The Tobacco Tax Amendment:

An Economic Analysis

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Executive Summary

On November 7, 2006, Missourians will vote on a constitutional amendment. The ballot item contains provisions that will raise the tax on cigarettes and tobacco products. The amendment further directs monies collected under the new tobacco tax to fund education and cessation programs, a range of health care services for low-income Missourians, and hold the school funds that are funded by the existing tobacco tax harmless. Proponents argue that the tax is important for Missouri's future. The tax increase will result in higher prices for Missouri cigarettes, resulting in fewer smokers. With taxes collected from remaining smokers, monies will be available to improve health care for low-income Missourians.

On the surface, the 3,300 word proposed constitutional amendment has something for everyone. Upon closer inspection, however, the tax increase applies only to Missouri cigarettes and tobacco products. The point is that tax avoidance is quite easy; Missourians need only cross the state line to avoid the tax. Online cigarette purchases are another way to avoid the new tobacco tax. The bottom line is that there many substitutes for Missouri cigarettes. Economics tells us that with close substitute goods available, the elasticity of demand increases. The elasticity of demand measures the percentage reduction in the quantity of a product for a one-percentage point increase in the product's price. For Missouri, a higher elasticity means that less money is collected from the cigarette tax.

Researchers have recently shown that the elasticity of demand is much higher when the cigarette market is defined at the state level as opposed to the national cigarette market. In a national market, research finds that the elasticity of demand is 0.4, or less. If the market is defined as a state, which is what a state cigarette tax does, the elasticity of demand is around 2. I demonstrate that the state's projected income is based on an elasticity of demand equal to 0.4. Thus, with elasticity equal to 2, there is a sharper-than-projected *reduction* in cigarette purchases and tax collections are lower than those projected. To be more concrete, after one takes into account all the competing cigarette sellers, Missouri's revenues are likely to be closer to $300 million as opposed to the $350 million to $500 million range projected by

It is important to note that $300 million is a substantial amount of money. The proposed constitutional amendment dictates how these monies are allocated. In particular,

one program specifies that Missourians with incomes at or below 200 percent of the federal poverty guidelines will receive monies for health care services. I show that the expected liability to the state far exceeds the monies collected by the new tobacco tax. Indeed, the short fall is approximately $800 million.

The economic impacts of the new tobacco tax are summarized in the following points:

- Missourians are voting in November 2006 on a state constitutional amendment that would increase cigarette taxes by 80 cents per pack. In addition, taxes on other tobacco products would increase to 20 percent of the manufacturer's invoice price. The current tax structure is 17 cents per pack and 10 percent of the invoice price.

- Missouri smokers will spend substantially more on cigarettes each year. With the elasticity of demand for Missouri cigarettes equal to 2, the monies collected by the new tobacco tax will be $303 million after expenses.

- Of the funds collected from the higher cigarette tax, 17.5 percent are earmarked for the Tobacco Use, Prevention, and Cessation Account and 82.5 percent go to the Health Care Access and Treatment Account.

- Of the monies earmarked for the Health Care Access and Treatment Account, 35.25 percent are spent on providing health care services to any Missourian from a household with income up to and including 200 percent of the Federal poverty guideline.

- I estimate that the monies collected from the new tobacco tax and dedicated to spending on health care services for Missourians whose incomes are at or below 200 percent of the federal poverty guidelines will be well below the expected health care costs. Indeed, for households with incomes at or below the income threshold, the expected health care costs are $800 million greater than the amount of dedicated funds from taxes collected. If the constitutional amendment were interpreted as a mandate, Missouri's General Revenue Fund would be tapped to cover this shortfall.

- Another 35.25 percent of the new tobacco tax monies are used to provide supplemental payments to physicians so that the Medicaid physician schedule is the same as the Medicare physician fee schedule.

- I show that the monies collected from the new tobacco tax will not cover the expected costs of the supplemental fees paid to physicians so that the fee schedule for Medicaid patients is the same as the fee schedule for Medicare patients. Specifically, I estimate that the monies collected will be about $70 million less than the expected costs of the supplemental payment plan. However, with

Medicaid reimbursements, it is possible to fund the supplemental payment plan without using monies from the state's General Revenue Fund.

- There is a sizeable redistribution of income associated with the cigarette tax; specifically, a transfer from cigarette smokers to others. The Amendment states that physicians are expected to receive $113.9 million in additional compensation from cigarette smokers in supplemental fees. Safety net clinics would receive about $40 million, trauma centers and emergency rooms would receive $46 million, and ambulance services would receive $3.8 million.

- The higher cigarette tax will also adversely affect the collections to current funds dedicated under the existing Missouri cigarette tax structure. With declining cigarette sales in Missouri, funds collected for the School Money Fund, the Fair Share Fund, and the Health Initiatives Fund will decline. These three funds that are funded out of the current 17 cent per pack tax. With an elasticity of demand equal to 2, the state would loss $17.5 million in funds that would have gone to K-12 education.

- To the extent that cigarette buyers substitute away from Missouri retailers that are subject to the tax, there is also a transfer from Missouri store owners to out-of-state retailers. Each year, convenience store owners currently sell approximately $360,000 in tobacco products per store. Statewide, cigarette purchases are estimated to decline between 40,000,000 packs and 190,000,000 packs, depending on how price sensitive consumers are. This is a loss in percentage terms, this is between 7 percent and 33 percent reduction in cigarette purchases. If the loss is equally distributed across all convenience stores, this would translate into foregone sales equal to between $25,200 and $120,000 per store.

1. Introduction

Missouri voters will vote whether or not to add one new section, Section 37(b), to Article IV of the Missouri State Constitution on November 7, 2006. The proposed Amendment is lengthy, containing 13 sections and over 3,300 words. If the Amendment passes, taxes will rise 80 cents per pack on cigarettes sold in Missouri and the tax on other tobacco products will increase from 10 to 20 percent of the wholesale price.

Monies collected under the new tobacco tax are directed to the Healthy Future Trust Fund. Monies collected and deposited into the Healthy Future Trust Fund are not included in the State General Revenue Fund, thereby excluding these funds from the legislative process. The Amendment stipulates that the monies are to be used to pay the collection and administrative costs of the new tax up to two percent of the monies collected. In addition, a percentage of the monies are directed to hold harmless the three funds that are supported by the existing cigarette tax. After these two allocations, monies are used to fund programs aimed at educating people on the effects of tobacco use, and fund health care services.

The purpose of this report is to examine the economic effects of the new cigarette tax. The existing tax on cigarettes sold in Missouri is 85 mills per cigarette, or 17 cents per pack. Missouri's cigarette tax is the second-lowest in the nation.[1] Thus, the proposed Amendment raises the cigarette tax in Missouri by 471 percent. If the Amendment passes, the new tobacco tax will take effect on January 1, 2007. The cigarette tax will result in higher cigarette prices in Missouri and for those cigarettes subject to the Missouri tax, the quantity demanded will decline. So, the first part of the report projects the quantity of cigarettes sold in Missouri that are subject to the tax. With these quantity projections, I estimate the taxes collected under the new tax. Next, I compute the expected monies put into each fund.

In the second part of the report, I examine the amount of funding that will be available for the programs identified by the Amendment. In particular, I am interested in assessing whether the new tobacco tax monies will be able to fund the expected costs of each new program. For instance, the taxes collected under the new tobacco tax will be

[1] See the article published in the Kansas City Star on July 29, 2006. This article is referenced at http://www.tobacco.org/articles/state/MO/ .

woefully short of funding the expected health care costs for Missourians with incomes at or below 200 percent of the federal poverty guidelines. With federal matching funds, the new tobacco tax should be able to fund the supplemental payments to physicians so that Medicaid fee schedules match Medicare fee schedules. With so many substitutes for Missouri cigarettes, monies collected under the new cigarette tax will not be able to hold harmless the funds currently receiving revenue from the existing tobacco tax. This means that K-12 education will receive less money from the state, or the Missouri's General Revenue Fund will have to make up the shortfall.

In the third part of the report, I examine the distributional effects that the proposed Amendment will have. Monies collected from the tax are directed to provide supplemental payments to physicians. As such, part of the tax amounts to a direct transfer from cigarette smokers to physicians. Other indirect transfers are also operating. For instance, there is evidence suggesting that convenience store operators will suffer reductions in sales, especially those near the state border as consumers shift their cigarette from Missouri stores to those in neighboring states. The implication is that is an indirect transfer as Missouri stores selling tobacco products lose customers to stores located in neighboring states. People can avoid the tobacco tax by making their purchases in any of the eight states bordering Missouri. With a majority of the Missouri population living one hour or less from borders with Illinois, Kansas, Oklahoma, and Arkansas, tax avoidance is clearly a strong possibility.

