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# WORKING PAPER

**SIN TAXES**

**Size, Growth, and Creation of the Sindustry**

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## **Abstract**

Revenue shortfalls have undermined states' ability to balance their budgets. Particularly attractive places for new revenue creation are taxes levied selectively on specific goods whose consumption public policy makers want to discourage, arguing that they impair the consumer's health, generate negative externalities, or both. These selective taxes collectively are known as "sin taxes" because of their historical association with vice. This paper explores three criticisms of sin taxes. First, the taxation of selected goods as a source of general budget revenue contradicts the standard Pigouvian social welfare argument. Second, the economic burden of sin taxes falls disproportionately on low-income households. Third, the expanding number of goods being taxed in this way results in unproductive preventive and defensive lobbying by the affected industries.

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## **Sin Taxes:**

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#### **I. Introduction**

Revenue shortfalls associated with the Great Recession and the corresponding slow recovery have hindered the ability of US state governments to balance their budgets. With lingering economic doldrums eroding governmental tax bases and strong resistance to proposals for cutting public spending or raising broad-based taxes, many states have begun searching for new revenue sources. Particularly attractive targets for revenue creation are goods deemed by policy makers to be unhealthy, to generate negative externalities, or both. Historically, certain items have been the primary focus of selective excise taxation: tobacco, alcohol, salt, stamps, tea, and motor fuels.<sup>1</sup> Owing to alcohol, tobacco, and gambling's longstanding association with vice, taxes on these items are commonly referred to as "sin taxes." While taxing items with presumed negative effects on public health, public morals, and the environment has a long history in traditional welfare economics, a growing number of consumer goods are now being added to the list of items singled out for selective sin taxation.

Recent additions to the sin tax category are foods that are high in sugar, trans fats, and other ingredients the public health establishment has associated with rising incidences of obesity,<sup>2</sup> type 2 diabetes, and similar so-called epidemics. Indeed, 33 states already have implemented a soft drink tax. Because public health expenditures are correlated with the

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<sup>1</sup> An excise tax is a per-unit tax levied on a particular good. It is not the same as an ad valorem tax, which is levied as a percentage of the value of the good sold. Ad valorem taxes, such as a general sales or payroll tax, also often are levied on much broader tax bases.

<sup>2</sup> But see Flegal et al. (2012, 71–72), who conclude, based on a meta-analysis of 97 published studies, that "grade 1 obesity," defined as a body mass index (BMI) between 30 and 35, "overall was not associated with higher mortality, and overweight [BMIs between 25 and 30] was associated with significantly lower all-cause mortality."

consumption of these goods, a case has been made for the selective taxation of all sugar-sweetened beverages, junk food, and many items on the menus of fast food restaurants (see Brownell et al. 2009 and Jacobson and Brownell 2000).

This paper addresses three criticisms of sin taxes: First, the traditional Pigouvian justification applied to sin goods, such as alcohol and tobacco, is frequently misapplied to a progressively broader base of goods and services where the “sin good” label is questionable, such as automobile tires, candy, soft drinks, and fast food. The standard argument is that, because consuming these and other goods generates negative externalities that consumers are unable to take into account, private markets “fail” in the sense that consumers purchase more sin goods than is socially optimal. Hence, governments must intervene by imposing the appropriate tax rate so that consumers internalize the externality and reduce their purchases. However, at some point, this justification blurred with things like motor fuel taxes, originally justified as user fees meant to build and maintain highway capacity. Nowadays, the justification advanced for taxing sin goods is often based on paternalistic, normative grounds—policy makers can make better consumption choices for individuals than individuals can make for themselves. Second, like consumption taxes in general, the burden of sin taxes usually falls disproportionately on low-income households. Third, the expanding list of goods taxed in this way triggers socially wasteful lobbying by the affected producers. They lobby both to counter the imposition of new sin taxes and to prevent existing tax rates from rising. Special-interest groups that support new or higher excise taxes also invest resources in promoting their own points of view. To illustrate the government’s exploitation of this tax base, we additionally document the trends in sin taxes over time, including changes in sin tax rates and the amounts of revenue they raise.

## II. Welfare Economics and Sin Taxes

The standard case for taxing a specific consumer good arises when consuming that good has negative external effects.<sup>3</sup> In other words, consuming the good imposes a cost on some third party not involved in either its consumption or production. Thus, social welfare can be improved by increasing the consumer's price for the good and thereby curbing the behavior associated with the negative externality. However, this justification is incomplete unless the tax revenue is used to mitigate the spillover effects of consumption. When such taxes are levied independently of the concern for the underlying externality, they become revenue-raising rather than social-welfare-enhancing taxes.

Consider, for example, the air pollution generated by burning motor fuel. While additional flexibility in travel plans is beneficial to individuals who have access to their own vehicles, choosing to drive rather than to take the bus or subway increases air pollution, congestion, and perhaps contributes to climate change. The adverse health effects of air pollution rise with increases in the emissions of sulfur dioxide and other particulate matter from tailpipes. Therefore, a marginal reduction in the number of gallons of gas burned in a local area will increase the public's overall health as air quality improves. In theory, public welfare can be enhanced by a targeted tax on the good (motor fuel) equal to the difference between the private cost and the social cost per gallon bought and sold. Scaled in this way, such a tax would reduce

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<sup>3</sup> See the discussion of the classic example of road pricing in Pigou (1952, 194): "The principle is susceptible of general application. It is employed, though in a very incomplete and partial manner, in the British levy of a petrol duty and a motor-car licence tax upon the users of motor cars, the proceeds of which are devoted to the service of the roads." Pigou points out in footnote 2, "The application of the principle is incomplete, because the revenue from these taxes, administered through the Road Board, must be devoted, 'not to the ordinary road maintenance at all, however onerous it might be, but exclusively to the execution of new and specific road improvements' (*Webb, The King's Highway*, p. 250). Thus, in the main, the motorist does not pay for the damage he does to the ordinary roads, but obtains in return for this payment an additional service useful to him rather than to the general public." See also the discussion of the history and implications of this example for common goods in Buchanan (1956).

the consumption of gasoline, including the negative effects of pollution, to the socially optimal level. Of course, getting the tax rate “right” is much easier in theory than in practice.

However, this framework is not used to justify sin taxes nowadays. The argument is not put forth solely on the basis that exposure to secondhand cigarette smoke causes cancer or that alcohol consumption leads to drunk driving accidents that maim or kill sober third party individuals. Nowadays, sin taxes more often are supported on the grounds of policy makers’ expressed paternalistic concern for the harm consumers do to themselves. Rarely do policy makers justify a sin tax based on the direct budgetary effects of government-funded health care programs, which experience uncompensated strain when the taxpayers in general are called upon to pay the costs of repairing self-inflicted bodily harm (e.g., cancer caused by smoking or obesity caused by consuming sugary soft drinks). The socialization of the consequences of risky behavior demands that people be “nudged” by selective taxes into adopting healthier lifestyles (Thaler and Sunstein 2008). But this nudge is based on normative ideas about the desirability of a choice like consuming “too much” sugar and not on a welfare economics claim about rising medical costs.

For ambient air pollution, Pigouvian taxes have been imposed predominately by state and local governments. Cities can point to the necessity of reducing smog and improving air quality ratings as justifications for taxes on gasoline and diesel fuels.<sup>4</sup> Gasoline taxation at the federal level was originally justified as a user fee to help pay for the construction and maintenance of the Dwight D. Eisenhower National System of Interstate and Defense Highways.

In order to align the private costs of individual consumption choices with their social costs, which include the costs borne by others, public policy makers try to close the gap by

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<sup>4</sup> Beijing, for example, placed heavy restrictions on permissible auto traffic to help reduce air pollution ahead of and during the 2008 Olympic Games.

levying an excise tax equal to the external cost per unit purchased. Because cigarette smoking causes cancer and treatment for smoking-related diseases is financed at least in part by taxpayers through Medicaid, Medicare, publicly owned hospitals and nursing care facilities, and other entities, excise taxes are levied at the state and federal levels on cigarettes and other tobacco products ostensibly to (a) reduce tobacco use and (b) generate revenue that helps defray the costs smokers impose on the public budget. Governments also prohibit smoking in public places and sue the cigarette manufactures, the latter of which we discuss more thoroughly below. At first glance, the Pigouvian formulation might appear to be an acceptable strategy for dealing with the consumption of a good that generates negative externalities (tobacco) or the production of one that is consumed collectively (highways), but this line of reasoning assumes that the revenue raised by selective excise taxes is spent in the ways intended—for treating smoking-related disease or maintaining the interstate highway system.

