

Economic Impact of Increasing the Delaware Cigarette Tax

Prepared by

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Executive Summary

This report analyzes the significance of cigarette sales in Delaware. It uses economic theory, econometric analysis, and simulation methods to answer three questions. Below are those questions and a summary of the results.

1. What are the relevant trends in the cigarette market?
 - In general, cigarette sales have been increasing, but highly volatile during the past 14 years. In 1995, 89 million packs of cigarettes were sold and by 2002, 113 million packs were sold. In 2003, sales jumped by 33 million packs, and reached 158 million packs in 2007. In 2008, sales fell to 115 million packs.
 - Despite the growth in sales, actual cigarette consumption by Delaware residents has likely fallen. In 1995, 25.5 percent of Delawareans smoked. By 2008, only 17.7% smoked.
 - Delaware's relatively low excise taxes have kept its prices below that of its neighboring states. In particular, Delaware has a key price advantage with New Jersey, reaching a high of \$2.96 by 2006.
 - The most likely explanation for these trends is that Delaware has become a substantial exporter of cigarettes. In 2007, more than two-thirds of sales were likely consumed by nonresidents.
2. What is the economic impact of cigarette sales to the state economy?
 - As a whole, cigarettes create 942 jobs for Delaware, of which 647 are due to exports.
 - Wholesale and retail profits on markups were \$48.4 million in 2008, increasing the state's GDP by \$52.7 million.

3. How would the proposed \$0.45 increase in the cigarette excise tax affect the cigarette market and the rest of the state's economy?
- The tax will reduce cigarette sales by an average of 16.4 million packs of cigarettes. Most of this decline is predicted to come from exports.
 - Wholesale and retail establishments could directly lose \$6.9 million in markups. This would reduce the corporate profit tax by \$259,000 in these industries.
 - The total job loss owing to the state excise tax is predicted to be between 110 and 135 jobs.
 - Disposable Personal Income is predicted to fall by \$3.5 million dollars in the first year the tax goes into effect and by \$5.6 million in the fifth year
 - The consumer's total tax burden that results from the \$0.45 excise tax will increase by an average estimate of \$25.6 million.
 - Because Delaware exports most of its cigarette market, the tax will increasingly burden Delaware residents more so than non-residents as exports decline at a faster rate than local consumption.

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Introduction

This report predicts the increased economic costs of implementing House Bill 211. HB211 raises the current excise tax from \$1.15 to \$1.60 per pack of cigarettes sold in Delaware.

Due almost exclusively to excise tax differentials, cigarettes are much cheaper to the consumer in Delaware than in adjacent states. This difference in price has contributed to a growing nonresidential demand. As of 2008, more than half of all cigarettes sold in the state were purchased by consumers in other states. The first section of this report describes the relevant trends since 1995.

The second section uses REMI's premier regional economic forecasting software, PI+, to analyze the economic impact of cigarettes in Delaware. PI+ predicts that cigarette sales add 942 jobs to the economy and that two thirds of these jobs come from exported cigarettes.

The third section uses regression analysis and PI+ to predict the effect of implementing HB211. The analysis forecasts that sales will fall by 16.4 million packs if the tax is imposed. Because exports respond much more to price changes than local demand, most of this decrease will come from a reduction in exports.

The decline in sales has many forecasted effects on the economy. The tax will eliminate between 110 and 135 jobs. Retail and wholesale margins will fall by approximately \$6.9 million. In addition, the state's excise tax burden is predicted to increase by \$25.6 million.

Relevant Trends in Delaware's Cigarette Market

In 2007¹, consumers in Delaware spent approximately \$584 million on 158 million packs of cigarettes. However, the market is highly volatile. In 2008, only 115 million packs of cigarettes sold in Delaware with a corresponding consumer expenditure to \$489 million, a decline of 27% in sales and 16% in expenditures.

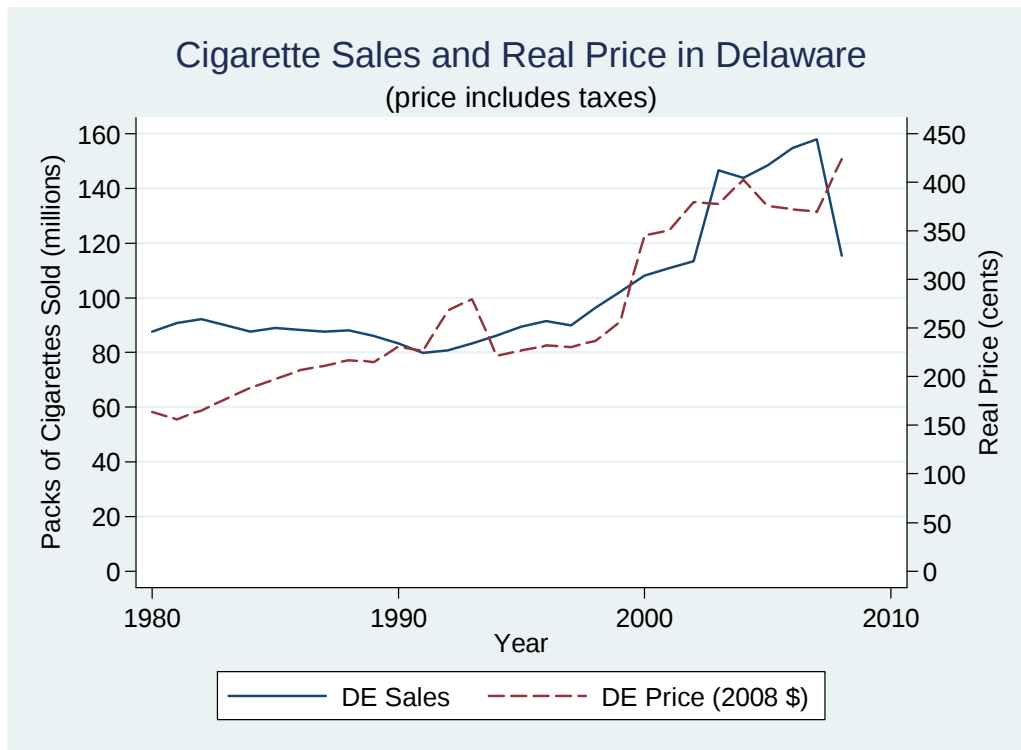


Figure 1 - Time Series Plot of Real Cigarette Price and Sales in Delaware

Figure 1 shows the average annual price for a pack of cigarettes in 2008 dollars and total sales. It is clear, that both price and quantity are rising over time. Economic theory tells us that such situations are likely characterized by increases in demand. Figure 2 indicates the national trend of cigarette consumption per smoker. It also includes the average packs of cigarettes reportedly smoked by Delaware residents. Given the declining trend in the nation and the fact that Delaware smokers have reported consuming less than the trend, it is unlikely that such a strong demand increase came from within Delaware.

