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*On Smokes,
Booze and Applied
Welfare Economics:
A Review of
Corrective Charges
for Externalities*

Robert F. Conrad

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COMMENTS WELCOME

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On Smokes, Booze and Applied Welfare Economics: A Review of Corrective Changes for Externalities

Robert F. Conrad, Duke University

Abstract

Three purposes are served by this paper. First, despite claims to the contrary, public financing of health care related to consumption of tobacco products and alcoholic beverages, as well as the use of averages to fund defined benefit pension plans are pecuniary externalities. Corrective pricing is therefore not necessary, and may be inefficient. Second, standard textbook examples of superimposing an externality in a particular market are shown to depend on a number of technical conditions about how the markets interact and how the externality is produced. The choice of corrective actions may be unduly restricted unless these factors are taken into account. Third, proposals are made to separate corrective prices from general taxation.

Keywords: Externalities, welfare economics, taxation.

I. Introduction

There is an old undergraduate examination question that goes something like:

“The optimal quantity of a commodity that produces a negative externality should be zero.” True – False – Uncertain.

The answer is “uncertain” because the answer depends on whether economic welfare is greater with zero consumption of the particular commodity relative to an interior solution where corrective pricing is used to determine the efficient non-zero level of consumption, holding other things constant.

The logic used to answer this question is applied below to smoking and alcoholic beverages. In particular, traditional applied welfare economic (cost-benefit) analysis is used to examine some claims made about externalities related to cigarette and alcoholic beverage consumption. The significant empirical work on these issues is not questioned.¹ Rather, questions are raised about the particular methodological claims made about the type of externalities introduced by the consumption of these commodities and the type of government intervention deemed appropriate, if any.

Some results from this investigation include:

- a. Public provision of certain goods and services (Medicaid and Medicare for instance) is not sufficient to create a real, as opposed to a pecuniary, externality. Corrective pricing is not required for such effects, and in fact may be counterproductive. Standard types of distortions from public provision might be introduced by the public provision itself, but the standard approach to correcting those distortions is to eliminate the subsidy.
- b. The claim that there is a “positive externality” for nonsmokers resulting from the premature death of smokers via increased social security benefits (or other defined benefit pensions) is questioned. Such effects are pecuniary externalities even when the action of smokers and drinkers is endogenous.
- c. On a more general level, the link between a commodity that produces a real externality and the efficient corrective price depends on the nature of the mechanism through which the externality is generated.
- d. Once a commodity that produces an externality is efficiently priced, the equilibrium consumption level of that commodity is generally not known. In particular, consumption of a commodity producing a negative externality could increase, at least relative to predicted reductions, because first order

¹ See Cook (2007) and Sloan, et. al. (2004) for a discussion of the empirical work on alcoholic beverages and smoking, respectively.

income effects and income distribution considerations will determine the ultimate equilibrium.

- e. Corrective pricing for real externalities is not a tax (or a subsidy as the case may be), certainly in the ability to pay sense of the term if not more generally. Thus, using tax analysis, including concepts such as progressivity or regressivity, to demonstrate the benefits of corrective pricing may be inappropriate.

Finally, some (hopefully practical) proposals are made to ensure that the role of taxation is separated from corrective pricing in situations where such separation might be beneficial for applied policy purposes.

None of these results are new, or perhaps even controversial when placed in context, but it is hoped that the present analysis can provide a restatement of the basic principles for corrective pricing as applied to externalities and provide some new insights into the use of applied welfare economics.²

II. Pecuniary Externalities

a. Public Financing of Medical Care³

Some scholars and policy analysts have claimed that corrective pricing is needed for tobacco products and alcoholic beverages because consumption of these commodities leads to increased publicly financed medical care via Medicare and Medicaid in the United States. For instance, Manning, et. al. (1991) state: "Collectively financed programs are a leading source of external costs."⁴ The argument might be summarized as follows:

- i. Consumption of tobacco products and alcoholic beverages causes illness (lung cancer and cirrhosis for instance).
- ii. As a result, medical costs are higher for people who consume these commodities, relative to people with zero consumption.⁵

² I have chosen to use historical references (such as Harberger (1964), Scitovsky (1954) and Meade (1952) among others) for much of the discussion in part to illustrate both the historical and analytical context for the claims made here.