Despite being earmarked for expenditures on roads, highways, and bridges in most states, the revenue generated by motor fuel taxes often is raided to supplement general tax revenue because the money is fungible (Crowley and Hoffer 2012). Highway “trust funds,” similar to the Social Security “trust fund,” frequently are treated as ordinary revenue at all levels of government, contrary to the original design. The same holds true for tax revenues from tobacco and alcohol.

Changing smokers’ behavior creates a complex set of tradeoffs. Reducing smoking may ultimately lower the health care costs associated with tobacco consumption—unless smokers’ lives are significantly prolonged after quitting.<sup>5</sup> Given the relatively price-inelastic demand for

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<sup>5</sup> Recent studies have shown that smokers cost governments less in social welfare expenditures than otherwise identical nonsmokers. Because smokers die younger, on average, they require fewer long-term health care services and collect fewer Social Security benefits. These savings more than compensate for the medical costs of those who become ill from smoking (Viscusi 1994; Sloan et al. 2004).

cigarettes, however, the reduction in consumption resulting from an excise tax will be limited. On the other hand, since demand is inelastic and the quantity of cigarettes sold therefore falls by a smaller percentage than the tax-ridden increase in price, sin taxes may be a relatively efficient means of raising revenue: such taxes create minimal excess burdens (deadweight social welfare losses) largely because of the small reduction in quantity demanded.<sup>6</sup> Thus, incentives to raise more revenue to plug holes in the public budget frequently work at cross-purposes with the aim of reducing smoking, leading to significant public choice problems.

The state tobacco litigation cases that played out in the mid- to late 1990s are great examples of the public choice dilemma. Revenue windfalls that were justified on the basis of smoking-related public health care costs were reallocated to the general budget and spent quickly. Mississippi, for example, received the most revenue per capita from the Master Settlement Agreement (MSA) with the tobacco industry, but spent only 29.8 percent of the settlement funds on Centers for Disease Control–recommended health care measures and only 4.6 percent on antismoking campaigns (Stevenson and Shughart 2006). Across all US states, for every dollar of MSA revenue, less than five cents was spent on antismoking programs (Hoffer and Pellillo 2012). A large share of the remainder finds its way into the general budget and is used to finance other government programs for which the marginal political returns to public spending are higher.

The traditional definition of a public good was something that, like national defense or a fireworks display on the Fourth of July, is both non-rival, meaning that one person's consumption of the good does not reduce the amount available for others to consume, and nonexcludable, meaning that access cannot be denied to anyone, including those who have not

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<sup>6</sup> See Harberger (1954, 1964), Hines (1999), and Ramsey (1927) for a further discussion of optimal excise taxation and deadweight loss.



contributed to financing its provision. The literature also identifies a category of goods that are nonexcludable, at least in principle, yet rival in consumption. Such goods are called “common goods” (Samuelson 1954). The consumption of public health services supplies an apt example. By levying sin taxes on goods likely to add to the demands for common goods, policy makers contrive a roundabout way of reducing the consumption of goods and services whose producers have yet to develop functional excludability conditions, such as treating the adverse health effects of smoking or drinking or the social consequences of individuals becoming “addicted” to wagering at the casino or at the horse track. However, simply charging more for cigarettes, alcohol, or gambling does not offset the higher public costs of lifelong smokers, intemperate drinkers, or gamblers. Indeed, excise taxes are blunt instruments for controlling external costs because the same tax rate applies to those who abuse tobacco and alcohol as well as those who consume in moderation (Wagner 1997).<sup>7</sup> The need for revenue makes any good that is not strictly private (i.e., goods that are both rivalrous and excludable) a likely target for selective taxation. This represents a discontinuous change in the rationale underlying policies that single out specific goods for taxation.

Moreover, public intervention to correct negative externalities is justifiable only when the externality is “Pareto-relevant,” that is, when the benefit of corrective action exceeds its cost (Buchanan 1962, 371). In addition, the lessons of the Coase Theorem (Coase 1960) apply here with particular force: many scenarios involving negative externalities can be solved through private bargaining or in accordance with the profit-maximizing objectives of private business owners. An example is a restaurant or bar owner using local knowledge to discover and implement a smoking policy for his or her establishment that caters to customers’ preferences

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<sup>7</sup> Wine drinking, for example, is estimated to account for only 9 percent of the cost associated with drunk driving, which is “considerably *less* than the total tax revenues collected by federal and state governments from wine sales” (Wagner 1997, 256–57).

(Shughart and Tollison 1986). Confusing the normative and positive arguments—“should” versus “is”—makes sin taxes an economically efficient revenue source, but does little to address the underlying social concerns posed by the original problem.

### **III. The Economic Incidence of Sin Taxes**

A popular method used to evaluate the equity considerations of tax policy is to identify the bearers of a tax’s burden. The term of art for this idea is the economic incidence of taxation. To gauge the incidence of a selective tax on a particular good, economists use the concepts of own-price elasticity of demand and supply.<sup>8</sup> The reason why those concepts are so attractive is that they provide insights into how a proposed tax on a market transaction will impact the buyers and sellers who participate in that market. For example, a person who uses insulin has a relatively inelastic demand for it. Insulin is essential to the human body’s processing of sugar, and hence, necessary for human life. That biological imperative means that, other things being equal, in response to a large price increase, the quantity of insulin demanded by diabetics will fall by a very small amount, if at all. From a taxation point of view, taxing something for which demand is relatively inelastic will provide a relatively stable revenue source because people will continue to consume the good, albeit in smaller amounts, despite its higher price. Moreover, the burden of such a tax will fall more heavily on the good’s buyers than on its sellers. Given that observation, the own-price elasticity of demand for sin goods will determine how much of the burden the individual consumer bears, relative to sellers, of a tax-ridden increase in the good’s price.

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<sup>8</sup> Any elasticity is the ratio of the percentage changes in two variables, holding all other things constant. Own-price demand elasticity is computed as the percentage change in the quantity demanded of a good divided by the percentage change in price that prompts consumers to alter the number of units of the good they buy. The first law of demand says that price and quantity demanded vary inversely, but the negative algebraic sign usually is ignored, so that demand is said to be elastic when (the absolute value of) the elasticity coefficient is greater than one, to be unit elastic when the coefficient is equal to one, and to be inelastic when the coefficient is less than one.

The economic evidence suggests that the demand for sin goods is inelastic, meaning that the reduction in quantity demanded is smaller (in percentage terms) than the retail price increase associated with the selectively higher federal excise taxes on them. Consider sin taxes on alcoholic beverages. For alcohol in general, the own-price demand elasticity is  $-0.497$ ; consumer demand thus is inelastic. Other things being the same, a 1 percent increase in alcohol's unit price causes a 0.497 percent decrease in quantity demanded. The price effects of selective taxes can also be broken out for subcategories of the market for alcohol in general. For beer, the own-price elasticity is  $-0.360$ , for wine it is  $-0.700$ , and for spirits it is  $-0.679$  (Gallet 2007, 124). Beer consumers thus are the least responsive to tax-ridden increases in alcoholic beverage prices. Taxes on beer, therefore, will have a lesser effect on consumption patterns and offer a more attractive revenue source for the tax collector.

Gant and Ekelund (1997, 265–66) studied the price effects of the Omnibus Budget Reconciliation Act of 1990, which raised federal excise taxes on alcohol and tobacco. In consequence of that law, wine taxes rose more than five times, beer taxes doubled, and liquor taxes rose by 10 percent. As a result, the long-run elasticity of the demand for wine was estimated to be between 1.2 and 1.6, meaning that tax-ridden increases in the price of wine caused tax revenue to shrink. From estimates of cross-price elasticities of demand,<sup>9</sup> Gruenewald et al. (2006, 101) find that increases in the prices of high quality beer and high quality wine led to increases in the consumption of lower quality distilled spirits. Spirit and beer price increases were related to reductions in purchases of higher quality wines and to increases in purchases of lower quality wines. Higher wine and spirit prices led consumers to buy less high quality beer and more low quality beer. Alcohol consumers evidently substitute freely between alcoholic

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<sup>9</sup> A cross-price elasticity of demand gauges the percentage change in the quantity demanded of one good associated with a one percent change in the price of some other good, all else equal.

beverages when their relative prices change. Gant and Ekelund (1997, 266) confirm this cross-price substitution effect. To the extent that such substitution is caused by changes in the excise tax treatment of alcohol, a normative principle of tax policy—neutrality—is violated.<sup>10</sup>

But the own-price elasticity of demand is only half of the story in the determining the incidence of a selective tax. The own-price elasticity of supply also matters.<sup>11</sup> The responsiveness of the demand and supply for a good in relation to the after-tax prices consumers and producers face depends on the alternatives each has in consumption and production. The burden of a selective excise tax will be heavier for whichever party is less responsive to the price change associated with the tax. This means that how the economic incidence of sin taxes is distributed will differ depending on the relative responsiveness to price changes of consumers as compared to producers.