Lastly, I quantify the effects that fewer smokers will have on the state economy. With higher prices, there will be fewer smokers in Missouri. There is evidence that non-smokers, including recent quitters, are more productive. Therefore, I measure the additional Gross State Product generated because Missouri's labor is healthier and more productive.

In terms of analyzing the tobacco tax, the economics are quite straightforward. The key question is how sensitive is the demand for cigarettes to changes in price. Throughout my analysis, I assume that the entire 80-cent tax per pack is passed onto to the consumer. So, for example, if the current selling price is $3.65 per pack, the new price in Missouri will be $4.45. Cigarettes are frequently identified as sources of additional tax revenues by federal, state, and local governments. The reasoning lies with

the perceived idea that the demand for cigarettes is inelastic with respect to changes in prices; that is, the quantity demanded changes very little for a given percentage increase in the price. Because the percentage change in quantity purchased by consumers falls relatively little compared to the percentage change in the price, governments anticipate large revenue gains.[2] Under these assumptions, the cigarette tax is quite attractive to governments.[3]

There are two important assumptions that are essential if governments are to realize these gains. First, there is the preference for cigarettes such that price increases do not deter the quantity smoking. I accept this assumption. The second involves the number of competing sellers. The State of Missouri is considering raising the tax on cigarettes sold in Missouri (hereafter referred to Missouri cigarettes). The key question is how many substitutes exist for Missouri cigarettes. The more close substitutes that exist, the higher the elasticity of demand is. For instance, if Illinois cigarettes (as defined here) are close substitutes for Missouri cigarettes, a price increase on Missouri cigarettes will induce people to substitute away from Missouri cigarettes to Illinois cigarettes. The extent to which cigarettes in other states are close substitutes for Missouri cigarettes will affect the quantity of Missouri cigarettes sold under the new tobacco tax. Indeed, substitutability plays a major in determining elasticity and explains why state governments may not realize tax collections that they expect; states face a more elastic demand because the state market is subject to competitors in neighboring states and internet sales that are not subject to the higher tobacco tax. Missouri's two largest metropolitan areas—St. Louis and Kansas City—are located along the border. More than 3 million people reside on the Missouri side of these two Metropolitan Statistical areas.[4]

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[2] To illustrate this point, consider a case in which the demand for cigarettes is perfectly inelastic. This means that there is no change in the quantity of cigarettes purchased as the price changes by an amount equal to the tax. Suppose there are 1,000,000 packages sold for $1 per package. The tax increases by 1 cent and each package sells for $1.01after the tax is implemented. Because the 1 cent tax is collected on 1,000,000 packages, the government would receive $10,000 in cigarette tax revenues.

[3] Economic theory indicates that governments want to tax items that are most inelastic. Textbooks articulate the logic in the following equation: $\frac{t_x}{t_y} = \frac{\varepsilon_y}{\varepsilon_x}$, where t_x and t_y are the tax rates on goods x and y, respectively; ε_x and ε_y are their respective elasticities. Also known as the Ramsey rule, this equation is the result of an objective in which the government seeks to maximize economic efficiency. See Diamond and Mirrless (1971a,b) for a more rigorous discussion of the Ramsey Rule.

[4] These data are obtained from the Missouri Economic Research and Information Center at http://www.missourieconomy.org/regional/index.stm . The Missouri counties are Cass, Clay, Clinton,

Insofar as Missouri smokers can avoid the Missouri tax by purchasing their cigarettes in neighboring states and it is not too costly to cross into the neighboring state, the demand for Missouri cigarettes—those subject to the new tobacco tax—may be quite elastic. Indeed, there is evidence that the elasticity of demand may be near two at the state level.[5]

The report proceeds as follows. In Section Two, I provide a brief review of the cigarette tax in Missouri. Section Three presents an economic model that is used to quantify the effects that the tax will have on cigarette purchases subject to the tax. I will also review the projections referred to in the State Auditor's fiscal note. It is possible to infer the implied elasticity of demand used in the projections forwarded by the Governor's office and referenced in the fiscal note. I cite research that estimate the elasticity of demand for cigarettes at the state level. With these estimates, I compute the expected quantity of cigarettes sold in Missouri that are subject to the new tobacco tax. Then, I use the allocation formulas in the proposed Amendment to estimate the funds available for supplemental payments to physicians, for health care services for people with incomes at or below 200 percent of the federal poverty guidelines, and for holding harmless the three funds receiving monies from the existing tobacco tax in Section Four. I examine the incidence of the proposed tobacco tax in Section Five. In Section Six, I estimate the economic benefits that occur. The state economy can expand because some smokers will quit in the face of higher cigarette prices. These quitters will be healthier and more productive workers. Section 7 provides a brief summary of the findings.

2. Missouri Cigarette Tax: An Overview

In this section, I provide a brief history and overview of the tobacco tax in Missouri. I also review how recent changes in tobacco taxes in neighboring states affected demand in two Missouri cities. In particular, I examine recent changes to cigarette taxes in Kansas and how those affected tax collections in Missouri.

Missouri began collecting a tax on cigarettes on January 1, 1956. The tax was 1 mill per cigarette or two cents per pack. In October 1993, Missouri enacted a tax on

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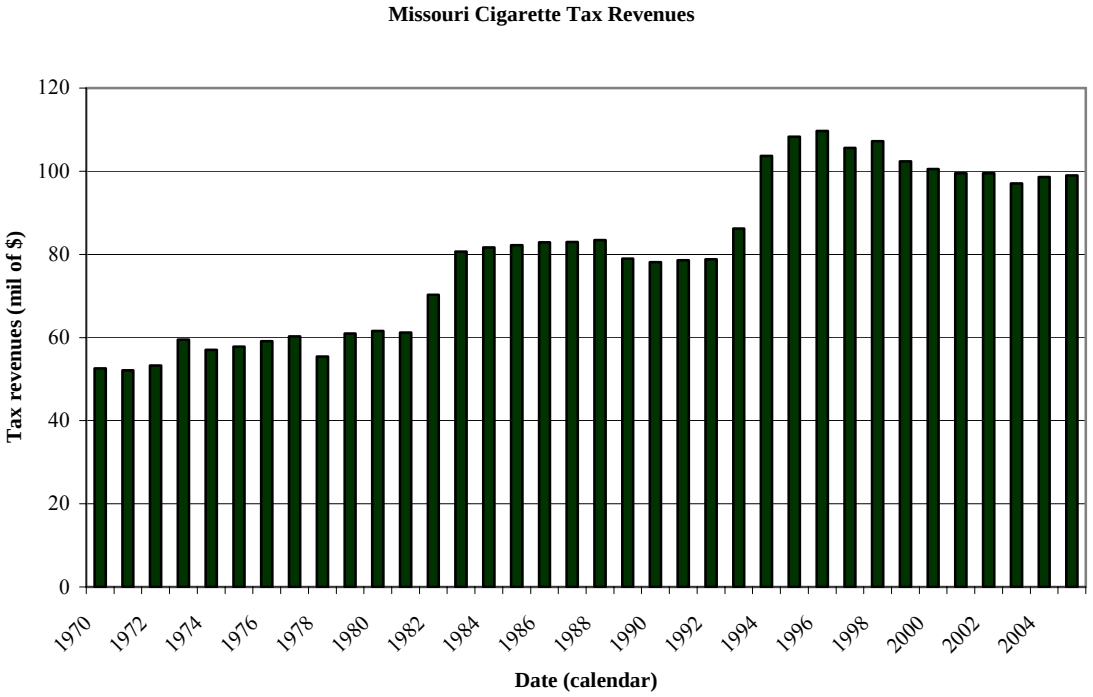
Jackson, Platte, Lafayette and Ray for Kansas City and Franklin, Jefferson, Lincoln, St. Charles, St. Louis, St. Louis City, and Warren for St. Louis.