¹ Unless otherwise noted, "year" refers to the fiscal year ending June 30th.

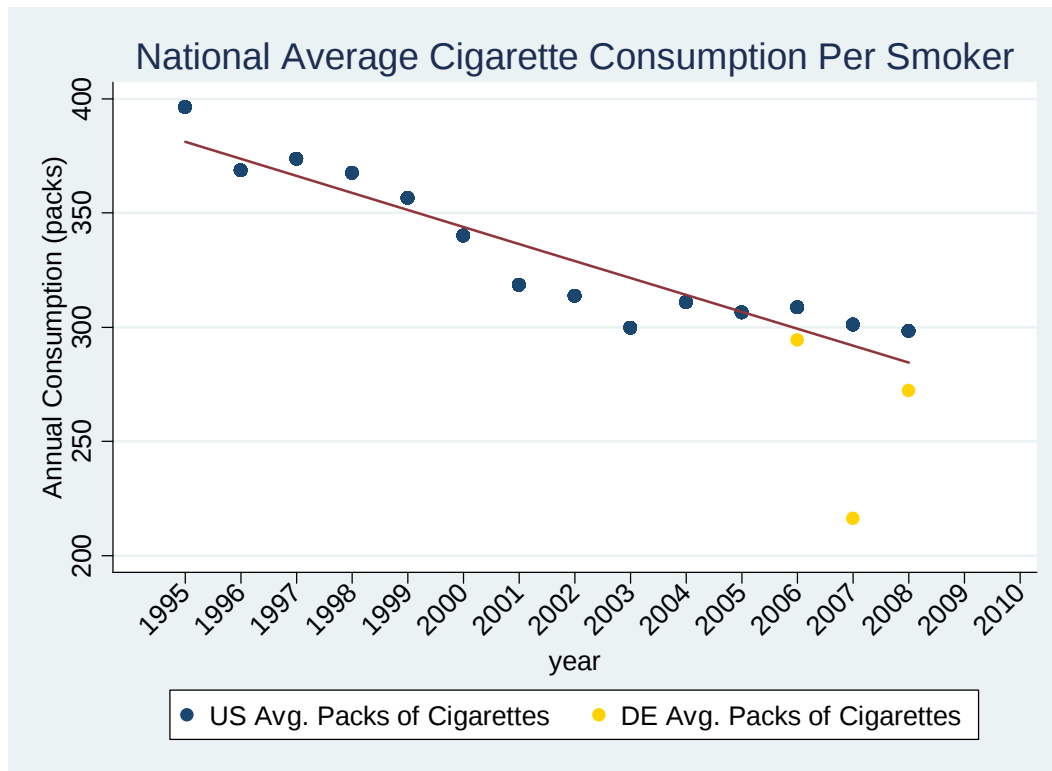


Figure 2 - National Average Cigarette Consumption per Smoker

According to the available indicators, Delawareans are reducing their consumption of cigarettes. Smoking prevalence within Delaware fell from 25.5% in 1995 to 17.7% in 2008.² Moreover, smokers in the nation have been consuming fewer packs, on average. Figure 2 indicates the national trend in the consumption habits of smokers and the available estimates for Delaware.³ Delaware smokers are likely consuming less than the national average.⁴ These trends are not surprising, given the extensive campaign to raise public awareness about the dangers of smoking. If increasing cigarette demand is not driven by Delawareans, it must stem from outside the state. Delaware does, in general, encourage exports by promoting its zero-sales tax policy.

² Behavioral Risk Factor Surveillance System, Centers for Disease Control (various years). Prevalence rates were averaged to adjust for fiscal year.

³ National data comes from Orzechowski and Walker (2008). Data for Delaware comes from the 2006, 2007, and 2008 Tobacco Attitudes and Media Survey conducted by CADSR.

⁴ Underreporting could make the reported consumption habits too low.

Figure 3 plots monthly sales in Delaware beginning in 1990.⁵ Prior to 1998, the difference between excise taxes in Delaware and the surrounding states was negligible and sales did not change very much. In January 1998, New Jersey raised its excise tax to \$0.80 which induced a \$0.56 tax differential with Delaware. Subsequently, sales rose to levels never seen previously. During June and July of 2002, New Jersey's tax rose to \$1.50 while Maryland and Pennsylvania's tax rose to \$1.00. Delaware's tax was unchanged at \$0.24. Sales again increased to unprecedented levels. After 2002, sales declined dramatically in two specific months, September 2003 and September 2007. The timing of these declines corresponds to the two most recent increases to Delaware's excise tax. In August 2003, the excise tax in Delaware increased to \$0.55, and in August 2007, the tax increased to \$1.15.

Figure 4 plots the real average price differential between Delaware and the neighboring states. Prior to 1990, the average cigarette price in Delaware was rarely more than \$0.50 different from New Jersey, Maryland, and Pennsylvania. However, in 1999 the gap with New Jersey jumped to \$1.19, and in 2002, jumped again to \$2.01. As New Jersey began imposing larger excise taxes on cigarettes, the trend continued and reached a high of \$2.97 by 2007. The gaps with Pennsylvania and Maryland both increased after 2000, although their levels never reached that of New Jersey.

⁵ Sales are calculated using monthly state revenue data supplied by the Delaware Department of Finance.