The market participants who have the fewest alternatives available for a particular good are affected disproportionately by the imposition of an excise tax on that good. Say, for instance, that a tax is imposed on junk food (e.g., potato chips or candy bars) or on purchases at fast food restaurants. Theory predicts that those individuals with the least flexibility in rearranging their purchases will suffer the most owing to their limited options for substituting another good for the one whose price has risen. While a middle-income consumer might take an increase in the price of eating meals at a fast food restaurant as an opportunity to dine at a more upscale establishment or eat a meal prepared at home, which is the policy's intent, consumers at the lower end of the income distribution face an entirely different set of options. For lower-income households, fast

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<sup>10</sup> A “neutral” tax is one that does not cause taxpayers to alter their behavior in the presence of the tax. Only so-called “head taxes” levied as lump sums or very broad-based taxes satisfy that criterion.

<sup>11</sup> The elasticity of supply is defined as the percentage change in quantity supplied divided by the corresponding percentage change in price, all other determinants of supply held constant. Because producers must bid for the resources used to produce and sell a good or service, quantity supplied is positively related to price. Supply is said to be elastic when the coefficient of own-price elasticity exceeds one, unit elastic when the coefficient is equal to one, and inelastic when the coefficient is less than one.

food is often the preferred option; it can be dramatically cheaper and less time-consuming than cooking at home. Yaniv, Rosin, and Tobol (2009) demonstrate that while the effects on obesity of levying a tax on junk food or fast food might be ambiguous for people who are not health conscious, the effect on those who are will be to discourage exercise in favor of cooking meals at home. This conclusion follows because a tax-ridden increase in the relative price of eating out at a fast food restaurant prompts rational consumers to allocate more time cooking meals at home, and thereby reduces the time available for exercising or engaging in other healthful behaviors.

For the consumer, a tax on one item will initiate a search for reasonably close substitutes. Taxing beer, for example, has a greater effect on beer consumption when it makes wine or distilled spirits relatively less expensive, so that beer drinkers switch to other alcoholic beverages.

The foregoing discussion suggests a two-part approach to understanding the incidence of a selective excise tax. First, a closer look at its economic incidence allows us to better understand how the tax's burden is distributed between buyers and sellers. When demand is relatively less elastic than supply, as is typically the case for a sin good, most of the tax burden will fall on consumers. But, because the demand for a sin good is by definition inelastic, the tax will affect consumer behavior less than if the same tax were levied on a good for which demand is more elastic. The good news is that the excess burden of a tax on a good with inelastic demand is small. The bad news is that the reduction in the quantity demanded of a sin good also is small unless the tax rate applied to it is very large.<sup>12</sup>

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<sup>12</sup> Given a linear demand curve, the deadweight loss (excess burden) associated with an excise tax can be computed as  $\frac{1}{2}(pq)t^2\eta$ , where  $p$  and  $q$  are the pretax price and quantity demanded,  $t$  is the per-unit tax rate, and  $\eta$  is the (absolute values of the) own-price elasticity of consumer demand. Other things being the same, the excess burden rises with the square of the tax rate and falls with the elasticity of demand. See Hillman (2009, 250–252) and appendix 2 for the derivation of the expression.

An increase in a good's price caused by imposing a tax on it (or raising an existing tax) has two effects on consumers of the taxed good. One is that the tax-ridden price increase causes consumers to switch from the taxed good to the next best alternative. This is a *substitution effect*. At some level of taxation on beer, for example, beer drinkers will switch to other alcoholic beverages. For consumers of fatty or sugary foods at a fast food restaurant, the price increase that follows a tax sets the consumer off on a journey to discover his or her next best option. The economic incentive can either result in substitution away from the taxed good or to the paying of the tax by consumers who fail to find a satisfactory alternative.<sup>13</sup> The tax's other effect is simultaneously to reduce the consumer's disposable income for spending on both the taxed good and all other goods. This phenomenon is called the *income effect*.

Consider again the case of taxing insulin. Because diabetics have very few close substitutes for insulin, even were the tax collected from insulin producers, most of the burden would be shifted forward to consumers, meaning that they would pay most and perhaps all of the tax. The tax would not significantly reduce the quantity of insulin that diabetic patients consumed as long as they could reduce consumption of other items in their budgets. For diabetics who make \$300 a week, a \$30 tax per unit of insulin bought would lead them to reduce purchases of other things, like food or transportation, or to save less.

After any increase in sin taxes, poor people, just like all consumers of disfavored goods, will adjust their household budgetary choices as their discretionary (after-tax) incomes shrink. Because sin taxes are imposed on goods for which demands are relatively inelastic, the total amount spent on those items must rise and absorb a larger fraction of their consumers' budgets—that is why sin taxes are robust tax-revenue generators, after all. With less room left in their

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<sup>13</sup> In a case made popular in the 2004 election, John Kerry saved \$400,000 in sales tax and \$70,000 in annual excise tax by berthing his yacht in Connecticut rather than in Massachusetts. Jim Powell, "Tax Hikes Will Only Make Us All Poorer," *Providence Journal*, August 22, 2011.

budgets for spending on other goods, consumers predictably will economize most on goods for which, owing to their more elastic demands, adjustments in purchases can more easily be made. Salt, flour, and eggs are less likely to be cut to make up for larger expenditures on sin-taxed goods than expenditures on things like rent, clothing, heating, and lighting. Sin tax proponents want people to substitute away from goods of whose consumption they disapprove. Economic theory suggests that that substitution may produce some surprising, perhaps unintended consequences, especially for low-income consumers.

Taxes on consumption goods, including sales taxes and selective excise taxes, therefore are regressive because they represent larger fractions of income for households at the lower end of the income distribution and smaller fractions of the budgets of high-income households. Sin taxes are levied on the consumption of disfavored goods; they would be regressive in any case and are especially so because low-income households consume those goods disproportionately. Taxes on beer and cigarettes affect consumers with the fewest substitutes available to them, namely those with lower incomes, more than a tax on wine or expensive pipe tobacco (which represent smaller proportions of the typical low-income household's budget). Consumers who spend more of their incomes on luxury goods can more easily find consumption alternatives. The burden of a consumption tax is therefore lighter for wealthier people (Wagner 1997).

A key determinant of the elasticity of demand for any good is the number of substitutes available for that good. Substitution possibilities are distributed unevenly across households according to income. Low-income households have the fewest consumption alternatives, which means that the own-price elasticity of demand for many goods will be relatively small for poorer consumers. We noted earlier that the demand for beer, which is a relatively inexpensive alcoholic beverage, is more inelastic than the demand for wine. If the same tax were levied on beer and

wine, it would impose a disproportionately larger burden on beer drinkers than on wine drinkers, who will reduce their purchases to a greater extent. If poorer consumers comprise a larger proportion of beer drinkers than of wine drinkers, then the beer tax will be more regressive than the wine tax.

Sin taxes, therefore, create larger substitution effects for consumers with wider portfolios of choice in general. The behavioral change of a middle-income person in response to a tax on fatty foods at a fast food restaurant could well be to patronize another restaurant offering healthier, untaxed options. The behavioral change for a lower-income person following the imposition of the same tax might be to begin buying more food at the grocery store to prepare at home. That option would be additionally burdensome for some consumers, especially in a society geared toward dual-income families, a development that promoted the outsourcing of redundant household labor to the wider market and spurred the rapid growth of retail food establishments. In practice, high-income consumers have the most options and the substitution effect of a price increase associated with a selective consumption tax therefore will be larger than the tax's income effect.<sup>14</sup> Owing to the fewer options available to them, the burden of a consumption tax therefore falls disproportionately on those with lower incomes.

The success of any attempt to alter consumption behavior through selective taxation depends on substitution away from goods that are less preferred from a social perspective to those that are more preferred. However, even if we accepted the general idea of “nudging” individual choices in that way, we would still have to recognize the unintended consequences of those tax policies on individuals and households with the least ability to cope with the constraints on their consumption choices. Dragone and Savorelli (2011), for example, argue that the

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<sup>14</sup> Because the income effect of a change in the price of one good, other things being equal, is spread over all of the items in a consumer's budget, economic theory points to the conclusion that the substitution effect of a price change almost always is larger than (outweighs) the corresponding income effect.



distribution of over- and underweight persons in the United States is the result of rational behavior and that taxes interfering with the choice process can both increase the number of underweight as well as increase the number of overweight persons.