³ The literature about smoking and alcoholic beverage consumption is significant and no attempt is made to review this literature. Summaries can be found in Sloan et. al. (2004), Gruber (2001) and Chaloupka and Warner (2000).

⁴ Given the large number of studies, references will be limited to those I infer to be the better known studies which have been used as the basis for subsequent revision and work.

⁵ There has been some debate and empirical work about whether medical costs for smokers do in fact increase. Gravelle and Zimmerman (1994), among others, suggest that overall medical costs might be reduced because smokers might die at a younger age, among other factors. Empirical estimates generally take such effects into account. See Viscusi (1995) and Sloan, et. al. (2004) for examples.

- iii. All of society pays for this behavior by publicly financing health care programs such as Medicare and Medicaid.
- iv. The rest of society is worse-off because of the need to pay taxes to finance such expenditures. In effect, subsidizing smoking-related illness increases the economic cost, however defined, of smoking.
- v. It is efficient to charge smokers and drinkers via a corrective charge on smoking and drinking to correct for this externality.

Estimates of these costs have been made by Viscusi (1995) and Sloan, et. al. (2004), among others, and various authors have included this value as an element in any corrective pricing mechanism. The difficulty with this approach is that public financing of such health expenditures is a pecuniary externality because the externality operates via prices and incomes with no resulting efficiency cost.⁶ Thus, the “efficient” corrective charge is zero. Consider the following simple example. Suppose there are two people: Person A, who consumes commodity X, and Person B, who does not consume commodity X. Suppose that Person A qualifies for complete public financing of medical expenditures (there is no copayment), while Person B must pay all of Person A’s medical expenditures. In this case, the budget constraints of the individuals become:

$$I_A = P_X X_A + P_O O_A$$

$$I_B = P_H H_A + P_O O_B$$

where I = Income
 X = Commodity X
 H = Health care resulting from consumption of commodity X
 O = A composite commodity (or all other goods).

If B’s utility is a function only of her own consumption (there is no real externality), the public financing works via B’s budget constraint only.⁷ That is:

$$P_H dH_A = -P_O dO_B.$$

⁶ The terminology of pecuniary and real externalities can be traced to Scitovsky (1954). The fact that such non-Pareto externalities exist had been known before 1954. Holcome and Sobel (2001) note Pigou’s example of proposals to delay construction of electricity plants because of lost profits that would be experienced by existing gas plants.

⁷ A real consumption externality is one in which the consumption of a particular commodity by one person directly affects the welfare of another person. That is, $U_B(\underline{x}_B, x_A^i)$ where \underline{x}_B is a vector of private consumption for Person B, x_A^i is the consumption level of commodity “i” by Person A which enters directly into the utility function of Person B, U_B . A pecuniary externality is by definition an externality that does not enter directly into the utility function but operates via the budget constraint by either affecting income or prices.

There are no second order effects (no welfare costs) resulting from the public financing because neither X nor H enters B's utility function (regardless of who consumes those goods and services). For sure, Person B is worse-off, but Person A is better-off by the amount of the real income transfer, and based on the criteria of economic efficiency, we have no method to judge whether the transfer is beneficial in any economic sense.⁸ It is true that distortionary taxes are used to finance the health care expenditure, but distortionary taxes are used to finance all government expenditures. Whether the public expenditure on health care, both in total and at the margin, is relatively efficient depends on the net gains and losses of using the funds for other publicly financed activities or reducing taxes (either now or in the future).⁹