[5] Throughout this analysis, I will adopt the approach that the elasticity is the absolute value of the percentage change in quantity demanded divided by the percentage change in price. Therefore, more elastic demand refers to a larger positive number.

tobacco products other than cigarettes. Missouri taxes non-cigarette tobacco products according to the wholesale price. The rate is ten percent of the product's wholesale price. At present, Missouri imposes a tax of 8.5 mills per cigarette, or 17 cents per pack. The revenues are earmarked for three specific funds: 4.5 mills per cigarette are dedicated to the State School Money Fund, 2 mills for the Fair Share Fund, and 2 mills for the Health Initiatives Fund. In Fiscal Year 2004, Missouri collected $98.8 million. Figure 1 plots

Figure 1



state revenues generated by cigarette tax for calendar years 1970 through 2005.

The Amendment for Tobacco Tax Increase adds a 4-cent per cigarette tax. Thus, the Missouri cigarette tax would increase from 17 cent per pack to 97 cents per pack. At the consumer level, cigarette prices would increase 22 percent.[6] For other tobacco products, the Amendment stipulates that the tax rises from 10 percent of the manufacturer's invoice price to 20 percent of the manufacturer's invoice price.

[6] In June 2006, cigarette prices are $3.65 per pack.

Monies collected by the new cigarette tax are placed into the Healthy Future Trust Fund. The Healthy Future Trust Fund receives monies *after* collection and administrative costs are covered and after the Director of Revenue determines whether there is any reduction in money collected and deposited into the Fair Share Fund, the Health Initiatives Fund or the State School Monies Fund. These are the three funds that receive monies from the existing 17-cent tobacco tax. It is important to note that there is a ceiling on how much the Director of Revenue can use to hold these three funds harmless. Specifically, there is a three percent limit each month; in other words, no more than three percent of the monies collected from the new tobacco tax can be applied to hold these three funds harmless because of the higher cigarette price.

Of the remaining monies collected from the new tobacco tax, the proceeds are the Healthy Future Trust Fund, which is then divided between two sub-accounts; one is the Tobacco Use Prevention, Education and Cessation Account (hereafter, TUPECA) and the other is the Health Care Access and Treatment Account (hereafter, HCATA). The proposed Amendment stipulates that 17.5 percent of the monies collected go into TUPECA and the remaining 82.5 percent will go into HCATA.

Generally speaking, monies placed into TUPECA are directed to educational programs and to cessation programs. For instance, up to ten percent of the monies could be used to fund tobacco-use cessation programs for Medicaid beneficiaries. At least 15 percent of the TUPECA monies will be used to fund public education through mass media, 15 percent on community programs aimed at reducing tobacco use, and five percent for surveillance and monitoring the uses of funds. Finally, cessation programs are to received between 15 percent and 30 percent of TUPECA's monies.

The monies placed into HCATA are generally earmarked for subsidizing health care services and improving the delivery of those services to lower income Missourians. Of those funds distributed into HCATA, 35.25 percent is dedicated to providing health care services to individuals with incomes less than or equal to 200 percent of the federal poverty guidelines. The Amendment further stipulates that 13 percent of HCATA funds go as supplemental payments to safety net clinics. These clinics are identified according to the visits by people whose incomes do not exceed 200 percent of the federal poverty guidelines. Supplemental payments to trauma centers and emergency rooms account for

15.25 percent of HCATA's funds while 1.25 percent of the monies placed into HCATA are dedicated to ambulance service for Medicaid beneficiaries. Finally, 35.25 percent of HCATA monies are allocated as supplemental payments to physicians in order to convert the Medicaid physician fee schedule to the Medicare physician fee schedule.

3. The economics of the cigarette tax

In this section, I develop an economic model. My main goal is present a framework that can be used to see the relationship between the cigarette tax, cigarette prices, and tax collections. For simplicity, I assume that the cigarette tax imposed on wholesalers is passed on to the final consumer. In other words, the consumer will face an 80 cent increase in a pack of cigarettes if the Amendment passes. The Law of Demand says that if a product realizes a price increase, the quantity demanded will decline. The key question is how much will the quantity demanded decline. In addition, this framework will be the basis for assessing the impact used in the State Auditor's fiscal note.

The taxes collected from the cigarette tax are equal to the product of the tax per pack and the number of packs sold. In equation form:

$$\tau \times q = tc \qquad (3.1)$$

Where τ is the tax paid per pack, q is the quantity of cigarette taxes paid, and tc is the dollar value of taxes collected.

Equation (3.1) is a useful starting point for discussing the economic effects associated with changes in taxes. The key feature is that the equilibrium quantity of cigarettes depends on the price paid by consumers; that is, the supply curve shifts to the left and we move from the original equilibrium to the new equilibrium along the same demand curve. Hence, the shape of this demand curve tells us how much revenue will be generated by the new tobacco tax. Insofar as the tobacco tax is passed on to consumers, an increase in cigarette tax, for instance, results in a higher equilibrium price for cigarettes and other tobacco products. By the Law of Demand, the equilibrium quantity of cigarettes declines, for instance, when cigarettes prices increase. From equation (3.1), an increase in the cigarette taxes corresponds with a decline in the quantity of cigarettes demanded. The impact on the cigarette taxes collected is ambiguous.

The elasticity of demand will pin down the direction of change in the total spending on cigarettes. If, for example, demand is inelastic—that is, the elasticity of demand is less than one—the percentage change in the cigarette price is greater than the percentage change in quantity demanded and total spending on cigarettes will increase with an increase in the cigarette tax. Conversely, if demand is elastic—the elasticity of demand is greater than one—the percentage change in the cigarette prices is less than the percentage change in the quantity demanded and total cigarette taxes purchases will decline in the face of an increase in excise taxes.

Thus, revenues paid to the tobacco companies can either rise or fall in the face of the new tobacco tax. The proposed increase in cigarette prices is 20 percent if the new tobacco tax is added in January 2007. Meanwhile, the cigarette tax increases 471 percent if the amendment passes. If the elasticity of demand is greater than one, total sales for Missouri tobacco products would decline in the face of the tobacco tax. Only under extreme assumptions regarding the elasticity of demand, however, would revenues generated by the new tobacco tax decline. There is no evidence that the elasticity of demand is large enough to cause tobacco tax revenues to decline. There is evidence that the elasticity of demand is large enough to result in a decline in total spending on Missouri tobacco products.

I first turn to the results reported in the State auditor's fiscal note regarding the tobacco tax. I can deduce the elasticity of demand used in their calculations.

3.1 Elasticities and the State Auditor's Fiscal Note

On the last page of the fiscal note, the State Auditor cites the Governor Office's projections for revenues from the cigarette tax. Using the economic framework developed above, I compute the implied elasticity of demand for Missouri cigarettes that is consistent with the Governor's Office projections.

I begin by calculating the quantity of cigarettes sold in Missouri that are subject to the current cigarette tax. In Fiscal Years 2002, 2003, and 2004, Missouri collected $97.2 million, $97.9 million and $98.8 million in cigarette taxes, respectively. For the purposes of my calculations, I will use $98 million as the tax collection value, *tc*. According to equation (3.1), with $\tau = 0.17$, it follows that $q = 576{,}470{,}588$ packs are sold subject to the Missouri cigarette tax.

According to the Governor's Office, projected revenues from the cigarette tax are $197.3 million in Fiscal Year 2007, rising to roughly $400 million in Fiscal Year 2008. If the initiative passes, the cigarette taxes would apply for only one-half of the fiscal year 2007. Therefore, I use the projections for Fiscal Year 2008 as a guide for the projected quantity of cigarettes that are consistent with the revenue projections. Again, I apply equation (3.1) to derive the implied quantity of cigarettes sold that are subject to the Missouri tax. With $\tau = 0.97$ and *tc* set at $400 million, it follows that $q = 540{,}251{,}156$. Thus, the Governor's Office projects a 6.3 percent decline in the quantity of cigarettes after the higher tax is implemented.

Next, I solve for the implied elasticity of demand. In order to do so, I use the following equation:

$$\frac{\Delta tc}{\Delta \tau} = q\left[1 - \varepsilon\right] \qquad (3.2)$$

where Δ indicates "change in" a variable and ε denotes the elasticity of demand with respect to a change in the tax per package.[7] Note that after some algebra, equation (3.2) can be derived from equation (3.1).[8] For my purposes, the change in tax collections from the cigarette tax is $300 million. The change in the tax is $0.80. Thus, the left-hand-side of equation (2.2) is $300 million divided by $0.80, which equals 375,000,000. For *q*, I use the midpoint formula for the arc elasticity. In other words, *q* is the arithmetic mean of the quantity before the higher cigarette tax is imposed and the projected quantity after the higher tax is imposed. So, *q* = [(576,470,588 million + 540,251,156 million)/2] = 558,360,872. So, I divide 375,000,000 by 558,360,872, yielding 0.672. Thus, equation (2.2) implies that $1 - \varepsilon = 0.672$, or that $\varepsilon = 0.328$. Thus, the revenue projections are based on the notion that the demand for cigarettes is inelastic with respect to the tax. Throughout my analysis, I assume that retailers pass the size of the tax increase onto consumers. Formally, I assume that $\Delta\tau = \Delta p$, where *p* denotes the price of cigarettes.