The contribution of selective taxes to total tax revenue should also decline over time to the extent that households respond by rearranging their consumption patterns. The demand for any good tends to be more elastic in the long run than in the short run because consumers have more time to search for and to take advantage of more substitution possibilities. If policy makers wish to keep revenue constant from selective excise taxes, they must therefore either increase the tax rate on existing goods or find more goods to tax. As selective tax policy expands to include goods whose demands are more and more price elastic, the distortion in terms of relative prices will be magnified and the excess burdens of taxation will mount. Even if everyone but smokers agrees that cigarettes ought to be taxed, the extension of the selective tax precedent to sugary, ready-to-eat breakfast cereals or to soft drinks inevitably would affect more consumers, introduce even larger wedges between price and cost, and, moreover, lead to the taxing of marginally more and more price-elastic goods, creating ever-greater redistributions of income.

#### **IV. What Is Sin?**

The singling out of particular goods for taxation is the hallmark of a sin tax. Predictably, state governments have broadened their definitions of “sin” and have begun to impose selective taxes on more goods. The definition of a taxable sin once was confined to booze, tobacco, and casino gambling,<sup>15</sup> yet it has been expanded to include buying automobile tires, making telephone calls (since repealed), and operating a private business enterprise (the so-called franchise tax). State-sponsored lotteries supply yet another example. Perhaps the most interesting twist in the

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<sup>15</sup> See Barbara Tuchman (1987, 20) on sumptuary taxes in the 14th century.

government's crusade against sin has been its treatment of transactions in the marijuana market. Eighteen states and the District of Columbia are currently testing legal consumption of medical marijuana in partial recognition of the failure of prohibition,<sup>16</sup> and marijuana taxation may soon follow. Similarly, the retreat from prohibition toward legalization and regulation also has spilled over into laws respecting the sale and taxation of alcohol. Counties known for decades-long commitments to remaining "dry," despite the existence of liquor stores immediately across the county's border, have suddenly begun abandoning their liquor-free attitudes.<sup>17</sup>

A term of art has been coined to cover a variety of new selective taxes: "disfavored taxes." Disfavored taxes are now being applied to snack foods and justified by their discouragement of consumption. As of 2009, 24 states had imposed a disfavored tax on sugary soft drinks. The average tax rate, among the states that have imposed soft drink taxes, is 5.9 percent of the before-tax retail price.<sup>18</sup> New York City recently banned sales of sugar-sweetened beverages (SSBs) of more than 16 ounces except in supermarkets.<sup>19</sup>

Sixteen states now levy a disfavored tax on candy, averaging 5.9 percent; 21 states tax vending machine items such as chewing gum, potato chips, pretzels, milkshakes, and baked goods. Four states impose a disfavored tax on ice cream; two states, Maryland and Florida, even have imposed a tax on popsicles (6.0 percent for both states). As with all selective taxes, the

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<sup>16</sup> "18 Legal Medical Marijuana States and DC: Laws, Fees, and Possession Limits," Procon.org, November 14, 2012, <http://medicalmarijuana.procon.org/view.resource.php?resourceID=000881>.

<sup>17</sup> "Live Free and Pay More Tax," *Economist*, March 17, 2012.

<sup>18</sup> Brownell et al. (2009) identify the 33 states that tax soft drinks, at a rate averaging 5.2 percent of retail value; nine states simply have applied their state food tax rate to soft drinks.

<sup>19</sup> This ban has numerous exemptions. For more information, see Jill Colvin, "New York Soda Ban Approved: Board Of Health OKs Limiting Sale of Large-Sized, Sugary Drinks," *Huffington Post*, September 13, 2012, [http://www.huffingtonpost.com/2012/09/13/new-york-approves-soda-ban-big-sugary-drinks\\_n\\_1880868.html](http://www.huffingtonpost.com/2012/09/13/new-york-approves-soda-ban-big-sugary-drinks_n_1880868.html), and Michael M. Grynbaum, "Health Panel Approves Restriction on Sale of Large Sugary Drinks," *New York Times*, September 13, 2012, <http://www.nytimes.com/2012/09/14/nyregion/health-board-approves-bloombergs-soda-ban.html>.

revenues sustained over time will depend on the long-run price and income elasticities of demand for the goods in question.

Moving in an entirely different direction, at least 11 states have imposed taxes on illegal drugs. Such taxes primarily have been imposed ex post on criminals convicted of drug possession or distribution, adding an additional financial penalty for their crimes while also generating revenue for the taxing government. A particularly creative measure has been to allow voluntary payment of the tax prior to being apprehended for possession, intent to sell, or both. In North Carolina, for example, it is possible for individuals to pay a tax to the Department of Revenue in exchange for stamps to attach to the illegal substance, fulfilling the individuals' tax obligations (though in no way alleviating them of future criminal charges). Voluntary submission to this tax predictably has been low: "Only 77 folks have come forward since 1990. Most of them are thought to be stamp collectors. (Or maybe they were just high?)." <sup>20</sup>

To demonstrate the extent of states' creativity with respect to selective taxation, consider the case of taxes on identifiable professions. In 1991, following the Chicago Bulls' victory over the Los Angeles Lakers in the NBA finals, California started a tax trend dubbed the "jock tax." <sup>21</sup> The jock tax, originally focused on professional athletes, targets traveling business professionals by requiring income earners to pay state, local, or both income taxes in any jurisdiction where they earn income. In the NBA, for example, each player's per-game salary is calculated, and whenever he plays road games beyond the borders of his home state, he is required to pay whichever tax is higher, the home state's tax or the visiting state's tax. <sup>22</sup>

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<sup>20</sup> Jeanne Sahadi and Annelena Lobb, "Strangest Taxes," *CNN Money*, April 9, 2004, <http://money.cnn.com/2004/03/31/pf/taxes/strangetaxes/index.htm>.

<sup>21</sup> *Ibid.*

<sup>22</sup> Aaron Merchak, "State Jock Taxes: Is LeBron Better Off in Miami?" Tax Foundation, July 8, 2010, <http://www.taxfoundation.org/research/show/26503.html>.

Merchak explains that, following California's adoption of the jock tax, Illinois passed a jock tax of its own (dubbed "Michael Jordan's Revenge" by the Illinois press), which taxed only those athletes residing in California.<sup>23</sup> Other states and cities followed suit, and as of 2010, only four NBA franchises were located in places that had no jock tax: Texas; Florida; Toronto, Canada; and Washington, DC.<sup>24</sup> Since the initial implementation of the jock tax in 1991, however, such taxes have been extended beyond professional athletes to include entertainers, any employee who earns income as part of an entertainment performance (such as coaches, broadcasters, trainers, stage crew, and concert venue security), and professional skateboarders. (Certified public accountants and lawyers employed by firms operating in more than one state have been required to pay multistate income taxes for many years.)

The European Union, currently deep in recession, has entered the game with an airline carbon tax computed over the full length of a flight (not just on the distance flown over domestic airspace). That tax generates revenue for every mile flown on the pretense that jet-fuel consumption causes harm to the environment generally, even though no direct link has been established between the total distance an aircraft flies and the number of miles, if any, that its route passes over one particular EU nation's airspace. Such a tax seems merely to be opportunistic from a revenue-generating perspective. Much like a protective tariff, this nominally environmentally friendly tax has caused protectionist reactions from the US, Indian, and Chinese airline industries. India has gone so far as to threaten to ban European airlines from its airspace.<sup>25</sup>

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<sup>23</sup> Ibid.

<sup>24</sup> Illinois levies a reciprocal jock tax, mirroring the jock tax of any state that taxes Illinois athletes (i.e., taxpayers); Tennessee levies a jock "fee" rather than taxing athletes on state-specific income earning percentages. Ibid.

<sup>25</sup> James Fontanella-Khan, Andrew Parker, and Joshua Chaffin, "India Warns EU over Airline Carbon Tax," *Financial Times*, May 24, 2012, <http://www.ft.com/intl/cms/s/0/aceffc00-a58d-11e1-a77b-00144feabdc0.html#axzz29m3JvseE>.

Also in retaliation, Russia has proposed prohibiting air traffic over the popular trans-Siberian corridor.<sup>26</sup>

In Utah, the definition of taxable sin has been extended to the sex industry. As of July 2004, establishments “where nude or partially nude individuals perform any service” are subject to a 10 percent tax on admissions and on sales of merchandise, food, beverages, and services (Sahadi and Lobb 2004). This tax comes on top of the 4.7 percent statewide sales tax and a mandatory 1.25 percent local sales tax. Targeting a particular entertainment industry with selective taxation introduces a compromise between prohibition and tolerance for the ostensible purpose of forcing customers to compensate the average taxpayer for their sins.