b. Defined Benefit Pensions

Smokers (and perhaps heavy drinkers) as a group have lower life expectancies relative to those who do not smoke or drink excessively. It has been claimed, at least from the time of Schelling (1968), that a positive externality is created by this group difference because those who live longer, nonsmokers for instance, benefit from either more pension benefits or lower contributions to the pension systems if the pension system is a defined benefit system.¹⁰ Social Security, being a defined benefit system,¹¹ has been cited as one source of this benefit. For instance, Manning, et. al. (1991, p. 29) note that: "An individual works in return for wages and salary, and fringe benefits. ... If smoking decreases the likelihood of receiving retirement benefits, then a claim on future earnings is forgone. That is, smoking leads to a shift in future claims or benefits from smokers to nonsmokers, thereby yielding a positive externality to nonsmokers." Viscusi (1995) estimates the value of this positive externality to be about \$1.23 dollars per pack, while Sloan et. al. (2004) provide an estimate of about \$0.84 per pack (Table 11.3). Like estimates for public financing of medical spending, such estimates have been used

⁸ A social welfare function might be used to determine the optimal distribution of income and the appropriate tradeoff between equity and efficiency. A social welfare function is not used here, in part because distributional considerations are not necessary when considering only efficiency and because those who suggest adjusting cigarette prices or alcohol prices do not employ distributional considerations in their analysis, except perhaps with respect to the distributional implications of the corrective charge itself. (See Chaloupka and Warner (2000) for a discussion of the supposed regressivity of corrective prices.)

⁹ It could be the case that public financing of health care for certain target groups might result from real externalities. For instance, motives such as paternalistic altruism might generate either positive or negative externalities. Health care provision to low income people might generate a positive externality for high income people even if those who receive the medical care engage in bad behavior. I am not arguing absence of negative externalities for smoking and drinking. An externality might be negative if those who do not engage in bad behaviors are made worse-off (at the margin) by others who do engage in such bad behaviors via second hand smoke and reductions in highway safety. These are real externalities, however, and have nothing to do with public financing of any particular good or service, which is the issue addressed in the text.

¹⁰ It is clear that no such externality, however defined, exists under a defined contribution system. Contributors, or their estates, accrue the current value of all contributions at the time of retirement (or death) under a defined contribution system.

¹¹ There is a redistributive element to Social Security pensions in the sense that the actuarially fair value of the pension is higher for lower income relative to higher income persons.

by Viscusi, Manning, et. al., Sloan et. al. and others to estimate the “efficient tax” on cigarettes, as they claim, with the tax decreasing as a result of this benefit.

The fact that this benefit is a transfer has been known (see for instance, Schelling’s (1968) use of the term “transfer”). It is well known that transfers should not be included in efficiency calculations because the costs and benefits of the transfers work via income effects alone. Manning, et. al. (1991, p 27) claim, however, that the positive externality is not merely a transfer because “length of life of smokers is endogenous.” “In the usual case, transfer payments do not depend on the behavior of the consumer. Thus, they (the transfer payments) do not alter behavior unless the payment is large enough so that income effects are considerable. In the case of smoking, however, receiving the transfer depends on the choices made by the consumer – that is, because smokers have shorter life expectancies, smoking affects the amount of the pension payments they realize (if any) and the amount of taxes they will pay” (p. 27). I understand this statement to mean: “Smokers (and perhaps drinkers) have shorter lives because of their choices. The fact that such choices are endogenous is sufficient to create an externality which should be adjusted via corrective pricing.”