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[7] Formally, the change represents the difference between the variable collected pre-tax increase and post-tax increase.

[8] The algebra is quite straightforward. Let *tc*' be the taxes collected under the higher cigarette tax. Then, $tc' = (\tau + \Delta\tau) \times (q + \Delta q)$. Subtract *tc* from *tc'*, yielding $\Delta tc \approx q\Delta\tau + \tau\Delta q$. Note that $\varepsilon = \frac{\tau}{q}\frac{\Delta q}{\Delta \tau}$. After rearranging, one can rewrite the expression as $\frac{\Delta tc}{\Delta \tau} = q\left[1 - \varepsilon\right]$.

Therefore, the elasticity with respect to cigarette taxes is equivalent to the cigarette's own-price elasticity.

3.2 Estimates of the elasticity of demand

There has been considerable economic research estimating the own-price elasticity of cigarettes. Table 1 reports the estimated own-price elasticity from ten different studies.[9] I include the data source and the estimation approach. At first glance, the literature has produced a range of estimates, suggesting that the answer is not very precise. At one end, the results indicate that the own-price elasticity is 0.05. This means that a one-percentage increase in the price results in a 0.05 percentage-point *decline* in the quantity of cigarettes demanded. At the other end of those reported in Table 1, the

Table 1

Study	Estimated own-price elasticity	Sample
Lewit and Coate, 1982	0.42	1976 National Health Interview Survey (OLS)
Mullahy, 1985	0.47	1976 National Health Interview Survey(IV)
Chaloupka, 1990	0.60	Second National Health and Nutrition Examination Survey, 1976-80 (IV)
Chaloupka, 1991, 1992	0.27 to 0.48	Second National Health and Nutrition Examination Survey, 1976-80 (IV)
Wasserman, et al. 1991	0.23	1985 National Health Interview Surveys (GLS)
Hu, et al. 1995	0.46	California Behavioural Risk Factor Surveys, 1985-91 (2SLS)
Ohsfeldt, et al.	0.05	1985 Current Population Survey (2SLS)
Centers for Disease Control and Prevention, 1998	0.25	National Health Interview Surveys (2SLS)
Evans and Ringel, 1999	0.25 to 0.56	Natality Detail, 1989-92 (2SLS)
Ohsfeldt, et al 1999	0.15	1992/93 Current Population Surveys, males (2SLS)

Source: Surgeon General's Report, Chapter 6, Table 6.8

[9] For the interested reader, I include the estimation method used in the study. Here, OLS means ordinary least squares; IV indicates that an instrumental variable approach was used. GLS means generalized least squares. 2SLS stands for two-stage least squares.

estimated elasticity is 0.6, which means that a one-percentage increase in the price results in a 0.6 percentage-point *decline* in the quantity of cigarettes demanded. Based on this quick survey of the literature, the elasticity of demand used in the Fiscal Note seems quite reasonable. There is an important feature of the samples used in this analysis; each study uses data on price changes at a national level. In doing so, the market is the national cigarette market. Because the national market covers a large geographic area, the costs borne by buyers to purchase cigarettes outside this market can be quite large. The implication is that United States cigarettes do not have as many close substitutes as cigarettes sold in a state market, resulting in a less elastic demand for national cigarettes. Put another way, when there is an increase in the price of U.S. cigarettes, it is difficult for buyers to avoid the U.S. price increase by going to Canada or Mexico.

To further illustrate the relationship between market size and the own-price elasticity of demand, I consider a special, limiting case. Suppose the tax increase were imposed on one store location; that is, one specific address. Moreover, the market size is defined by that store location. Because nearby stores would not be subject to the tax, consumers would avoid the tax by buying cigarettes at the other nearby locations. So, no cigarettes would be sold at the location subject to the cigarette tax. In this limiting case, the estimate of the elasticity demand for cigarettes would be infinity; there is a 100-percentage-point reduction in the quantity of cigarettes sold in my one-store market given a small-percentage-point increase in the price of cigarettes. The limiting case helps to build one's intuition regarding the economics of the tax increase. With regard to price changes, people will search for substitutes. In the case of cigarettes, perfect substitutes exist in stores or on the internet. The key question is how costly is it to buy cigarettes in a market that is not subject to the price increase. In this way, people avoid the higher cigarette tax by purchasing the items at other locations.

The own-price elasticity is critical for state governments seeking to project revenues. How much will the tax base change if there is a change in the excise tax? As Table 1 indicates, researchers have estimated cigarette's own-price elasticity to be between 0.05 and 0.5. However, the researchers were asking a different question than the

one needed by state governments.[10] There are subtle, but important differences, so that applying values with the Table 1 range is probably not a good idea. Revenue projections based on these own-price elasticities are likely to be above the actual projections because of the nature of state cigarette markets and the extent to which close substitutes exist.

Recently, researchers have asked questions specifically related to cigarettes and state markets. Most importantly, the implied elasticity used in the Governor's Office projection seems a little low for the state market. Since revenue projections are negatively related to the size of the elasticity of demand, it is important to use the "correct" estimate of the own-price elasticity.

Goolsbee and Slemrod (2004) examine the role that the internet cigarette sales have on the elasticity of the demand for cigarettes at the state level. Federal law stipulates that no more than 60,000 cigarettes (300 cartons) can be transported across state lines without proof that state taxes have been paid.[11] Goolsbee and Slemrod estimate the size of the elasticity of demand for cigarettes with and without the internet-effect. By purchasing 300 cartons or less, a person can avoid paying the state cigarette tax. With state-level data, the authors estimate that the own-price elasticity in state markets is 1.2 when they ignore the effect of online sales. They go on to estimate the elasticity, taking into account online sales. To measure online sales, they use the fraction of people in each state that use the Internet as a proxy measure for the volume of online cigarette taxes. With this measurement included, they find the elasticity of cigarette demand rises to 2.[12]

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[10] For the reader familiar with statistics, point estimates will vary from sample to sample. I cannot add any insight into this inherent stochastic element.

[11] See The Contraband Cigarette Trafficking Act of 1978. More recently, two changes have affected online cigarette sales. First, neither United Parcel Service nor Federal Express will ship from online cigarette sellers. This leaves United States Postal Service as the principal carrier. Second, credit card companies will not honor payments made to online sellers. Payment methods are limited to Paypal and checks. The switch to Paypal may not have a material effect on sales as this means of online payment is increasingly common. It is not clear how much the change in the shipping restrictions will seriously affect online sales. Especially since the United States Postal Service continues to ship online cigarette purchases.

[12] Note that 2.0 is the interpreted as the average elasticity of demand for cigarettes across states. For some states, like Alaska or Arizona, the elasticity of demand is likely to be less than two because there are very few competitors for state cigarettes. The absence of competition stems form the distance the state and the continental 48 states in the case of Alaska. For Arizona, there are few competing borders since the population lives predominantly along a line that bisects the state from north to south. It is several hours to a border state. There is a relatively strong case that Missouri's elasticity is at least two. Missouri is currently benefitting from having one of the lowest taxes as suggested by per capita number of cigarette packs sold; Missouri sold 103 packs per person in 2005. With the new tobacco tax, the relative standing of Missouri taxes to border states shifts dramatically and is likely to reduce the "excess" sales currently reported.

The implication is that online cigarette purchases are treated as a very good substitute for in-store purchases. As such, online sales result in a higher own-price elasticity of demand; that is, the demand for cigarettes is more elastic and the impact on state cigarette taxes collected will be adversely affected by the existence of online sales.