Other extensions of the selective excise tax have occurred in Alabama, which has added a 10 cent tax to the purchase of decks of playing cards; Minnesota, which implemented a 6.5 percent tax on fur clothing; and Maine, which levies a tax of three-quarters of one cent per pound on the blueberry industry (Sahadi and Lobb 2004). Having fun has also become a target for selective excise taxation. Thirty-six states have imposed so-called amusement taxes, the biggest collectors being Nevada, Illinois, and Indiana. The amusement tax can be levied on admission to any event that provides entertainment (e.g., concerts, sporting events, shows, and plays). Even parking spots in some areas are subject to a tax. Tuchman (1987, 20) provides examples from the 14th century of the failure of so-called sumptuary taxes on clothing and other goods distinguishing the rich from the poor.

Often, the levying of a selective tax to generate governmental revenue results in a transfer of wealth from all consumers of the taxed good to those more Puritan consumers who take advantage of opportunities to generate revenue from an identifiable minority. H. L. Mencken

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<sup>26</sup> Pilita Clark and Catherine Belton, “Russia Threatens to Cap EU Flights,” *Financial Times*, February 22, 2012, <http://www.ft.com/intl/cms/s/0/90c48008-5d7d-11e1-8bb6-00144feabdc0.html#axzz29m3JvseE>.

(1949, 624) famously defined Puritanism as “the haunting fear that someone, somewhere, may be happy.” How groups are singled out to pay selective excise taxes is an important issue both for the orthodox theories of public finance and for models grounded in public choice theory. The former focuses on “optimal” taxation, while the latter emphasizes the political process through which selective excise taxes are adopted.

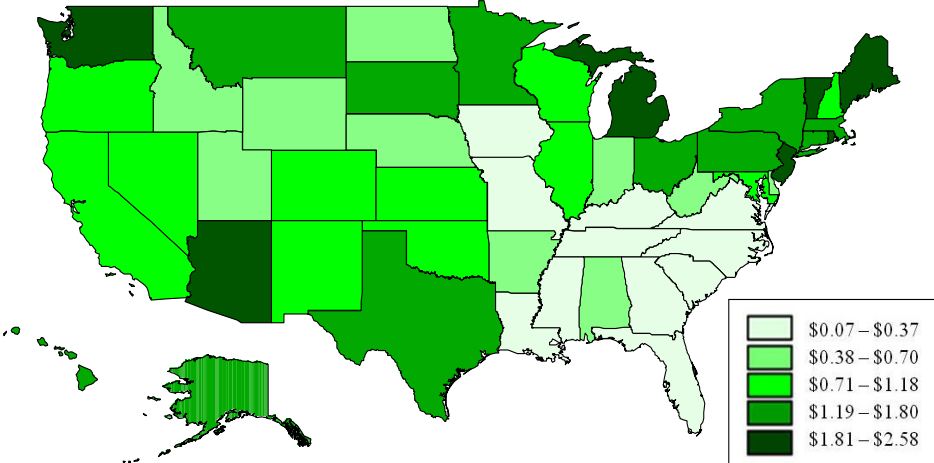
## **V. A Public Choice Analysis of Industries**

A number of heroic assumptions underlie the orthodox public finance models justifying selective excise taxation as a means of correcting “market failures” and of improving market outcomes. First and foremost, the private and social costs associated with consumption must be identifiable and separable, as only the latter would generate Pareto-relevant externalities. These models also assume that these “efficiency improving” policies do not alter any other decisions by firms and consumers, so that the principle of tax neutrality is not violated. Unfortunately, these assumptions do not hold outside of pure economic theory.

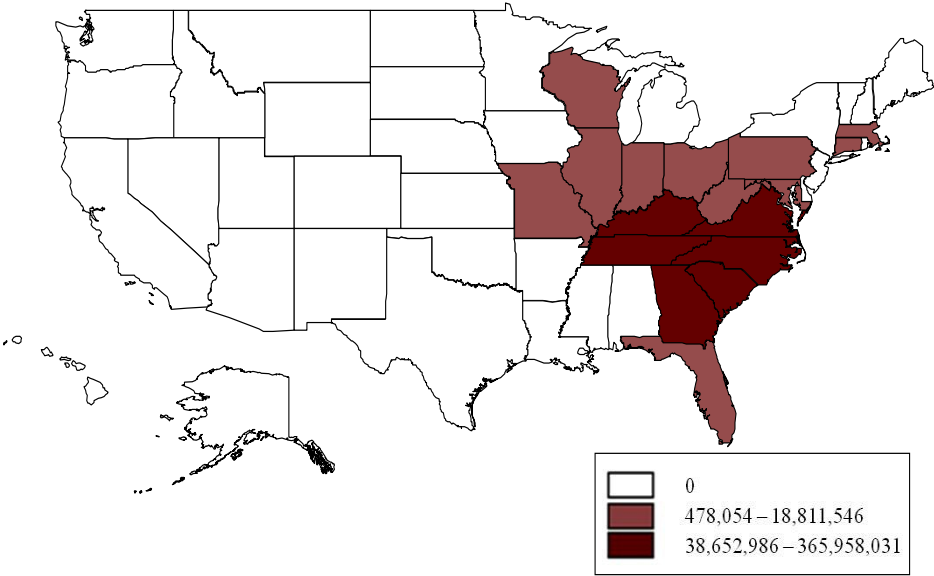
Without some way of determining the relative magnitudes of the private and social costs of an individual’s consumption decision or choice, the optimal tax rates are simply a guess since there is no independently observable set of social preferences (Arrow 1963). Those guesses end up being determined legislatively, and thus easily are manipulated by special interests and other political economy factors. Hoffer (2012) details this outcome for cigarette taxes, as illustrated in Figure 1.

**Figure 1. (a) Cigarette Tax per Pack in 2007 and (b) Pounds of Tobacco Production by State in 2007**

(a)



(b)



Source: Hoffer (2012).

The temptation for states to use selective excise taxation is politically irresistible since the revenues generated in such ways can be reallocated to the public treasury, while some taxpayers, who are portrayed as imposing costs on society at large, are penalized. Generating

public support for the underlying paternalism of sin taxes, even if not based on studies controlling for confounding factors, does not hurt (Goren et al. 2010). Bans on trans fats; taxes on junk foods, drive-thru meals and dine-in restaurant meals; and taxes on other supposedly unhealthy products exploit the public's concern with rising health care costs. A line of reasoning goes like this: why should one person incur more medical care costs because others in the same "insurance" pool engage in above-average levels of unhealthy behaviors? Such public concerns grow as payment for health care becomes more publicly financed. These programs' popularity may help explain the attention First Lady Michelle Obama pays to healthy diets and exercise as well as the \$50 "fat tax" proposed by Arizona governor Jan Brewer.<sup>27</sup> But such policies, grounded supposedly in hard science but in reality based largely on correlations rather than causality, merely are attempts to raise tax revenue by convincing the public that the consumers of some products impose uncompensated external costs on them personally.

The ambiguity of sin taxes provides wide room for abuse by opportunistic special-interest groups. If taxes on "sins" are justified because they plausibly generate negative health outcomes, then a tax could—and therefore *should*—be levied on all goods and activities that negatively affect human well-being. Where does the "should" end? Why not impose taxes on all goods containing the wrong kinds of fat or cholesterol? What about excessive consumption of sodium? What about watching television, playing video games, or even reading a book? Those activities primarily are conducted while sitting down, staying indoors, and, hence, may impair one's health. What about hang gliding, mountain climbing, or riding a motorcycle or bicycle, especially while not wearing a helmet? Despite the slew of additional questions that these policy

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<sup>27</sup> The Arizona fat tax would be applied to Medicaid patients who are obese or smoke and do not follow a doctor's recommended plan for becoming healthier. Clemens Bomsdorf details the repeal of a fat tax in Denmark after one year, citing harm to the economy and particularly small businesses, caused primarily by cross-border shopping in Germany, which dominated any prospective health gains. Clemens Bomsdorf, "Denmark Scraps Much Maligned 'Fat Tax' After a Year," *Wall Street Journal*, November 11, 2012, <http://online.wsj.com/article/SB10001424127887323894704578113120622763136-1MyQjAxMTAyMDEwMzExNDMyWj.html>.



options would create (i.e., at what rate should each good be taxed? Who administers the tax? What goods and activities actually are considered healthy?), the philosophical question underlying this debate is, *who* should be making the choices, individuals or governments?