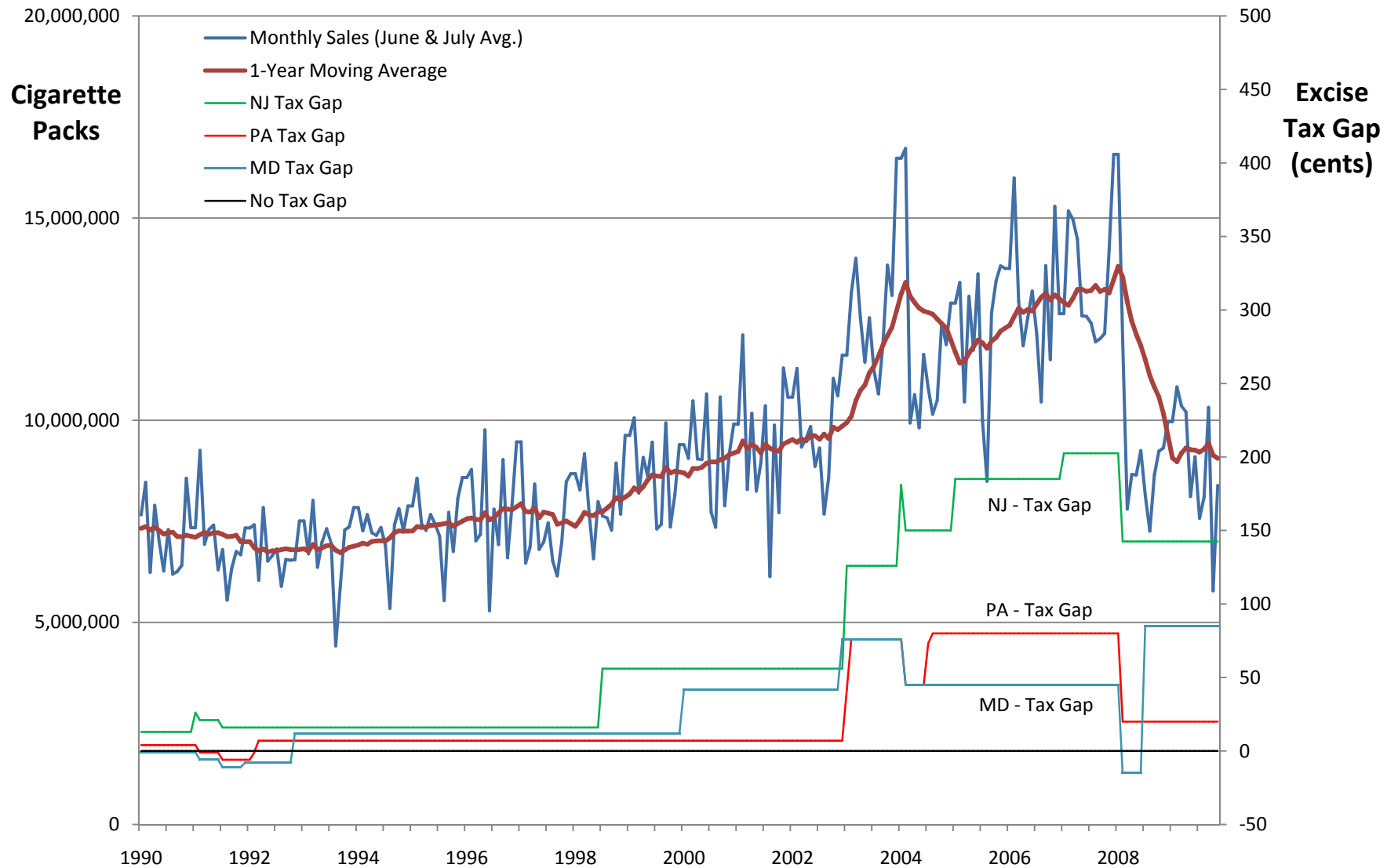


Figure 3 - Delaware Monthly Cigarette Sales and Nominal Excise Tax Differentials with Neighboring States

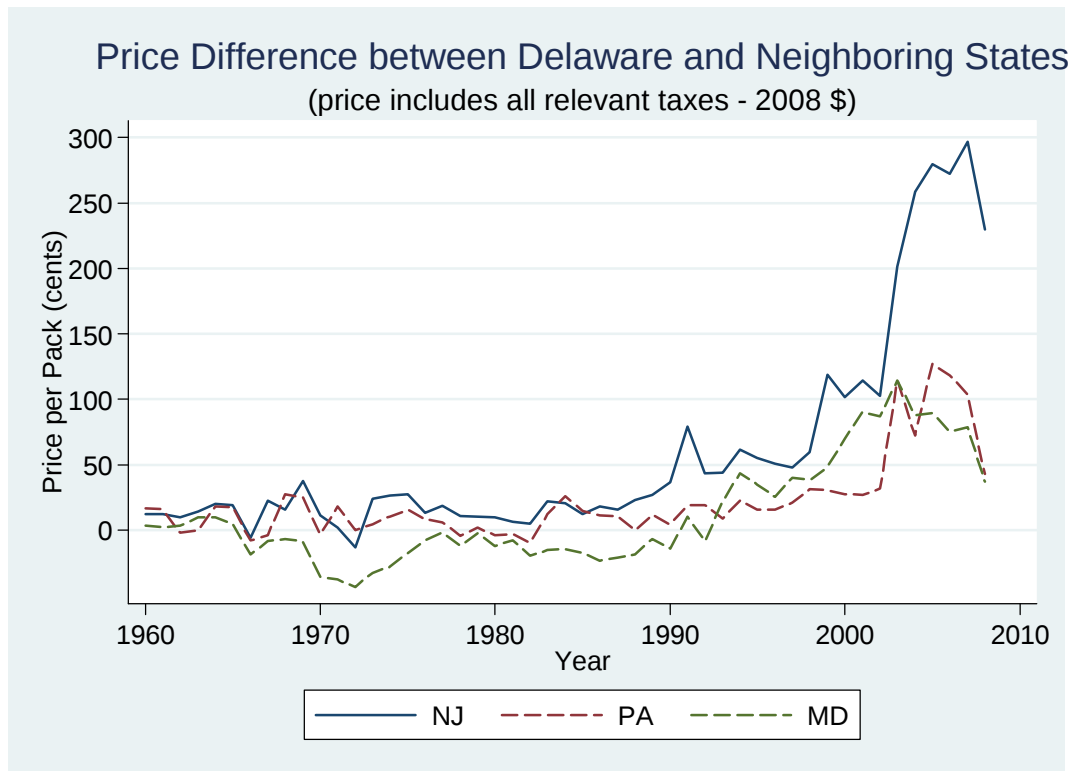


Figure 4 - Difference in Annual Prices between Delaware and Neighboring States, (in 2008 cents)

Unfortunately, the total number of cigarettes actually consumed by Delaware residents is not known. Therefore there is no direct knowledge of how many cigarettes are actually exported. However, if Delaware smokers consume approximately the national average, then in-state consumption can be predicted.⁶ Essentially, the difference between in-state sales and expected consumption gives a reasonable approximation of net exports.⁷ Table 1 reports the estimated amount of exported cigarettes since 1995.