Goolsbee and Slemrod provide evidence suggesting that own-price elasticities are higher for state markets than for national markets. I have argued above that one of the important factors that can account for higher elasticities in state markets is that people face a lower cost to avoid the tax; they can move across the border. For Missouri, this may be particularly important because the two largest metropolitan areas—St. Louis and Kansas City—are located along borders with states that are not implementing higher cigarette taxes. However, the border states—Illinois and Kansas did impose higher cigarette taxes in 2002 while Missouri kept its cigarette taxes constant. Interestingly, two counties in the Missouri metropolitan areas collect a county cigarette tax. Both St. Louis County and Jackson County impose an additional tax on cigarettes. In both St. Louis and Jackson counties, the tax is 2.5 mills per cigarette, or 5 cents per pack. In Fiscal Year 2004, St. Louis County collected $4.2 million in cigarette taxes while Jackson County collected $2.9 million in cigarette taxes.

The two county cigarette taxes are potentially useful indicators to the extent that people avoid the higher taxes. In 2002, Illinois increased their cigarette tax by 40 cents. Kansas raised their taxes by 46 cents in 2002 and another 9 cents in 2003. Figure 2 plots two ratios over the period 2000 through 2004; one ratio is cigarette taxes collected in St. Louis County relative to the cigarette taxes collected in Missouri while the other is cigarette taxes in Jackson County relative to cigarette taxes collected in Missouri.[13] Figure 2 shows that between 2002 and 2003, the fraction of cigarette taxes collected in Jackson County rose. There has been a consistent decline in the fraction of cigarette taxes collected in St. Louis County over the time period. The evidence in Jackson County is consistent with the notion that Kansans avoided the higher cigarette taxes by increasing their purchases in Missouri between 2002 and 2003. The evidence for St. Louis County is

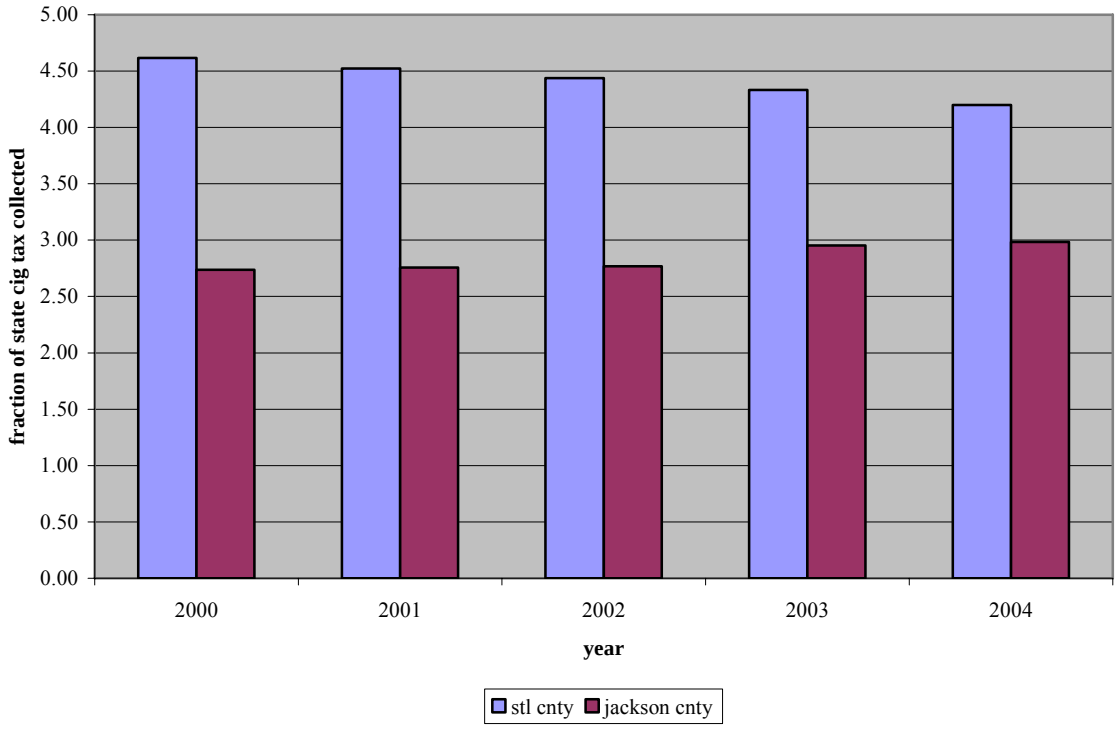
[13] I use this ratio is order to account for movements that occur in the state taxes collected over time. For instance, cigarette usage has generally decline in the state over the 2000-2004 period. Plotting cigarette taxes in the two counties would show a "structural" decline.

not evidence that Illinoisans did not attempt to avoid the higher cigarette taxes. Rather, St. Louis City

Figure 2

Ratio of county cigarette

tax collections to state cigarette tax collections



offers a competitive county-equivalent option for people to avoid the higher Illinois cigarette tax. St. Louis City may be even more attractive place to purchase cigarettes because it does not impose a cigarette tax over and above the state tax.

Many different effects are operating in the Kansas City and St. Louis metropolitan areas. The data are not collected in such a way to identify the contributing factor. The evidence, however, does suggest that tax avoidance may account for the change that occurs between 2002 and 2003, exactly when Kansas and Illinois implemented higher cigarette taxes.

3.3 Summary of the Economics

Overall, the evidence suggests that the elasticity of demand for state markets is greater than one. In my analysis, I consider a range of values between 0.4 and 2. In the next section of the report, I compute revenue projections under each of the four different own-price elasticity assumptions. These estimates are then used to assess the impact on the two sub-accounts in the Healthy Future Trust Fund.

4. Estimated Economic Impacts

In this section, I provide alternative projections of the cigarette tax collections. In addition, I compute the estimated effects that the amendment will have on Medicaid payments to Missourians.

4.1 Projections of cigarette tax collections

Here, I compute the expected value of revenues generated by the higher cigarette tax. The answer depends critically on the quantity of cigarettes sold in Missouri that are subject to the tax. This answer depends on the own-price elasticity of demand for cigarettes. Because there are a range of estimates produced by economic researchers, I will use four values: 0.4, 0.8, 1.0, and 2.0.

Table 2 reports the quantity of cigarette packs sold under the alternative measures of the elasticity of demand. In addition, I report the cigarette tax revenues generated by multiplying the quantity after the tax increase by the 80 cents per pack tax increase. Table 2 shows that the

Table 2

Annual Quantity and Revenues Projections

Under the Higher Cigarette Tax

Elasticity of demand	Quantity sold	Additional cigarette tax revenue (=col 2*0.8)
0.4	532,653,346	$426,177,677
0.8	492,044,690	$393,635,752
1.0	472,835,426	$378,268,341
2.0	386,294,724	$309,035,779

projected revenues from the tax will be between $300 million and $430 million, depending on the demand for cigarettes and its own-price elasticity. The proposed amendment allows for up to 2 percent of the collections to be applied toward collection expenses. This means that with an elasticity of demand equal to 2.0, the net additional revenue would be $302.8 million.

Next, I use the revenue projections to compute the expected distribution of funds into TUPECA and HCATA. Because the allocation of monies within HCATA are well defined, I further divide the monies to (i) health-care services to those at or below the 200-percent poverty guideline threshold; (ii) payments to safety net clinics; (iii) payments to trauma centers; (iv) payments to ambulance services; (v) supplemental payments to physicians. In addition to the cigarette tax, there will be additional revenues from the tax on other tobacco products. In Fiscal Year 2005, this tax raised $11 million. If consumption stays the same, the new tax will generate an additional $11 million in receipts. The tax on other tobacco products is likely to raise the consumer price and, therefore, reduce the quantity of those products purchased in Missouri. The revenues are fairly small compared to the revenues from the cigarette tax. Consequently, I will assume that an additional $11 million will be placed into the Healthy Future Trust Fund. Table 3 reports the results of these calculations.[14]

[14] The State Auditor's Fiscal Note projects revenues from the tobacco tax will be $351 million. I have not deducted expenses from the revenue projections. What is interesting is that my calculations are in the neighborhood of the State Auditor's for elasticities of demand between 1.0 and 2.0.