Firms that operate in industries wish to counter the ideology supporting the imposition of or increase in the tax rate on their products (Shughart 1997). Lobbying and contributing to political campaigns are traditional tools for achieving their goals. Notably, tobacco tax increases were relatively benign until the popular backlash against tobacco in the 1990s, sparking a surge in industry lobbying.

The activities of firms to influence legislation favorable to their business practices are called “rent seeking” (Tullock 1967; Krueger 1974). When legislatures can extort lobbying expenditures from these firms, it is called “rent extraction” (McChesney 1987). All funds used in securing politically mediated favors, while potentially rational from the profit-maximizing perspective of the producer, come with an opportunity cost. Those monies and efforts, which previously were used for things such as research and development, plant expansion, and job creation, are now engaged in directly unproductive, profit-seeking activities (Bhagwati 1982; Baumol 1990).

Such activities can be both preemptive and responsive with respect to policy implementation. The “fat tax” provides an example of how industries can engage in strategies both to respond to and possibly to preempt proposed tax rate increases. The term “fat tax” encompasses a variety of public policy processes meant to discourage the consumption of ostensibly weight-increasing or unhealthy foods or beverages or, alternatively, to punish overweight individuals. The tax is motivated by claims that imposing a tax will help guide consumers toward healthier lifestyles while simultaneously raising government revenue that can

be spent partially to offset the additional public costs (primarily medical costs) they ostensibly cause.<sup>28</sup>

Other proposed fat taxes, beyond those already in place on sugary soft-drink beverages (SSBs), seek to expand the tax base. Brownell et al. (2009) propose a one cent national SSB tax that they estimate would generate \$14.9 billion in revenue in the first year alone, a substantial blow to the beverage industry. To help prevent these future taxes from being enacted, firms in the fast food and beverage industries have expanded their directly unproductive profit-seeking efforts substantially through lobbying activities and political campaign contributions.

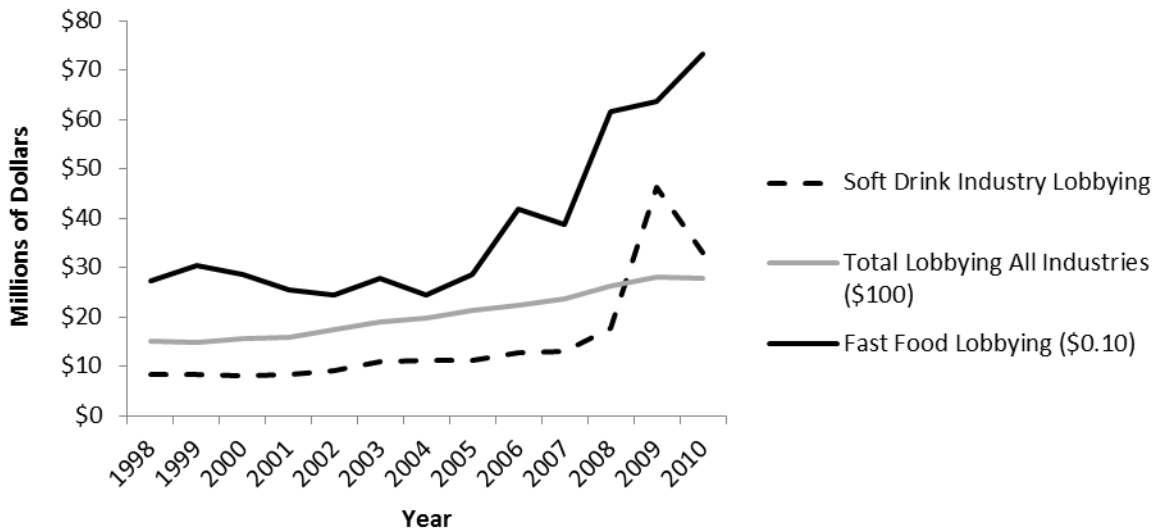
Figure 2 shows that, after growing at a compound annual rate of 4.4 percent per year from 1998 to 2007, the soft drink and beverage industries increased their lobbying efforts by 160 percent during the 2008 election cycle. Those efforts represent both responsive and preemptive lobbying strategies, responsive in the sense that a majority of US states already had SSB taxes in place. The industry simultaneously attempted to preempt the enactment of legislation in the states that did not then impose a tax on SSBs in order to block further increases in existing tax rates and to deflect legislation that would impose such a tax nationwide. No federal soft drink tax currently is in place, but further efforts to impose one loom on the horizon.<sup>29</sup>

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<sup>28</sup> Malik, Schulze, and Hu (2006) and Vartanian, Schwartz, and Brownell (2007) connect the consumption of SSBs to obesity by conducting systemic literature reviews. Duffey et al. (2010) examine four foods (soda, whole milk, pizza, and hamburgers) and conclude that a tax on soda and pizza would reduce consumption and therefore substantially lower energy intake and weight gain. Lin, Smith, and Lee (2010) analyze the elasticity differences between high- and low-income households for various beverages, finding that high-income households had an elastic demand for sugary soft drinks, while low-income households (those more likely to be eligible for Medicaid) had an inelastic demand for that product category. This evidence suggests that that after the implementation of the tax, the relative consumption of SSBs will shift to the less wealthy, increasing the tax's burden on the poor.

<sup>29</sup> In a *Los Angeles Times* article dated February 7, 2012, the case is made that a sure-fire way to raise revenue to pay for increased health care costs, taxing soft drinks, was overwhelmed by a lobbying effort by the soft-drink industry. At the time, a Yale University study cited in the article claimed that a one-penny-per-ounce soft drink tax would reduce consumption by 23 percent, on the basis of which the Congressional Budget Office estimated that \$50 billion in tax revenues would flow into the public treasury in the first 10 years after implementation. Tom Hamburger and Kim Geiger, "Beverage Industry Douses Tax on Soft Drinks", *Los Angeles Times*, February 7, 2012, <http://articles.latimes.com/2010/feb07/nation/la-na-sodatax7-2010feb07>. A current court case involving various soft drink

**Figure 2. Selected Industry Lobbying Totals**



Note: Numbers are adjusted for inflation, year 2000 base.  
Source: opensecrets.org.

After soft drink taxes began to be implemented at the state level, the fast food industry began preemptive lobbying to prevent similar taxes from being imposed on other high-calorie foods. The growth in lobbying from that sector was slightly more gradual than were the soft drink and beverage industry's preventive efforts. After a compound annual growth rate of only 0.6 percent from 1998 to 2004, the fast food industry's lobbying spending averaged a compound annual growth rate of 20.7 percent from 2004 to 2010, with the largest single-year jump in 2008, representing a 59.2 percent increase from 2007, also illustrated in figure 2. The fast food industry has yet to be hit directly by a selective tax.

Campaign contributions grew at a much smoother, but nevertheless accelerated rate. Figure 3 shows the sum of campaign contributions from the fast food and the soft drink and beverage industries for federal election years. For both industries, presidential election year campaign contributions predictably have been larger. In 2008, campaign contributions peaked at

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industry representatives and agencies of the City of New York certainly will have some impact as this story develops (New York Supreme Court Index No. 653584-2012E).

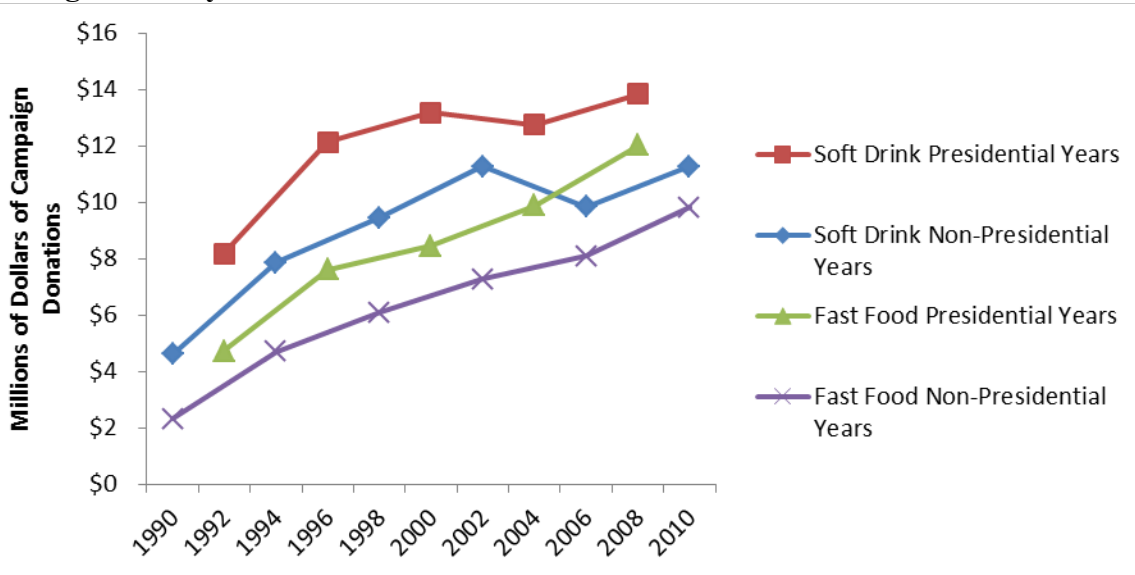
more than \$12 million (\$9.6 million in real, inflation-adjusted 2000 dollars) for the fast food industry and at more than \$17.3 million (\$13.9 million in real, inflation-adjusted 2000 dollars) for the soft drink and beverage industry.