The trends in estimated exports are exactly what one would predict given the history of the price differential. As the price gap with New Jersey increased from \$0.56 in 1997 to \$1.20 in 1998, exports increased by 16.7 million packs. In 2003 the gap rose by \$0.69 to \$2.64 and exports rose from 37.3 to 85.7 million packs of cigarettes. This was the first year that exports captured the majority of the market share.

⁶ See appendix for details. Also see LaFaive, Fleenor, and Nesbit (2008) for a more detailed discussion of the underlying methodology.

⁷ If Delawarean smokers consume less (more) than the national average, the estimated number of exports will be too low (high). Given the survey data from the Tobacco Attitudes and Media Survey, these numbers may be too low. See Figure 2.

Economic Impact of Cigarette Sales on Delaware's Economy

Table 1 reports the average expenditures on exports (in millions of 2008 \$) in the final column. In 2008, 71.7 million packs were exported, creating an expenditure of \$304 million dollars. Of that, approximately \$28 million went to the federal excise tax, \$82 million went to the State of Delaware's excise tax, and the remaining \$194 million was distributed amongst the tobacco companies and retailers. Assuming an average markup of \$0.42 per pack, this implies that approximately \$30.1 million went to retail and wholesale markups.⁸ In 2007, markup profits had reached \$44.9 million from exports.

Table 1 - Estimated Cigarette Sales by In-State and Out-of-State Residents (in millions of packs)

Year	Total Sales	Estimated Exports	In State Sales	Exports (% of Sales)	Avg. Price (2008 \$)	Export Expenditures ⁹
1995	89.4	13.1	76.3	14.6%	\$2.27	\$29.6
1996	91.4	19.0	72.4	20.8%	\$2.32	\$44.1
1997	90	14.1	75.9	15.6%	\$2.31	\$32.4
1998	96.3	20.5	75.8	21.3%	\$2.37	\$48.6
1999	102.2	30.3	71.9	29.7%	\$2.56	\$77.7
2000	108	38.4	69.7	35.5%	\$3.45	\$132.7
2001	110.8	41.9	68.9	37.8%	\$3.51	\$147.0
2002	113.4	39.1	74.3	34.5%	\$3.80	\$148.5
2003	146.7	82.1	64.6	56.0%	\$3.78	\$310.3
2004	143.9	79.3	64.6	55.1%	\$4.03	\$319.3
2005	148.4	87.1	61.3	58.7%	\$3.76	\$327.4
2006	154.9	99.8	55.1	64.4%	\$3.72	\$371.3
2007	158.1	106.8	51.3	67.5%	\$3.70	\$394.7
2008	115.3	71.7	43.6	62.2%	\$4.24	\$303.9

One way of determining the economic impact of cigarette sales and exports is to use simulation methods. REMI's Policy Insight+ is the leading software developed by Regional Economic Models, Inc. used to make policy implications about the economy. The software has been developed over the last twenty years and is specially tailored to suit Delaware and its surrounding region. The model incorporates thousands of economic equations

⁸ According to www.charlotteward.org, \$0.42 per pack was the average markup in Delaware in 2006.

⁹ Expenditures include the price and all relevant taxes, including state and federal excise taxes.

representing important relationships within the state, region and nation. For the purposes of this paper, REMI was used to understand what impact cigarettes and cigarette exports have on the state.¹⁰

According to REMI's prediction, \$30.1 million in retail markup (the direct effect of exported cigarette sales) creates approximately 647 jobs in Delaware and adds an additional \$6.1 million to the state's Gross Domestic Product due to a multiplier effect. The effect of the entire industry's contribution to retail trade (\$48.4 million = 115.3 million packs × \$0.42) is approximately 942 jobs and \$52.7 million to the state's GDP.

¹⁰ A detailed discussion of the REMI model can be found at www.remi.com.

Impact of Increasing the Cigarette Tax on Consumption and Exports

The report now turns its attention to the proposed \$0.45 increase in state excise taxes. Economic theory tells us that the tax will reduce the amount of cigarettes consumed however it cannot say by how much. Most national estimates find that the consumption of cigarettes will fall by approximately four percent if the price rose by 10 percent.¹¹ If this were true for Delaware, the combination of the \$0.62 federal tax and \$0.45 state tax would decrease the amount of cigarettes consumed by 10.2 percent (11.7 million packs of cigarettes). The decrease owing to the state's excise tax would be 4.9 million packs, which would have created \$2.1 million in profit margins.

This national estimate is an average across many studies, and is not necessarily representative of Delaware. Moreover, it does not provide any indication whether the lost sales will arise from local consumption or exports.

The top half of Table 2 displays the results and predictions from eight OLS regressions. The dependent variables in these models are total sales (first 2 columns), exports (middle 4 columns), and local consumption (last 2 columns). For technical reasons, the columns labeled "Log-Log" transform the sales and price variables using the natural logarithm. Each regression uses the years between 1995 and 2008. For different technical reasons, these coefficients are not interpretable in the strict economic sense, though they are useful for forecasting.

Regardless of the specification, the real price in Delaware is statistically significant and in the expected direction for every specification of total sales and exports, as is the price in New Jersey.¹² The prices in Pennsylvania and Maryland are also in the expected direction for sales and exports, and significant in some models. Local consumption, on the other hand, does not match expectations, but the coefficients are not statistically different from zero.

¹¹ Chaloupka, Frank J., and Warner, Kenneth E. "The Economics of Smoking." National Bureau of Economic Research, Working Paper 7047. 1999.

¹² With this analysis being a small sample and time series data, one should not rely too heavily on the statistical significance or magnitudes of these individual coefficients.

The bottom half of Table 2 forecasts the effect on sales (in millions) for the proposed taxes. The first row predicts the combined effect of the \$0.62 federal excise tax and the \$0.45 state excise tax. The second row predicts the effect of just the \$0.62 federal tax, and the third row estimates the difference between the first two rows. The third row is also the forecast of just the state excise tax.

If the state excise tax were implemented, the first two models predict that total sales will fall by either 28.2 million packs or by 15.4 million packs depending on the specification. The wide spread between the two estimates is due to the influence of 2008 and the small sample size. Table A.1 in the appendix shows further specifications using different time periods and varying the last observation. In general, eliminating 2008 reduced the impact of the tax, and adding observations reduced the spread between the predictions. On average, sales are predicted to fall by 16.4 million packs if the state excise tax is implemented.