Table 3

Distribution of monies from the new tobacco tax

Elasticity of demand	Net Revenue from new tobacco tax	Designated to TUPECA	Designated to HCATA
0.4	$428,433,677	$74,975,893	$353,457,784 (i) $124,593,869 (ii) $45,949,512 (iii) $53,902,312 (iv) $4,418,222 (v) $124,593,869
0.8	$396,543,037	$69,395,031	$327,148,006 (i) $115,319,672 (ii) $42,529,241 (iii) $49,890,071 (iv) $4,089,350 (v) $115,319,672
1.0	$381,482,974	$66,759,520	$314,723,454 (i) $110,940,018 (ii) $40,914,049 (iii) $47,995,327 (iv) $3,934,043 (v) $110,940,018
2.0	$313,635,063	$54,886,136	$258,748,927 (i) $91,208,997 (ii) $33,637,361 (iii) $39,459,211 (iv) $3,234,362 (v) $91,208,997

Source: author's calculations; sums may not yield total due to rounding error

The next step is to estimate the expected costs of two of the Amendment's features. In particular, I am interested in the projected costs necessary to pay for the supplemental payments to physicians so the Medicaid fee schedule is closer to the Medicare fee schedule [item (i) in column (4) of Table 3] and to pay for health care services for people with incomes at or below the 200-percent threshold based on the federal poverty guidelines [item (v) in column (4) of Table 3].

4.2 Expected health care costs: the 200-percent federal poverty guidelines

The Amendment specifies that HCATA funds are to be used to fund health care services to individuals with income that equals 200 percent or less of the federal poverty guidelines. In addition, a fraction of HCATA funds shall be used for supplemental payments to physicians and, subject to the availability, to convert Medicaid physician fee schedule up to the Medicare physician fee schedule.

To begin, I will compute the maximum expected costs to Missouri if it provided health care services to all people with incomes at or below 200 percent of the federal poverty guidelines. To perform this calculation, I need to know the expected number of Missourians that satisfy the income test. In addition, I need an estimate of the medical expenses per person. The product of these two numbers will yield the maximum expected costs to provide health care services to Missourians with incomes at or below the level set at 200-percent of the federal poverty guidelines.

In order to find the number of Missourians that are likely to satisfy the income test, I use data collected by the United States Census Bureau. For 2006, the Health and Human Services specifies Poverty Guidelines, which are provided in Table A.1 in Appendix A. The United Census Bureau reports number of people in income brackets. For 2003, Table reports the distribution of income and benefits for Missouri.
There is no straightforward way to translate the data from the size distribution of income reported by the Census Bureau to the number of Missourians that are at or below the 200 percent threshold indicated by the federal poverty guidelines. The problem lies in the number of people in each household.

To further illustrate the problem, note that the federal poverty guidelines indicate that a family of four with income less than or equal to $20,000 satisfies the poverty guidelines. For Missouri, this means that for all families with four people and income less than $40,000, they would satisfy the income test to receive funds for health care services. For instance, the Census Bureau data report that there are 398,713 households earning incomes greater than $35,000 but less than $50,000. So, for example, a household earning $38,000, for example would satisfy the income test to receive funding for health care services if it contained four people, but not if the household has three or fewer people because the income threshold falls to $32,000 (or less) for households with fewer people.

Table 4

Distribution of Income and Benefits for Missouri, 2003

Income brackets	Total number of households
Less than $10,000	209,566
$10,000 but less than $15,000	151,645
$15,000 but less than $25,000	307,945
$25,000 but less than $35,000	304,253
$35,000 but less than $50,000	398,713
$50,000 but less than $75,000	459,808
$75,000 but less than $100,000	225,256
$100,000 but less than $150,000	161,063
$150,000 but less than $200,000	34,484
Greater than $200,000	31,930

Source: website: http://www.census.gov/acs/www/Products/Profiles/SIngle/2003/ACS/

I begin by using data on the average number of people in a household. According to the 2000 decennial census, the Census Bureau reports that there are, on average, 2.1 people per household. Based on the federal poverty guidelines, the 200-percent income threshold is $26,400 households with two people in 2006. Table 4 reports that there 669,156 Missouri households with income and benefits less than or equal to $25,000. I use the 669,156 figure as the number of households with incomes at or below 200-percent of the federal poverty guidelines. I then multiply the number of households in Missouri by the average number of people per household (669,156*2.1) to obtain

1,405,227. I use this figure as the expected number of Missourians that fall below the 200 percent poverty threshold.[15]

Note that the current number of people covered by Medicaid in Missouri is 992,622.[16] I am interested in the expected medical costs of "new" people receiving health care benefits under the tobacco tax amendment. Thus, I need to compute the difference between the number of Missourians with incomes at or below 200 percent of the Federal poverty guidelines and those currently enrolled in the Medicaid program. The difference is 412,605.

Next, I need some estimate of the medical expenses per person. For that, I turn to the United States Department of Health and Human Services which conducts a Medical Expenditure Survey. In 2003, the department reported that 86 percent of the American people had some medical expense. Of those reporting expenses, the median medical expense was $559 in 1996. In order to account for inflation in the prices of medical services, I adjust the 1996 value to what would be the same cost of services in 2005. The United States Bureau of Labor Statistics reports that the average inflation rate between 1996 and 2005 for medical care expenses was 3.8 percent. So, the median value of medical care expenses equal to $559 in 1996 would be expected to cost $808 in 2005. Note that 86 percent of population reported a median annual expense equal to $808 in 2005 dollars. However, 14 percent reported zero expense. Consequently, I compute the expected medical care expense as a weighted sum of the people reporting medical expenses and those reporting no medical expenses. Thus, the weighted sum is (0.86*808) + (0.14*0) = $694.9. I use $694.90 as the expected medical expense per person in Missouri.

The Missouri Hospital Association also reports the average medical cost per person enrolled in Medicaid. Their report indicates that spending is $1909 per child enrolled and $2816 per adult.[17] Suppose the distribution of Missourians with incomes is distributed the same as the state population. In 2005, the Census Bureau reports that 62.9 percent of Missourians are between 18 years old and 65 years old. In addition, 24.3

[15] Note that by increasing the family size, I would raise the income boundary defined by the federal poverty guidelines which would potentially increase the number of Missourians identified as satisfying the 200-percent income threshold.
[16] See www.dss.mo.gov/dms/global/pdf/medicaiddollars.pdf for this report.
[17] See http://web.mhanet.com/asp/Governmental_Relations/medicaid/medicaid_future_may05.asp .

percent of the population is less than 18 years old.[18] If all new recipients are children or adults; that is excluding the elderly, then the number of new recipients less than 18 years old will be 100,263. Meanwhile, the number of new adults receiving care will be 259,528.

Now, I can compute the expected value of health care services for people with income less than 200 percent of the federal poverty guidelines. There are 412,605 Missourians that are expected to satisfy the income test with each person spending $694.90. The product is the expected value of health care services for Missourians with incomes that are less than 200 percent of the federal poverty guidelines. After multiplying these two numbers, the expected medical expense for these people is $286,714,214. If I use the Missouri Hospital Association expected costs per enrollee, then I add two products; that is, (100,263*1909)+(259,528*2816), which equals $922,232,915.

Here, I use the calculations reported in Table 3 to assess the ability for the new tobacco tax revenues to cover the expected health care costs. With the most inelastic demand for cigarettes, I find that the funds in HCATA available to cover the health care costs of Missourians with income less than or equal to 200 percent of the federal poverty guidelines is $127,136,733. Yet, expected expenses are estimated to be $286 million under the most conservative scenario and up to $922 million under the costs given by the Missouri Hospital Association. Thus, the shortfall is between $159 million and $795 million. In this scenario, I assume that the courts interpret the Amendment as a state mandate requiring Missouri to cover the health care expenses of residents with incomes at or below 200 percent of the federal poverty guidelines, the state would expect to pay up to $795 million out of general revenue funds.

There is an alternative interpretation. Suppose there is a first come-first serve approach such that HCATA monies are allocated to health care expenses for Missourians meeting the income test and once exhausted, the state's obligation ends. How many Missourians would be expected to have their health care costs funded by the HCATA allotment? Divide $127 million by $694.90, yielding 182,957 people could be served. If I use the Missouri Hospital Association figures, the $127 million could be used to serve 66,527 children *or* 45,099 adults. Obviously, if the expected cost per enrollee is higher, fewer recipients could be treated. Thus, about one in seven eligible Missourians would be

[18] See www.census.gov and the fact sheet for Missouri.

expected to receive health care expenses from the HCATA allotment before the monies would be exhausted.

Note that I did these calculations under the most inelastic demand scenario. If, in contrast, the elasticity of demand is 2.0, there is only $93 million available from the HCATA allotment that goes toward covering the health care expenses of Missourians with incomes less than or equal to 200 percent of the federal poverty guidelines. The shortfall increases to a maximum of $829 million. Alternatively, revenues would cover expected health care costs for, at best, 133,933 people if I use the expected cost per patient equal to $694. If I use the Missouri Hospital Association figures, $93 million could be used to cover expenses for up to 48,717 children *or* 33,026 adults. Note that under the most elastic case, the HCATA allotment would be able to cover about 50,000 fewer people compared to the most inelastic case.