Even if length of life is endogenous, the issue is still whether the externality is real, as opposed to pecuniary, and whether it should be included in some efficient corrective pricing system, or whether the externality is Pareto relevant.¹² Consider the following simple model. Without loss of generality, suppose there are two people: one who smokes, “S”, and one who does not smoke, “N”. Suppose that each individual is given the same exogenous income which they can spend over two periods – working and retirement. The probability of living until retirement is α_N for the nonsmoker. The probability of living until retirement is endogenous for the smoker and is a function of the quantity of cigarettes smoked during the working time period. That is, define α_S as the probability of living until retirement for smokers with $\alpha'_{S_x} < 0$, where X is the number of cigarettes smoked. Both the smoker and nonsmoker contribute to a defined benefit pension system (a mandatory system), which is their only form of saving. Pensioners get a lump-sum amount K in present value terms if they live to retirement. Both individuals must pay a proportion, β , of their current income in exchange for this expected annuity. The contribution rate, β , is defined to be equal to the average probability of survival, $\bar{\alpha} = \frac{\alpha_S + \alpha_N}{2}$, so that when calibrated with the amount of pension in present value terms, this is sufficient to ensure that the pension system is fully funded. That is, $2\bar{\alpha}K = 2\beta I$ (where “I” is income). Thus, income for smokers and nonsmokers, in terms of the present value of consumption, is:

¹² I use the following example of pecuniary externalities in my undergraduate classes. A new business decides to invest in a rural region where immigration is costly. The result is that the new business drives up the prevailing market wage, which in turn reduces profits for, and production from, preexisting firms. The choices of the new business managers are endogenous, but these endogenous choices create a pecuniary externality for existing firms and workers. Workers benefit, existing firms lose. There is no need for corrective action, however, because the externality is not Pareto relevant.

$$I = P_0 C_0^S + P_X X_0 + (\alpha_S - \bar{\alpha})K = P_0 C_0^N + (\alpha_N - \bar{\alpha})K$$

Where: P_0 = Price of consumption, other than cigarettes, during the working period

P_X = Price of cigarettes during the working period

C_0^J = Quantity consumed of the composite commodity during the working period with $J = N$ (nonsmoker) or S (smoker)

X_0 = Quantity of cigarettes consumed during the working period.¹³

The nature of the externality is clear.¹⁴ Smokers pay the same amount and get less in expected value terms relative to nonsmokers. The issue is whether this positive externality is Pareto relevant or is merely a pecuniary externality. For convenience, assume risk neutrality and, appealing to Harberger (1964), assume that economic efficiency can be enhanced by choosing the corrective pricing policy that minimizes the welfare cost of the system. That is, set the marginal social gain from the subsidy equal to the marginal social cost, or:

$$T_X X'_{0_{P_X}} - (\alpha'_{S_X} - 2\bar{\alpha}'_{\alpha_S} \alpha'_{S_X}) K X'_{0_{P_X}} = 0$$

$$T_X - (1 - 2\frac{1}{2}) K \alpha'_{S_X} = 0$$

$$T_X = 0$$

The optimal corrective price is zero.¹⁵ Once again, the externality is pecuniary with no effect on overall economic efficiency, even when the probability of death by smokers is endogenous.

III. Taxes and Corrective Prices

There has been a tendency to equate corrective prices (Pigovian taxes) and general excise taxes. For instance, Chaloupka and Warner (2000) contains a discussion about the distributional implications of corrective pricing for cigarettes. Viscusi (1995), among others, has measured whether the current excise tax system is

¹³ The quantity of cigarettes consumed in the retirement period is not relevant for the current analysis because that quantity has no effect on the probability of living until retirement.

¹⁴ The correspondence between this example and standard adverse selection problems is noted. Adverse selection is not a problem here because smokers cannot opt out of the system.

¹⁵ It can be shown that the $\frac{1}{2}$ in the text can be replaced by the relevant proportions of smokers and nonsmokers. The result will hold as long as the proportions sum to unity.

calibrated to compensate for externalities and Cook (2007) has proposed using the excise tax on alcoholic beverages to reduce other distortionary taxes, in the spirit of the double dividend literature.¹⁶ Economists have known since the time of Coase (1960) and the famous Meade (1952) bees and honey example, however, that it takes two to make an externality and there is more than one way to correct for an externality. These principles are reviewed below in order to demonstrate that it may be necessary to separate tax analysis from corrective pricing and to lay some foundation for the proposals developed in the following section.

a. Corrective Pricing as One Option

For simplicity, suppose there are two types of people: drinkers (D) and nondrinkers (N) and that there is no government.¹⁷ Suppose further that nondrinkers care about highway safety as indicated by their willingness to pay for reductions in the probability of highway accidents. Finally, suppose that increases in drinking lead to increases in the probability of highway accidents (involving nondrinkers), or:

$$HS = HS(B) \text{ with } HS'_B > 0$$

Where B = amount of alcoholic beverage consumption.