Table 2 –OLS Estimation of Delaware Cigarette Sales, Exports and Local Demand. (std. err.)

*** p<0.01, ** p<0.05, * p<0.1

Specification	<u>Sales</u>		<u>Exports</u>				<u>Local Consumption</u>	
	Lin-Lin	Log-Log	Lin-Lin	Log-Log	Lin-Lin	Log-Log	Lin-Lin	Log-Log
Price DE	-0.626*** (0.118)	-1.619*** (0.364)	-0.471** (0.151)	-1.976 (1.275)	-0.380*** (0.0690)	-1.631** (0.578)	0.0650 (0.0376)	0.397* (0.197)
Price NJ	0.149** (0.0551)	0.522** (0.207)	0.166** (0.0707)	1.671** (0.723)	0.159** (0.0679)	1.673** (0.686)		
Price MD	0.285** (0.105)	0.601 (0.393)	0.0914 (0.135)	0.423 (1.375)				
Price PA	0.162 (0.0955)	0.780** (0.308)	0.214 (0.123)	1.281 (1.080)	0.271** (0.0862)	1.507* (0.751)		
Trend	1.190 (1.452)	0.00133 (0.0126)	2.748 (1.865)	0.0265 (0.0440)	1.959 (1.414)	0.0167 (0.0288)	-3.21*** (0.656)	-0.056*** (0.0112)
Constant	-2290 (2886)	0.159 (24.23)	-5480 (3707)	-57.98 (84.85)	-3914 (2814)	-39.16 (55.86)	6461*** (1302)	113.6*** (21.44)
Observations	14	14	14	14	14	14	14	14
R-squared	0.979	0.979	0.980	0.979	0.979	0.979	0.854	0.838
<u>Impact on DE</u> (in millions of packs)								
	<u>Sales</u>		<u>Exports</u>				<u>Local Consumption</u>	
Both Taxes	-30.1	-15.5	-21.2	-5.5	-14.0	-1.9	7.0	4.1
Fed. Only	-1.9	-0.1	0.0	7.2	3.1	8.9	4.0	2.4
Dif. (DE Only)	-28.2	-15.4	-21.2	12.7	-17.1	-10.9	2.9	1.6

In columns 3-6, the regression was estimated on exports. Columns 3 and 4 include Maryland's price of cigarettes, but the results are poor under this specification. The 5th and 6th columns remove the price in Maryland, and more reasonable forecasts emerge. The average loss in exports that result from the state tax is nearly identical to the average loss in total sales that results. This indicates that most of the loss in sales will be foregone exports. Unfortunately, more observations were not available to estimate the effect of the state excise tax on exports with more precision.

Because local consumption is not likely affected by the current prices in the neighboring states, a fourth regression is reported that only includes the real price of Delaware. However, the results are insignificant and the sign on this variable's coefficient is opposite to expectations. Clearly, higher prices should reduce the consumption of cigarettes. Unfortunately, this specification cannot estimate the impact of the tax on local sales.

One drawback of the regression approach is that it probably gives a poor forecast of the federal tax. To the average household that smokes, the \$0.62 increase in the federal tax will most likely seem as a reduction in income which should lower consumption. However, most of the regressions predict that the federal tax will slightly increase exports from Delaware. Economic theory tells us this result is possible, depending on the preferences of out-of-state consumers. The \$0.62 federal tax could drive these consumers to seek any bargain they can find (despite the fact that all prices rose equally). On the other hand, consumers could reduce their consumption enough to offset any increase in exports that would have occurred. Moreover, the federal tax increases the relative price of cigarettes in Delaware ($\text{Price_DE} / \text{Price_NJ}$), which should partially reduce exports.

To summarize the regression results, national estimates often ignore exports and predict that Delaware will realize a loss of approximately \$2.1 million in markup as a result of the taxes. However, the results in Table 2 and in the appendix find that the state sales tax will reduce total sales by 16.4 million packs of cigarettes, mostly exports. This will decrease wholesale and retail margins by \$6.9 million. Assuming a 3.75% effective corporate profit tax rate, the corporate profit tax will fall by \$259,000. The regression analysis may not provide an accurate forecast of local consumption or the federal tax.

Due to uncertainty in the regression analysis, this report will also implement the REMI model in two ways to account for the impact of the \$0.45 state excise tax. The first approach directly adjusts the commodity price for tobacco products. If both state and federal taxes are imposed, the price of tobacco increases by 25.4% in Delaware and by other amounts in the surrounding region. The effects are recorded, and then tobacco's commodity price is increased by only 14.7% in Delaware instead of 25.4% as if just the federal tax were imposed. Differencing between the two outcomes gives a reasonable prediction of what would occur if the state excise tax was enacted. The second approach using REMI decreases the profit margins in the retail sector by \$6.9 million, which is the expected loss in margins that would occur with a 16.4 million pack reduction in sales.

In addition to a robustness check, the REMI model adds other important contributions that regression analysis cannot. First, REMI allows the change in the price of tobacco to affect other areas in the economy. For example, a loss in retail sales will likely lead to a smaller demand for construction, which in turn depresses wages, income, changes consumption habits, etc. The total effect on the economy is the direct impact on sales and these other "multiplier effects". In contrast, the regression analysis is a partial equilibrium analysis, meaning that the effects of changing the price of cigarettes are isolated to that market.

A second advantage of the REMI model is that its effects evolve over time. By allowing the model to adjust incrementally, the consequences of the policy can be monitored each year. Unlike other regional economic forecasting models that are static in nature, REMI's dynamic feedback process may not finish adjusting for many years. On the other hand, some effects are temporary and revert quickly to their expected baseline control.