The bottom line is that the provision in the Amendment is not close to be funded enough to meet the expected costs of Missourians that meet the income test.

4.3 Supplemental payments to physicians

In the Amendment, Subsection 2 of Section 8 stipulates that 35.25 percent of HCATA monies are allocated to provide supplemental payments to physicians to convert Medicaid fee schedules to be up to the Medicare fee schedule. Here, I examine the expected size of the supplemental payments to physicians.

I use the Medical Expenditure Survey to estimate the cost of physician visits that would be covered if the Amendment passes. Specifically, the survey measures the distribution of respondent's costs for ambulatory care. I use ambulatory costs as the sole proxy for physician expenses. In this way, I am taking a very conservative approach to measuring physician fees that would be supplemented if the Amendment passes.

Data from the Medical Expenditure Survey divides the respondents into two groups: those that reported ambulatory medical expenses and those that did not. Note that 73 percent of respondents reported ambulatory medical expenses. The median expense in 1996 was $274. After adjusting for the annual average 3.8 percent inflation in medical expenses, the median expense in 2005 is $397. It follows that 27 percent of survey respondents reported zero ambulatory medical expenses. I follow the same methodology as I used to find the expected health care expense for those with incomes at or below 200

percent of the federal poverty guidelines; namely, I compute a weighted sum using the median value for 73 percent of the population and $0 for 27 percent of the population. Thus, the weighted sum is (0.73*397)+(0.27*0) = $290, which is interpreted as the expected per person ambulatory medical expense.

In order to compute the expected ambulatory medical expense for Missourians who are covered by Medicaid, I need to know the number of people who receive Medicaid benefits. The United States Census Bureau reports that 5,800,310 people live in Missouri in 2005. I discovered that 11 percent of Missourians received Medicaid benefits in 2001.[19] If the fraction of Medicaid recipients were the same in 2005 as in 2001, there are 638,034 Missourians receiving Medicaid benefits. I multiply this number by $290 to obtain the aggregate ambulatory medical expense for Missourians receiving Medicare benefits; or, $185,029,860.

The Amendment stipulates that 35.25 percent of the funds in HCATA will be used to provide supplement Medicaid payments to physicians up to the level for Medicare patients. There are no published guidelines for Medicaid and Medicare patients. Therefore, the supplemental payment is a bit ambiguous. For my purposes, suppose Medicaid currently pays about 30 cents on the dollar for physician visits while Medicare pays 60 cents on the dollar. So, the supplement would need to be about 30 cents per dollar spent on physician care. I proceed to compute the size of the supplemental payment to physicians by multiplying the aggregate expected dollar value spent by Missouri Medicaid recipients by 0.3. The result is an estimate of expected supplement payment that would go to physicians treating Medicaid patients in Missouri. I calculate that the size of the supplemental payment would be $55.5 million.

What happens if I use the sample mean for the ambulatory medical expense instead of the median. Recall that the median is a central tendency of a distribution with 50 percent of the survey respondents having larger expenses and 50 percent of the survey respondents with some expenses have smaller expenses. The sample mean is the central tendency that measures the total expense divided by the number of respondents. Since some of the respondents will have very large expenses, the distribution is not centered over one value like a classical bell-shape. Rather, the distribution is skewed to reflect the

[19] Source: The Center for Health Policy, Policy Brief Number 1, Table 1, 2003.

high-expense outcomes that occurred. After adjusting for the inflation, the $920 value in 1996 is $1287 in 2005. The expected per person ambulatory medical expense is (0.73*1287)+(0.27*0) = $939. The aggregate ambulatory medical expense for Missourians receiving Medicaid benefits is $599,113,926. To provide 30 additional cents on each dollar spent, the figure is $179,734,178.

From Table 3, HCATA will have between $93 million and $128 million available to cover the supplemental payments such that Medicaid fee schedule is in line with the Medicare fee schedule. If the median level of ambulatory medical expense is a reasonable proxy, then monies in HCATA will be sufficient to cover the supplemental expenses. However, if the sample mean is a better measure of the expected per-person physician fees, I find that the monies deposited into HCATA would be insufficient to cover the supplemental payments to physicians. Indeed, the shortfall is over $50 million if the demand for Missouri cigarettes is inelastic and is over $86.7 million if the elasticity of demand is equal to 2.0.

It is important to note that the federal government reimburses the state $1.56 for each $1 spent for Medicaid beneficiaries. For instance, for the case in which the elasticity of demand for Missouri cigarettes is equal to 2.0, the state will spend $93 million. Federal matching funds will be 1.56 times $93, which equals $145.1 million. Thus, the monies collected from the new tobacco tax *combined with* the federal matching funds will be enough to meet the supplemental payments to physicians, bringing the Medicaid fee schedule up the Medicare fee schedule.

4.4 Hold Harmless Funds

Missouri currently collects 17 cents on each pack of cigarettes sold. The taxes collected are earmarked for three funds: the School Money Fund, the Fair Share Fund, and the Health Initiatives Fund. Section 5 of the proposed amendment includes a special provision that purports to maintain revenues going into these three funds. Specifically, the Director of Revenue can transfer up to three percent of the taxes collected under the new cigarette tax in order to maintain revenue losses that occur because the demand for

Missouri cigarettes falls in response to a price increase. In this sense, some of the monies collected from the new tobacco tax are directed to hold the existing funds harmless.[20]

Both the School Money Fund and the Fair Share Fund are aimed at K-12 education. The Health Initiatives Fund uses monies to cover health care expenses and education. As the reader will see, the elasticity of demand will play an important role in terms of being able to hold these three funds harmless.

The basic premise is that the new tobacco tax will be passed on to consumers. With an increase in the price of Missouri cigarettes, the quantity purchased will decline. The implication that the three existing funds supported by the 17-cent tax will realize smaller collections as the product of quantity times the excise tax falls. With declining cigarette sales in Missouri, funds collected for the School Money Fund, the Fair Share Fund, and the Health Initiatives Fund will decline. Table 5 reports the lost revenues to the three existing funds for the different elasticities of demand. It is clear from Table 5 that

Table 5

The impact of the new tobacco tax on

three funds supported by the existing 17-cent tobacco tax

	School Money Fund	**Fair Share Fund**	**Health Initiatives Fund**
Elasticity	**Reduction in Monies collected**	**Reduction in Monies collected**	**Reduction in Monies collected**
0.4	$3,943,552	$1,752,690	$1,752,690
0.8	$7,598,331	$3,377,036	$3,377,036
1.0	$9,327,165	$4,145,406	$4,145,406
2.0	$17,115,828	$7,607,035	$7,607,035

as the elasticity of demand increases, monies collected by the existing 17-cent tax decline and the three funds suffer larger losses. The School Money Fund is expected to lose between $3.2 million for the case in which demand is inelastic and $17.1 million for the case in which the elasticity of demand is equal to 2.0. Similarly, the Fair Share and

[20] The limitation is actually three percent of the monies collected per month. Over the year, there is a three percent maximum of annual monies collected that could be contributed to the Hold Harmless Fund.

Health Initiatives Funds will see reductions in monies collected from cigarette sales. The projected loss will be $1.7 million under the assumption that the elasticity of demand is 0.4 and $7.6 million if the elasticity of demand is 2.0.

To partially offset the reduction in monies collected by these three funds under the new tobacco tax, the Amendment gives the Director of Revenue authority to apply as much as 3 percent of the new tobacco tax monies to the three funds. The objective is to hold three funds harmless. The problem arises because the Amendment indicates that at most 3 percent of the monies collected under the new tobacco tax can be applied to the Hold Harmless Fund. More concretely, the more elastic demand for Missouri cigarettes is, the larger the harm to the three existing funds. As fewer Missouri cigarettes are purchased, the 3-percent limit may not be sufficient to indeed, hold these three funds harmless.

