the American Journal of Public Health, February 2004, 94(2), 225-229.

Because of the concentrated nature of the U.S. cigarette industry (see Table 1, below), tax increases are almost uniformly passed on in full (or more) as price increases to consumers. Industry price increases have often coincided with public tax increases so as to deflect negative consumer sentiment from the manufacturers and maximize political pressure against tax increases. As shown in the below Table 1, only six (or fewer) firms have controlled more than 90% of the U.S. cigarette output for the last 97 years.

Table 2 - U.S. Market Shares of Largest Cigarette Manufacturers
(selected years, percent)[11]

Year	Reynolds American	Phillip Morris	Brown & Williamson	American Brands	Lorillard	Liggett & Meyers	Total
1913	0.2	NA	NA	35.3	22.1	34.1	91.7
1925	41.6	0.5	NA	21.2	1.9	26.6	91.8
1940	21.7	9.6	7.8	29.5	5.4	20.6	94.6
1955	25.8	8.5	10.5	32.9	6.1	15.6	99.4
1970	31.8	16.8	16.9	19.3	8.7	6.5	100.0
1975	32.5	23.8	17.0	14.2	7.9	4.4	99.8
1980	32.8	30.8	13.7	10.7	9.8	2.2	100.0
1985	31.7	35.8	11.8	7.4	8.2	5.0	99.9
1991	27.8	43.4	11.1	7.0	7.3	3.4	100.0
1996	24.6	47.8	17.2	NA	8.4	1.9	99.9
2010	28.3	49.9	NA	NA	13.2	NA	91.4
2012	26.4	49.8	NA	NA	14.4	NA	90.6

Although cigarette taxes currently fall most heavily on lower income households, recent studies note that two mitigating factors can render cigarette tax increases as proportional or even progressive.[12] The first is that there is significantly greater price sensitivity among the lowest income families. This means that not only will there be short term savings from smoking cessation among this group, but that there will also be longer term savings from reduced future health care expenditures.

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[11] Sources: "Reducing Tobacco Use,: A Report of the Surgeon General, U.S. Department of Health and Human Services, October 2000, page 307; Reuters News (http://www.reuters.com/article/2008/09/05/tobacco-idUSN0551452220080905?pageNumber=1) and current company annual reports as compiled by KRA.

[12] See "Federal Taxation of Tobacco, Alcoholic Beverages, and Motor Fuels," Congressional Budget Office, 1990, and "Cigarette smoking by socioeconomic group, sex and age: effects of price, income and health publicity," by J. Towsend, P. Roderick and J. Cooper, *British Medical Journal,* 1994;309(6959);923-6.

The second mitigating factor involves transfer payments that may be made with public monies raised through tobacco taxes. If revenues from cigarette taxes are allocated to supplementing transfer payments such as food stamps, EITC payments or expanded medical care for low income families, the potential regressivity of a cigarette tax increase may be completely negated.

Health Benefits

The scope of this review did not include economic estimates of potential long term health care savings from reduced smoking in Vermont due to tax increases, nor did it attempt to quantify the more difficult to measure human costs and benefits associated with such reductions.

While some have attached economic measurements to "lives saved" and annual estimates to extensions of "productive" years of life, it is impossible to truly quantify such concepts. There is no doubt that any reduction in smoking due to a Vermont tax increase would result in fewer premature smoking-related deaths and lower private and public health care costs prior to such deaths. In general, the larger the tax increase, the greater will be the reduction in smoking. Estimates of direct health care cost savings and numbers of Vermont residents affected for any given tax rate increase can be generated by the Joint Fiscal Office upon request.

SUMMARY AND RECOMMENDATIONS

- *Changes in key factors affecting Vermont cigarette tax revenues, especially industry pricing changes and federal and surrounding state tax rates, should be monitored regularly - at least annually. Based on this information, Vermont cigarette tax rates and policies should be adjusted so as to maintain revenue goals and related economic and health policies of the State. Consideration should be given to ad valorem tax options as well as "per pack" rate adjustments.*

- *Development and coordination of regional and national cigarette taxation policies should be explored with other (especially surrounding) states. Tax increases should be coordinated whenever possible to maximize Vermont revenue yields.*

- *Current and "best practice" enforcement policies should be reviewed to ensure they are as up-to-date and cost-effective as possible. Additional enforcement funding should be allocated if cost-effective so as to maximize net revenues.*

- *Given the relatively high incidences of use among younger Vermont age cohorts, enhanced educational programs and other policy measures to curb tobacco and other substance abuse among Vermont youth should be seriously considered.*