Economic Impact of Increasing the Delaware Cigarette Tax

Table 3 - REMI Predicted Declines for Key Economic Variables (currency is in millions of 2008 \$)

	Year					
	2009	2010	2011	2012	2013	2014
<u>Remi: Adjust Tobacco Price (federal & state)</u>						
Total Employment	318	342	345	336	325	315
Gross Domestic Product	\$22.83	\$23.99	\$24.02	\$23.31	\$22.50	\$21.83
Personal Income	\$11.86	\$14.37	\$16.16	\$17.17	\$17.85	\$18.40
Disposable Personal Income	\$10.07	\$12.42	\$14.09	\$15.11	\$15.83	\$16.45
Value Added to GDP - Construction	\$3.318	\$4.725	\$5.264	\$5.276	\$5.032	\$4.664
Value Added to GDP - Manufacturing	\$0.612	\$0.612	\$0.600	\$0.600	\$0.637	\$0.686
Value Added to GDP - Wholesale Trade	\$2.069	\$2.044	\$1.983	\$1.922	\$1.885	\$1.861
Value Added to GDP - Retail Trade	\$8.276	\$8.141	\$7.896	\$7.627	\$7.370	\$7.137
Tobacco Expenditures	13.81%	13.82%	13.83%	13.84%	13.85%	13.85%
<u>Remi: Adjust Tobacco Price (federal)</u>						
Total Employment	205	221	222	216	209	202
Gross Domestic Product	\$14.88	\$15.66	\$15.69	\$15.24	\$14.70	\$14.28
Personal Income	\$7.77	\$9.38	\$10.51	\$11.15	\$11.56	\$11.88
Disposable Personal Income	\$6.59	\$8.09	\$9.16	\$9.79	\$10.23	\$10.59
Value Added to GDP - Construction	\$2.117	\$3.016	\$3.363	\$3.371	\$3.211	\$2.975
Value Added to GDP - Manufacturing	\$0.418	\$0.416	\$0.410	\$0.410	\$0.427	\$0.459
Value Added to GDP - Wholesale Trade	\$1.357	\$1.341	\$1.302	\$1.263	\$1.234	\$1.217
Value Added to GDP - Retail Trade	\$5.286	\$5.205	\$5.056	\$4.884	\$4.721	\$4.570
Tobacco Expenditures	8.62%	8.63%	8.63%	8.64%	8.64%	8.65%
<u>Remi: Adjust Tobacco Price (state)</u>						
Total Employment	113	122	123	120	116	113
Gross Domestic Product	\$7.96	\$8.34	\$8.32	\$8.07	\$7.80	\$7.55
Personal Income	\$4.09	\$4.99	\$5.65	\$6.02	\$6.29	\$6.52
Disposable Personal Income	\$3.48	\$4.33	\$4.93	\$5.32	\$5.60	\$5.86
Value Added to GDP - Construction	\$1.201	\$1.709	\$1.901	\$1.905	\$1.822	\$1.689
Value Added to GDP - Manufacturing	\$0.195	\$0.196	\$0.190	\$0.190	\$0.209	\$0.226
Value Added to GDP - Wholesale Trade	\$0.712	\$0.704	\$0.682	\$0.660	\$0.651	\$0.644
Value Added to GDP - Retail Trade	\$2.990	\$2.936	\$2.840	\$2.742	\$2.648	\$2.567
Tobacco Expenditures	5.19%	5.19%	5.20%	5.20%	5.20%	5.20%
<u>Remi: -\$6.9 in Retail Profit Margins</u>						
Total Employment	132	135	134	130	124	118
Gross Domestic Product	\$9.09	\$9.64	\$9.81	\$9.71	\$9.50	\$9.25
Personal Income	\$3.87	\$4.62	\$5.17	\$5.52	\$5.74	\$5.87
Disposable Personal Income	\$3.25	\$3.93	\$4.42	\$4.74	\$4.94	\$5.06
Value Added to GDP - Construction	\$0.774	\$1.089	\$1.246	\$1.272	\$1.229	\$1.151
Value Added to GDP - Manufacturing	\$0.088	\$0.092	\$0.085	\$0.072	\$0.060	\$0.051
Value Added to GDP - Wholesale Trade	\$0.167	\$0.193	\$0.207	\$0.214	\$0.221	\$0.230
Value Added to GDP - Retail Trade	\$5.232	\$5.336	\$5.411	\$5.470	\$5.521	\$5.570
Tobacco Expenditures	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%

The top box of Table 3 summarizes the difference between REMI's baseline forecast and its prediction if both taxes were implemented. The simulation forecasts that 342 jobs will be lost in 2010, and that GDP for the state would fall \$24.9 million. The taxes also reduce Disposable Personal Income by \$10 million in the first year, which grows to \$16.5 million in the fifth year. Though the retail sector is most affected, the combined wholesale and retail trade industries lose \$10.2 million, while the construction and manufacturing sectors lose \$3.9 million. According to REMI, Delawareans' expenditure on tobacco products will fall by 13.8% from the baseline forecast.

The second section in Table 3 reports REMI's predicted decline from its baseline forecast if the federal tax was implemented. In clear contrast to the regression implications, the federal tax is expected to have a large and negative impact effect on the economy. The effect of just the federal tax is qualitatively similar to the effect of both taxes, but quantitatively smaller. Nearly 220 jobs and \$15.7 million in GDP is expected to be lost in 2010 as a result of the federal excise tax.¹³

The third section in Table 3 reports the difference between implementing both taxes and implementing only the federal tax. This is the predicted impact of the state excise tax and is of primary interest. The net effect of the \$0.45 Delaware excise tax will be a loss of between 110 and 120 jobs each year and approximately \$8 million in state GDP. Disposable personal income falls by \$3.6 million per year at first, growing to \$5.9 million in the fifth year. The retail and wholesale markets are expected to lose approximately \$3.0 and \$0.7 million dollars respectively, but this lessens over time. The state tax is expected to contribute to 37 percent (5.19%/13.81%) of the decline of local tobacco expenditures.

The fourth section in Table 3 assumes that the excise tax reduces cigarette sales directly by 16.4 million packs and lowers retail profit margins by \$6.9 million. Under this analysis, the REMI model predicts that approximately 130 jobs and \$9.1 million in GDP would be lost, which is a slightly higher estimate than what was predicted by adjusting prices. Personal income and personal disposable income are expected to fall by \$3.9 and \$3.3 million respectively. Similar to the table above, these reductions will also grow over time. The

¹³ This assumes that the tax was enacted on January 1, 2009.

construction, manufacturing, and wholesale industries are less affected than before, which is expected given that this impact is assumed to fall directly on the retail sector.

The regression analysis estimates that total market sales fall by 16.4 million packs as a result of the sales tax. REMI's results were not too different. Assuming that 16.4 million packs is accurate, the total tax burden from Delaware's excise tax will rise from \$132.6 million ($\1.15×115.3 million packs) to \$158.2 million ($\1.60×98.9 million packs). The model also predicts that most of the decrease will be due to exports, implying that the tax will increasingly burden Delaware residents.