To illustrate this point, suppose the elasticity of demand for Missouri cigarettes is 0.8. Missouri would collect $396.6 million in revenues from the new tobacco tax (see Tale 2). The maximum contribution to the Hold Harmless Fund is 3 percent of $396.6 million, or $11.9 million. Under this assumption, however, the Director of Revenue could not supplement the Hold Harmless Fund with enough monies to offset the reduction in taxes for these three funds. As Table 5 shows, the revenue collections paid into the three funds will be $7.6 million + $3.4 million + $3.4 million = $14.4 million. Note that with an elasticity of demand equal to 2.0, the shortfall in the Hold Harmless Fund is $23 million as the three funds would see their collections fall by $32.3 million and the maximum contribution from the new tobacco tax collections would be only $9.3 million.

Thus, the new tobacco tax is actually likely to harm Missouri schools by eroding their financial resources. According to the current contribution rates, 76 percent of the existing tobacco tax collections are spent on Missouri education. If the harm is distributed among the three funds equally according to these contribution rates, then state monies allocated to Missouri schools would decline by $17.5 million for the case in which the elasticity of demand is equal to 2.0.

5. Tax Incidence

The purpose of this section is to examine the distributional consequences of the new tobacco tax. By definition, the tax is borne directly by tobacco users. The monies collected from the tax are distributed to other parties. In addition, I examine some of the indirect effects that the new tobacco tax can have on those selling Missouri cigarettes.

It is straightforward to identify who bears the direct effect of the cigarette tax. The total value of the new tobacco tax will cost cigarette smokers between $309 million and $426.2 million, depending on the elasticity of demand for Missouri cigarettes. For the purposes of the incidence analysis, I will focus on the case in which the elasticity of demand is equal to 2.0. In this case, the State of Missouri will collect $302.8 million in taxes from the new tobacco tax.

So, who benefits from the new tobacco tax? It is not always clear who the recipient of the monies will be. For instance, with the elasticity of demand equal to 2.0, TUPECA is slated to receive $53 million. However, there is no definitive group associated with these funds. Monies are allocated to mass media, community programs and surveillance. Other monies are somewhat more clear. For instance, $88 million is slated to go to physicians that provide services to Medicaid beneficiaries. In addition, safety net clinics will receive $32.5 million, trauma centers will receive $38.1 million, and ambulance services will receive $3.1 million.

There are also indirect costs borne by retailers that sell cigarettes. The incidence arises because cigarette buyers substitute away from Missouri retailers that are subject to the tax. Thus, there is a transfer from Missouri store owners to out-of-state retailers who sell cigarettes that are not subject to the new tobacco tax. Note that convenience store owners annually sell $360,000 in tobacco products per store. The reduction in Missouri cigarette sales is between 40,000,000 packs and 190,000,000 packs, depending on how price sensitive consumers are. For the purposes of my illustration, suppose that the elasticity of demand for Missouri cigarettes is 2.0. If Missouri retailers currently sell 576,000,000 packs, the new tobacco tax would result in a reduction of 189.7 million packs of cigarettes. In percentage terms, cigarette purchases would decline by 38 percent

in Missouri.[21] Next, suppose that the loss of sales is equally distributed across all convenience stores. Therefore, with a 38 percent reduction in sales, the typical convenience store would see sales fall by $136,800. Insofar as people substitute their cigarette purchases, lost sales in Missouri convenience stores represent a transfer to these new cigarette sellers.

6. Economic benefits—productivity gains

There are indirect benefits that arise because of the reduction in smoking. Specifically, one input—the quantity of effective labor—increases as smoking decreases. In this section, I compute the expected increases in Gross State Product that occur because of the productivity gain associated with healthier workers.

In order to quantify the gains realized to the quantity of labor, I need some reliable measure of the decline in the number of smokers. The United States Department of Health and Human Services reports that the number of smokers declines 0.26 percent for every one percent increase in cigarette prices.[22] If the Amendment passes, Missouri cigarette price will increase by 19 percent. Thus, the new tobacco tax will result in a 4.9 percent decline in the number of smokers in Missouri. The Center for Tobacco Cessation reports that 27.3 percent of Missouri's adult population was identified as smokers in 2005.[23] With a population of 3.6 million, this means that 972 thousand Missourians are smokers. With the additional tobacco tax, a 4.9 percent decline amounts to 47,600 fewer smokers because of the effect that the new tobacco tax would have on cigarette prices.

The last piece of the calculation is to quantify the lost productivity per smoker. The Center for Disease Control estimates that smoker's lost productivity is valued at $1,760.[24] It follows that Missouri's lost productivity would be $83.8 million in lost output. In other words, Missouri's Gross State Product (GSP) is expected to increase by $83.8

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[21] I compute the percentage change as using the average price as the denominator; that is, $4.05 = \frac{3.65+4.45}{2}$. So, 0.8÷4.05 = 0.19, or 19 percent.

[22] Source: Table 7.1 found at www.quit.org.au/Fandi/fandi/c07s1.htm. Note that I am also including the effects of education efforts in this number. Some Missouri smokers will continue to smoke, purchasing cigarettes in other, non-tax locations.

[23] See Center for Tobacco Cessation—Missouri facts 7-1-2005.

[24] See Annual Smoking-Attributable Mortality, Year Potential Life Lost, and Economic Costs—United States, 1995-99.

million because there will be fewer smokers. With Missouri's GSP at $216,069 million in 2005, the productivity gain amounts to a 0.04 percent increase because of healthier workers.

With an increase in GSP, there will also be gains to Missouri's General Revenue Fund. Historically, Missouri collects 3.8 percent of each dollar of GSP in General Revenue. Thus, an increase of $135.5 million translates into $3.18 million in additional net General Revenue Funds collected by the State because workers are healthier and produce more goods and services.

7. Summary and conclusions

Cigarette taxes are often targeted as useful because many perceive demand is inelastic. While there is plenty of evidence to support this at the national level, state cigarette taxes are different. In particular, there are many substitutes for state cigarettes; citizens can cross borders or shop online for their tobacco products.

The elasticity of demand for Missouri cigarettes plays a central role in analyzing the economic effects of the November election. At that time, Missourians will vote on an Amendment that raises the cigarette tax by 80 cents per pack and raise the tax on other tobacco products. In addition, the Amendment dictates how monies collected from the new tobacco tax will be spent.

In this report, I compute the expected full-year revenues from the new tobacco tax. I compare this against the projections reported in the State Auditor's Fiscal Note. I find that the projected revenue is about $50 million less than the most conservative projections reported in the Fiscal Note. The reason is simple. The projections are based on demand elasticities that are too low compared with evidence from recent research using state-level data.

I proceed to examine the funding allocations directed by the Amendment. Three are particularly interesting. First, funds are directed to provide health care services for low-income Missourians. Second, the Amendment directs monies to finance supplemental payments to physicians so that Medicaid fee schedules match Medicare fee schedules. Third, the Amendment provides for monies to be used to keep funds supported by the existing tobacco tax. I show that the Amendment's provision for health care

services are under funded by $800 million. The wording potentially exposes State Government to a spending mandate that would require General Revenue Funds. With the federal government's matching funds, there will be enough money to cover the expected costs of the supplemental payment plan. The existing tobacco tax stipulates that the lion's share of the funding goes to K-12 education. The new tobacco tax, however, will not hold these funds harmless. Indeed, I find that the shortfall means that the state will pay $17 million less to Missouri elementary and secondary schools.

In terms of the impacts on the Missouri economy, I examine the distributional effects and the macroeconomic effects. The incidence of the new tobacco tax is borne chiefly by smokers and users of tobacco products. I find that the new tax will cost tobacco users in Missouri about $310 million. The monies collected are distributed to physicians as well as the owners of ambulance companies, emergency rooms and trauma centers, and safety net clinics. With respect to the macroeconomic effects, price increases associated with the new tobacco tax will result in fewer smokers. Evidence suggests that nonsmokers are more productive, owing chiefly to better health, than smokers. I find that the productivity gain adds $83.8 million to Missouri Gross State Product. Further, the state's non-tobacco tax revenues rise by over $3 million. While large in dollar terms, it is important to note that GSP is only 0.04 percent higher because of the reduction in the number of smokers.

References

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Appendix A

Federal Poverty Guidelines, 2006

Persons In Family or Household	Income Boundary
1	**$9,800**
2	**$13,200**
3	**$16,600**
4	**$20,000**
5	**$23,400**
6	**$26,800**
7	**$30,200**
8	**$33,600**
For each additional person, add	**$3,400**

Source: *Federal Register*, Vol. 71, No. 15, January 24, 2006, pp. 3848-3849. Website: http://aspe.hhs.gov/poverty/06poverty/shtml