A proposal to raise the state cigarette tax by \$1 per pack in California recently triggered \$47 million in lobbying spending by special-interest groups opposing and supporting the plan. That the tobacco industry is counted among the opponents of the tax increase contemplated by ballot proposition 29 is not surprising, but it was joined by budget deficit hawks who object to earmarking the projected \$735 million in additional revenue the tax would raise for funding cancer research at a time when the state's budget is severely in the red and other spending shortfalls arguably are of higher priority. As one member of the state legislature put it, California's voters "are disinclined to give money—even tobacco money—to the Legislature to spend; they don't trust them with the money."<sup>30</sup>

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<sup>30</sup> Adam Nagourney, "A \$1 Cigarette Tax Starts a \$47 Million Brawl in California," *New York Times*, June 2, 2012.

**Figure 3. Campaign Contributions from the Fast Food Industry and the Soda and Beverage Industry**



Note: Numbers are adjusted for inflation, year 2000 base.  
 Source: opensecrets.org.

The evidence suggests that the opportunity for political extortion has grown by leaps and bounds. These extractive rent-seeking activities further undermine the Pigouvian welfare arguments justifying intervention in the first place. In some cases, the deadweight loss from lobbying may exceed the social welfare gains from reducing negative externalities.

## VI. Summary and Conclusions

The expansion of selective taxation of sin goods and other disfavored goods is built on a welfare economics argument, namely that penalizing buyers and thereby controlling a negative externality will help to limit the production of these public “bads.” However, the methodology for singling out negative externalities for taxation ultimately is a political game. Producers that can resist higher taxes will invest resources in the attempt to do so. Low-income consumers, who have the fewest alternatives available to them, will shoulder the heaviest tax burdens, while others who have more consumption alternatives will get off comparatively lightly. This scenario

explains the income regressive effects associated with the selective taxation of supposedly sinful goods.

While a policy of “tax and regulate,” rather than outright prohibition, is often a step toward compromise, the application of selective taxation is only as good as the paternalism that such a policy represents. For consumers, higher excise taxes compromise the ability to maximize their own welfare at the lowest possible prices. Even if such taxes—and the implied income redistribution—can be justified somehow, the benefits to the public must be larger than the destruction of value to the individual. If not, selective tax policies simply become ones of political opportunism that raise additional revenue for the public sector by selectively levying heavier taxes on some consumers at others’ expense. An important principle of public finance argues in favor of raising revenue, politically unpopular as it may be in a majoritarian system of collective choice, by levying broader-based, but in some sense “fairer” taxes on all.

Selective taxation of specific goods, owing to the supposed negative externalities their consumption generates, is an old but fatally flawed “theory” of public finance. The flaw is the idea that the consumers of some private goods should be taxed to provide benefits for the public at large. Taxing “sin” is an elastic concept that, as James Madison and his colleagues feared, represents nothing more than the “tyranny of the majority.”

## **Appendix 1: Tax Revenues over Time**

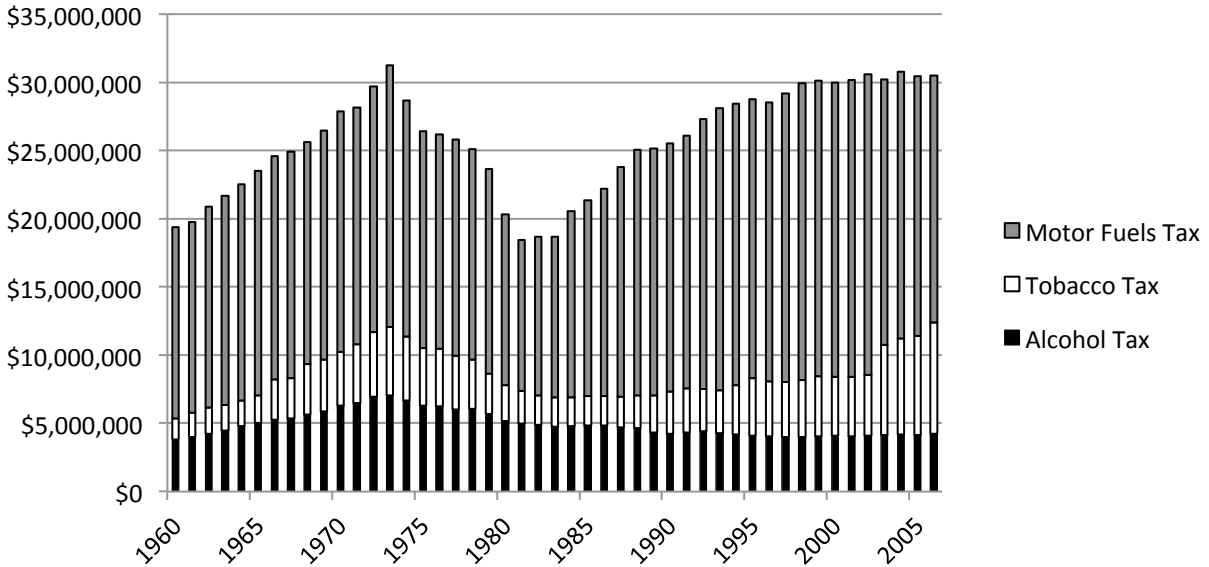
Part of the emerging trend discussed in this paper is that states continue to add revenue sources by selectively taxing goods that plausibly generate external (“social”) costs that the individual consumer does not bear and therefore does not take into account in deciding how much of the good to purchase. This process is better understood after detailing some of the secular shifts into new forms of taxation. In this appendix, we detail how states have pursued their assault on sin goods and the corresponding outcomes.

State-level tax revenue increases on the “big three” (alcohol, tobacco, and gasoline), shown in figure 4, have by and large been the result of substantial increases in gasoline consumption over time. Continued growth in vehicle miles traveled, despite rising gasoline prices, has resulted in millions of dollars of additional state tax revenue each year. Figure 4 illustrates that gasoline tax revenue grew the most in real (inflation-adjusted) dollar terms, increasing from \$19.4 billion in 1960 to \$30.5 billion in 2006. Tobacco tax revenues grew by the largest percentage; the more than \$7 billion increase represents a rise of 130.8 percent.<sup>31</sup>

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<sup>31</sup> These data are adjusted for inflation, with year 2000 as the base.

**Figure 4. Annual Tax Revenue from State Governments from the Big Three**

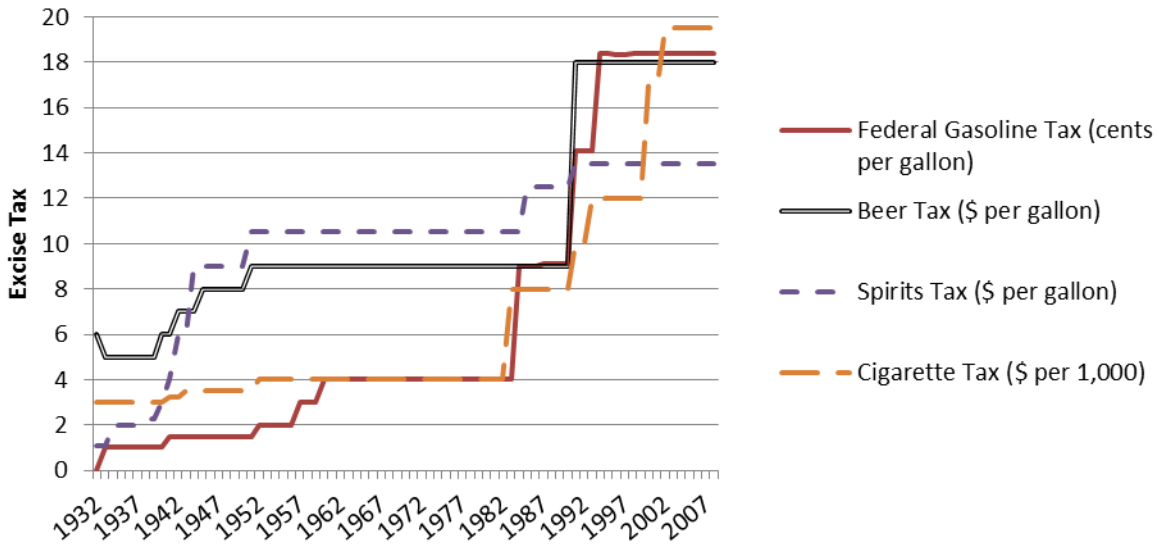


Note: Data are adjusted for inflation, year 2000 base.  
Source: US Census Bureau's State Government Finances.