There are a few points to make about the comparison between the regression analysis and the REMI model. First, the effects of the federal tax are different. REMI solves thousands of equations that are each derived by economic theory. In addition, specific counties in the surrounding area, such as New Jersey's Salem County and Pennsylvania's Delaware County, are modeled to trade regionally with Delaware. As a group, these equations give a deep analysis based on thousands of well-reasoned assumptions. Regression analysis, on the other hand, provides a broader perspective by seeking a few strong statistical relationships in observed data. Due to the small sample and other important factors, these regressions found the strongest statistical relationship to be associated with the price of cigarettes in Delaware, New Jersey, and Pennsylvania.

The second point to make is that both models yield similar results despite their differences. The predicted loss in jobs, gross domestic product, personal income, and disposable personal income are all quite similar. This is reassuring and raises confidence in both approaches.

The government's role has been largely absent in the preceding discussion. It is true that some of the revenue from the tax will be spent by the state. Without knowing how much tax revenue will be spent and what type of expenditures will be made, the impact on GDP and the other aspects of the economy are incomplete. Similarly, if the excise tax decreases smoking prevalence, there will be long term health benefits that this report does not capture.

Summary and Conclusions

Due to Delaware's relatively low price, cigarettes are very important to the Delaware economy. In 2007, 158 million packs of cigarettes were sold in Delaware bringing in \$585 million in consumer expenditures. However, this market is highly volatile. In 2008, sales fell by 43 million packs, driven primarily by a \$0.54 increase in the price.

During the past 14 years, cigarette prevalence and consumption has fallen in Delaware, although sales have grown dramatically. The increase in sales is explained by exports to other states. After adjusting for inflation, a pack of cigarettes in Delaware in 1995 cost \$0.16 less than in Pennsylvania, \$0.35 less than in Maryland, and \$0.55 less than in New Jersey. Because other state governments have imposed excise taxes, cigarette prices in Delaware in 2007 were \$1.04 below Pennsylvania, \$0.79 below Maryland, and \$2.97 below New Jersey's cigarette prices. This has created a large export market for Delaware.

Today, nearly two out of every three packs of cigarettes purchased in Delaware are likely consumed out of state. Most recently, nonresidents spent \$304 million on cigarettes which created 647 jobs for Delaware residents. However, exports are very sensitive to price changes. Over the course of one year, nonresidents reduced expenditures in Delaware by \$90.8 million.

HB211 proposes a \$0.45 excise tax on cigarettes. Both benefits and costs should be considered when making the final policy decision. This report focuses on the economic costs and finds that sales would fall by an average of 16.4 million packs if the excise tax were implemented. Most of this decline will be due to exports. The lost sales have the following ramifications:

- Retailers and wholesalers will lose \$6.9 million directly from lost markup. Corporate profit tax will also decline by \$259,000.
- Between 110 and 130 jobs will be lost due to the state's excise alone. In conjunction with the new federal excise tax, total job loss will be 340.
- Disposable Personal Income will fall by \$3.5 million, which increases over the next five years.

- The tax revenue/burden increases by \$25.6 million.
- Larger portions of the burden will increasingly be paid by Delaware residents as exports leave the state.

APPENDIX

The methods underlying the decomposition between exports and local consumption are explained here in greater detail. Recall that information is not available on sales by the consumer's state of residence. Therefore, exports and in-state sales must be estimated. Heavy use was made from the work of LaFaive, Fleenor, and Nesbit (2008).

Information relating to cigarette sales, prices, and taxes was obtained from the Tax Burden on Tobacco: Historical Compilation by the firm Orzechowski and Walter (O&W). Data is recorded by fiscal year ending June 30th. Information on smoking prevalence came from the Centers for Disease Control's Behavioral Risk Factor Surveillance System for the years 1995 to 2008. Three missing observations were imputed with the national average. Prevalence rates were averaged with the preceding year to adjust the calendar year into the fiscal year. Prices were adjusted for inflation using the Bureau of Labor Statistic's Consumer Price Index for All Urban Consumers.

Initially, a model is estimated that ignores interstate trading. The equation is expressed in Equation 1. The specification regresses the natural logarithm of per capita sales on state smoking prevalence and a trend. North Carolina was not included, because it is relatively large and encourages exporting by not imposing any statewide excise taxes. Alaska and Hawaii were also not included, leaving 47 states and Washington DC in the sample. The sample is from 1995 to 2008.

$$\log(\text{pc_sales}) = \alpha_0 + \alpha_1 \times \text{Trend} + \alpha_2 \times \text{Prevalence} \quad (1)$$

Source	SS	df	MS	Number of obs = 672		
Model	53.4084153	2	26.7042077	F(2, 669)	=	480.45
Residual	37.1840905	669	.0555816	Prob > F	=	0.0000
				R-squared	=	0.5895
				Adj R-squared	=	0.5883
Total	90.5925058	671	.135011186	Root MSE	=	.23576

ln_pc_sales	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
year	-.0142751	.0024191	-5.90	0.000	-.0190249	-.0095252
percentsmo~r	.0808048	.0030781	26.25	0.000	.0747609	.0868486
_cons	31.10609	4.8669	6.39	0.000	21.54986	40.66233

Technically, the residuals from the above equation are per capita sales that cannot be explained by a national trend (see Figure 2) or by smoking prevalence. These are assumed to be per capita exports. Figure A.1 plots the predicted and actual values of per capita sales. The solid line predicts per capita sales given the degree of smoking prevalence in the state. Distances above the trend line indicate sales in excess of what is expected if each smoker consumed the national average. For example, unexplained per capita sales in Kentucky can be derived for a particular year by the vertical distance of the dashed line in Figure A.1. Unexplained sales could be due to more intensive consumption habits, exports, or a combination of both factors. This paper attributes the entire difference to exports.