The traditional graph for this situation is illustrated in Figure 1 where it is assumed that drinking alcoholic beverages imposes a negative externality on non-drinkers via reductions in highway safety. It is important, I believe, to illustrate all the steps necessary in order to derive Figure 1. In effect, there are two markets (alcoholic beverages and highway safety) and one linkage, HS(B) that affect how Figure 1 is derived. Such a situation is illustrated in Figure 2 where it is assumed that HS(B) is linear and decreasing in B. The top figure in the left hand panel illustrates the determination of the quantity of alcoholic beverage consumption without regard for the real externality imposed on others.¹⁸ The demand function is the compensated demand for B, constant marginal cost is assumed for industry supply and B₀ is the level of consumption. The top figure in the right hand panel contains the compensated demand function by others for highway safety, which is assumed to be inelastically supplied at each level of drinking at a relative price of zero, again for simplicity. Absent corrective action, drinkers will demand B₀, resulting in a highway safety level of HS₀. The figure below the compensated demand for alcoholic beverages is the function that relates highway safety to alcoholic beverage consumption. The figure immediately below the

¹⁶ Bovenberg and de Mooij (1994) are one source for the discussion of this issue where environmental taxes might be used to reduce distortionary taxes.

¹⁷ For simplicity it is assumed that drinkers do not care about highway safety. If drinkers cared about highway safety, then they would trade off highway safety for more drinks and set the private marginal cost of drinking equal to the change in the probability of accidents. An externality might not even exist in this case. At a minimum, the compensated demand for safety would be affected by a corrective price on alcoholic beverages creating a shift to the left or right in the compensated demand for safety. This effect is ignored in the current analysis by assuming either that drinkers do not care about highway safety or that the compensated cross price effects are zero for drinkers.

¹⁸ All demand functions in the figures are compensated demands.

compensated demand for highway safety is a forty-five degree line necessary to map highway safety onto itself in order to complete the graphical linkage between the compensated demand for alcoholic beverage consumption with the compensated demand for highway safety. It is clear that a figure similar to Figure 1 (the traditional textbook example of a negative externality) can be derived.

It is clear that potential gains from trade may exist because the initial situation produces the welfare cost of ABC in Figure 2. Whether an interior solution exists, however, depends on the willingness to pay for drinking and highway safety and depending on how alcoholic beverage consumption affects highway safety. Given this situation, there are three potential solutions. The first two cases illustrated in Figure 3 are situations where the externality is not relevant at the margin. Panel A of Figure 3 is the situation where a complete ban on alcoholic beverages is efficient. In effect, there is a nonconvexity with respect to the intercept term sufficient so that the willingness to pay for complete highway safety adjusted for the functional relationship between highway safety and alcoholic beverage consumption is greater than the marginal value of the first drink after the marginal private cost of production is taken into account (effectively drivers can buy off drinkers). The second case, illustrated in Panel B of Figure 3, is the situation where the status quo is efficient. That is, no corrective charge is necessary because finite damages are imposed on those who demand highway safety (effectively drinkers can buy off drivers). Finally, an interior solution might be efficient. In this case, the summation of the consumers' surplus can be maximized by setting the marginal benefit equal to the marginal social cost (see Figure 4a).