Because of the inelastic demands for the big three, governments have been able to increase revenues by raising tax rates on sin items, which nowadays include the sins of driving too much, eating too much, and consuming calorie-dense foods and beverages. Figure 5 shows the federal tax rates for gasoline, cigarettes, and alcohol (beer and distilled spirits) from 1932 to 2008. The figure shows two particular periods exhibiting the largest variation in tax rates: 1940 to 1960 and 1982 to 2002, with no change in any of the tax rates during 1960 to 1982.



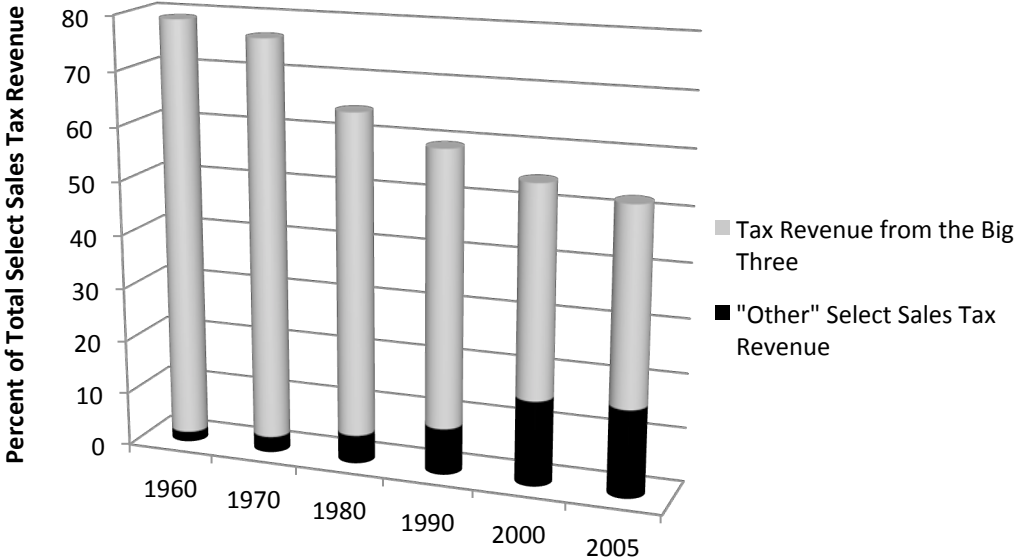
**Figure 5. Nominal Federal Tax Rates on the Big Three**



Source: US Alcohol and Tobacco Tax and Trade Bureau, [http://www.ttb.gov/tax\\_audit/94a01\\_4.shtml](http://www.ttb.gov/tax_audit/94a01_4.shtml).

While tax rates and tax revenue from the big three have increased dramatically over the past half-century, states have also expanded the scope of selective excise taxation. In 1960, the \$4.9 million in total state revenue from the big three was 79.1 percent of total selected sales tax revenue. By 2006, the \$16.2 million raised from the big three was only 51.9 percent of that total tax revenue. Conversely, the category of “other” sales tax revenue, which contains special taxes that are not necessarily popular and typically do not account for a large sum of revenue individually, comprised only 1.9 percent of total sales tax revenue in 1960. By 2006, that percentage grew to 17.5, as figure 6 shows. The \$14.5 million in revenue from “other” taxes in 2006 was greater than total tobacco tax collections and more than three times the amount of alcoholic beverage collections.

**Figure 6. Composition of Total State Select Sales Tax Revenue**



Source: US Census Bureau's State Government Finances.

## Appendix 2: Elasticity

This appendix collects the definitions of elasticity and the derivation of the excess burden to society as a result of the proposed tax.

**Price Elasticity of Demand:** “The price elasticity of demand is the proportionate change in quantity purchased divided by the proportionate change in [a good’s own] price” (Hirshleifer, Glazer, and Hirshleifer 2005, 133).

$$\eta_i^D = \frac{\Delta Q_i^D / Q_i^D}{\Delta P_i / P_i},$$

where  $Q_i^D$  is the quantity demanded of the good  $i$  and  $P$  is its price per unit.

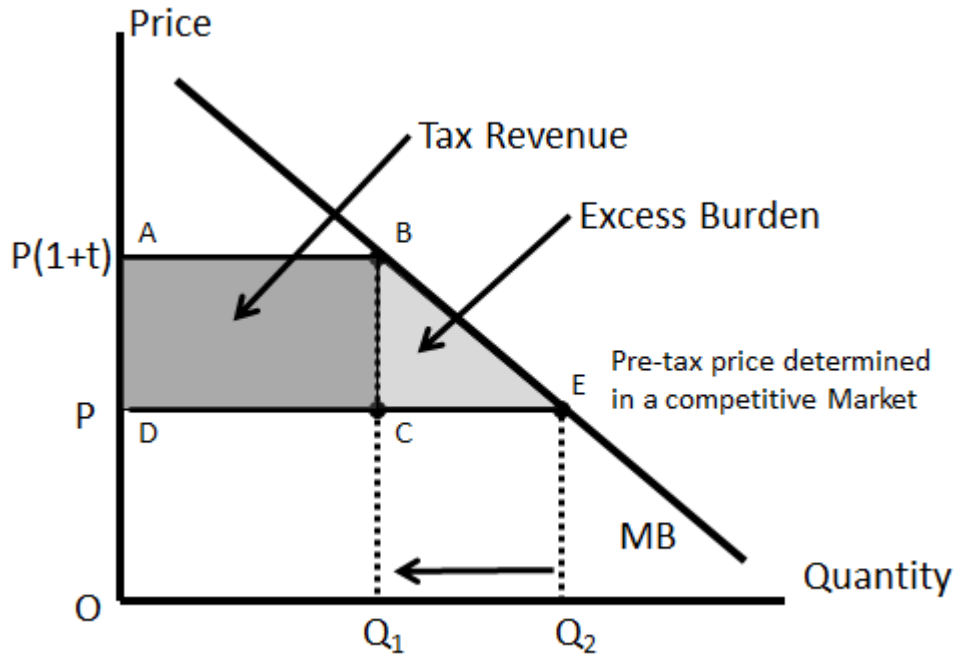
**Price Elasticity of Supply:** “Elasticity of Supply  $K$  is the proportional change in quantity supplied divided by the proportional change in price” (Hirshleifer, Glazer, and Hirshleifer 2005, 195).

$$\eta_i^S = \frac{\Delta Q_i^S / Q_i^S}{\Delta P_i / P_i},$$

where  $Q_i^S$  is the quantity supplied.

**Excess Burden:** “When taxes are used to finance public goods, an efficiency loss known as the excess burden of taxation is present. . . . The excess burden of taxation arises because, through delegation of responsibility to government, payment for public goods is financed by taxes in the labor [and private goods] market[s]—and not in a market for public goods” (Hillman 2009, 246, 251).

**Figure 7. Excess Burden of a Sin Tax**



Source: Adapted from Hillman (2009, 252).

Given linear demand and constant marginal cost, the excess burden of a tax is the area of the triangle defined by the changes in price and quantity following the tax's imposition:

$$excess\ burden = \frac{1}{2}(Q_2 - Q_1)(P(1 + t) - P),$$

where  $\Delta Q = (Q_2 - Q_1)$ ,  $P$  is the pretax price per unit, and  $t$  is the per-unit tax. Using the formula for the own-price elasticity of demand, the change in quantity demanded can be written as

$$\Delta Q_i^D = \eta_i^D * \left( \frac{\Delta P_i * Q_i^D}{P_i} \right).$$

Some substitution yields:

$$\begin{aligned} \text{excess burden} &= \frac{1}{2} \eta_i^D \left( \frac{\Delta P_i Q_i^D}{P_i} \right) (P_i(1+t) - P_i) \\ &= \frac{1}{2} \eta_i^D \left( \frac{t P_i Q_i^D}{P_i} \right) t P_i \\ &= \frac{1}{2} (P_i Q_i^D) t^2 \eta_i^D. \end{aligned}$$

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