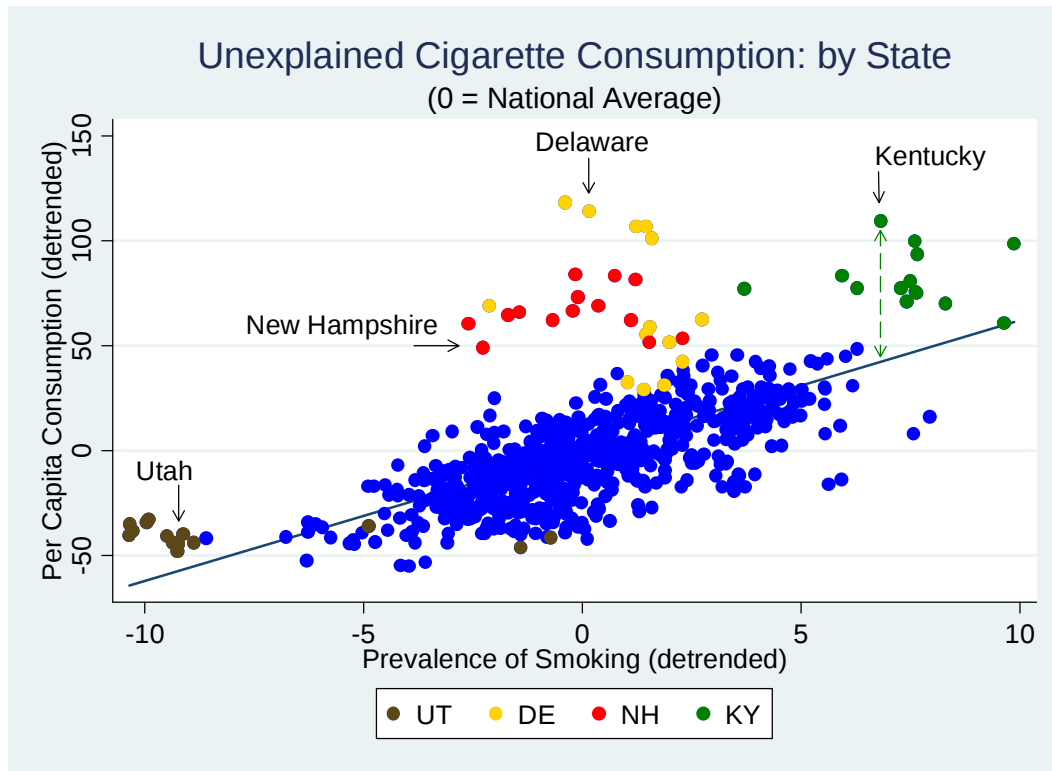


Figure A.1 - Unexplained Cigarette Consumption by State

Given Figure A.1, it is clear that a few states act quite differently from the nation. Four states are highlighted. Utah has significantly lower levels of smoking prevalence, but those who purchase cigarettes in Utah buy more than the conditional national average.¹⁴ On the opposite extreme is Kentucky, which has much higher smoking prevalence rates than other states and also has higher sales than what would be expected.

New Hampshire and Delaware have prevalence rates within three percent of the national average, though Delaware has above average prevalence in most time periods. Both states have per capita sales that are much higher than would be expected. The effect is clearly greatest in Delaware, due in part to its border with a high income population, its relatively low price of cigarettes, and a small population. After making the proper per capita adjustments, exports for Delaware are estimated and reported in Table 1.

¹⁴ Imputing missing values resulted in Utah receiving a high level of smoking prevalence in early years.

Economic Impact of Increasing the Delaware Cigarette Tax

Table A.1 - OLS Estimation of Delaware Cigarette Sales, Alternative Sample Specifications

Specification	1995 - 2007		1990 - 2008		1990 - 2007		1980 - 2008		1980 - 2007		1970 - 2008		1970 - 2007	
	Lin-Lin	Log-Log	Lin-Lin	Log-Log	Lin-Lin	Log-Log	Lin-Lin	Log-Log	Lin-Lin	Log-Log	Lin-Lin	Log-Log	Lin-Lin	Log-Log
Price DE	-0.259 (0.189)	-0.601 (0.464)	-0.502*** (0.0774)	-1.359*** (0.266)	-0.260** (0.102)	-0.666* (0.329)	-0.535*** (0.0782)	-1.562*** (0.371)	-0.504*** (0.106)	-1.610*** (0.464)	-0.515*** (0.0689)	-1.343*** (0.310)	-0.466*** (0.0882)	-1.278*** (0.357)
Price NJ	0.100* (0.0498)	0.354* (0.166)	0.119** (0.0511)	0.318 (0.220)	0.102** (0.0408)	0.285 (0.179)	0.194*** (0.0476)	0.780** (0.306)	0.199*** (0.0494)	0.775** (0.314)	0.174*** (0.0424)	0.578** (0.247)	0.184*** (0.0440)	0.593** (0.253)
Price MD	0.0119 (0.148)	-0.190 (0.414)	0.179** (0.0632)	0.422* (0.210)	0.0160 (0.0742)	-0.0172 (0.232)	0.197*** (0.0627)	0.320 (0.295)	0.176** (0.0786)	0.358 (0.368)	0.170*** (0.0562)	0.211 (0.242)	0.138** (0.0665)	0.163 (0.275)
Price PA	0.217** (0.0814)	0.818*** (0.231)	0.244** (0.0838)	0.917*** (0.301)	0.210*** (0.0672)	0.654** (0.262)	0.200** (0.0856)	0.817* (0.410)	0.190** (0.0897)	0.834* (0.430)	0.203** (0.0765)	0.764** (0.341)	0.184** (0.0798)	0.738** (0.352)
Trend	1.542 (1.192)	0.00843 (0.00975)	0.504 (0.598)	0.00664 (0.00632)	1.574** (0.594)	0.0194** (0.00688)	-1.000** (0.370)	-0.0127 (0.00773)	-0.961** (0.386)	-0.0134 (0.00874)	-0.440** (0.201)	-0.00237 (0.00376)	-0.394* (0.208)	-0.00193 (0.00397)
Constant	-3009 (2370)	-14.45 (18.88)	-933.5 (1187)	-10.47 (12.20)	-3071** (1183)	-35.70** (13.42)	2060*** (731.1)	27.74* (14.71)	1983** (764.2)	29.07* (16.75)	952.2** (397.5)	8.015 (7.241)	859.7** (411.6)	7.109 (7.701)
Observations	13	13	19	19	18	18	29	29	28	28	39	39	38	38
R-squared	0.988	0.990	0.974	0.965	0.985	0.978	0.954	0.872	0.954	0.870	0.944	0.851	0.945	0.849
Impact on DE														
Both Taxes	-7.3	-2.8	-20.2	-11.9	-7.5	-5.0	-20.6	-14.9	-18.9	-15.4	-21.2	-13.8	-18.4	-13.2
Fed. Only	4.3	3.3	2.4	1.3	4.2	1.7	3.5	0.0	3.8	0.0	2.0	-1.0	2.5	-0.9
Dif. (DE Only)	-11.7	-6.1	-22.6	-13.2	-11.7	-6.7	-24.1	-14.9	-22.7	-15.3	-23.2	-12.8	-21.0	-12.2

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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