If an internal solution is efficient, then it is clear that the marginal value of the externality is AB in Figure 2, but determining the optimal price for alcoholic beverages now depends on both the compensated demand for HS and the functional form of the probability of an accident, $\alpha(B)$. Because the markets are linked via the externality, it does not matter in which market corrections take place. For instance, the correction can take place in the alcoholic beverage market yielding the familiar "drinkers are at fault" analysis.¹⁹ Alternatively, the demand for alcoholic beverages can be superimposed onto the demand for highway safety as in Figure 4b. It is important to note the arbitrary nature of the transformation onto one graph. In Figure 4a, drivers impose an externality on drinkers. In Figure 4b, drinkers impose an externality on

¹⁹ How drinking affects the probability of accidents could take any form in theory. It is an empirical question, holding the driving habits of nondrinkers constant. The question of Pareto relevance depends on the shape of the function to some extent. For instance, it is possible that the derivative of α with respect to B is zero after some point, making the optimal price the current observed market price, if the marginal value of the externality becomes zero before the current level of consumption. Note also that the effect here is different from the cross price effect discussed in the last section with respect to public financing. The demand for health care was the smoker's demand in the last section. The cross-market effect was created in that case because people other than those consuming the bad commodity were affected by the consumption of that commodity.

drivers. It takes two to make an externality; however, who is good or bad here is a social evaluation beyond the scope of welfare economics.²⁰

The fact that the markets interact, however, expands the range of policy options, in addition to the well known ways to correct the externality in the alcoholic beverage market. Options include, but are not limited to:

1. Impose a per unit charge on drinking (the traditional Pigovian Tax),
2. Pay drinkers to reduce drinking,
3. Impose a per unit charge on highway safety (another form of the traditional Pigovian Tax),
4. Pay drivers to reduce driving,
5. Set a quantity limit on alcoholic beverage consumption, or equivalently, dictate a certain level of highway safety,
6. Increase overall highway safety,
7. Inform drivers to take action to avoid accidents (stay home on New Year's Eve), and
8. Impose a quantitative restriction on drinking (or driving).

As a practical matter, the choice of which option to employ will depend on administrative costs and the creation of additional incentives, such as moral hazard.²¹ Absent such costs and incentives, however, the choice is arbitrary relative to the criteria of economic efficiency, because the right price is charged to someone; really the right price ratio is being established, with the only difference being a different distributional outcome.

Suppose a Pigovian tax on alcoholic beverages is chosen by the members of the community. It is clear that this is not a tax in any sense of the term because there is no government. Rather, the Pigovian tax is a corrective charge – an efficient price that would be charged if someone had enforceable property rights and could enforce those rights in an incentive-compatible manner. The revenues from this charge could accrue to drivers as compensation for the cost of accidents in this case (or for the reduction in highway safety). In addition, the revenues are greater than the total social costs if the marginal cost is increasing, which means that an additional income transfer has taken place. Finally, real income (real welfare) has increased because the welfare cost has been eliminated.

Suppose now that the policy is actually implemented. The only thing economists can say is that welfare has gone up. In particular, no prediction can be made about the quantity of either consumption of alcoholic beverages or the probability of accidents because all demand functions, including the ordinary demand functions not pictured in

²⁰ I do not claim that drivers would be taxed in any practical situation. Rather, the point is that there is no basis in welfare economics to claim the superiority of one situation relative to another. That is, the decision about what is good and bad in these situations is a social decision beyond the scope of welfare economics. One benefit of welfare economics in these situations might be to illustrate the limitations of economic analysis of policy situations.

²¹ Paying people to reduce drinking may provide an incentive for drinkers to drink more (or at least to threaten to drink more).

the graphs, will shift. Income effects from two sources now determine the ultimate equilibrium. First, there is the redistribution of income from drinkers to drivers. Second, total income has increased because the welfare cost has been eliminated. In this case, the gain has gone to drivers at the expense of drinkers. Drinking and driving would accordingly rise or fall relative to the initial equilibrium depending on whether these commodities are normal or inferior goods.²² There is no way to predict.

Finally, suppose a government is now introduced into this simple world and that the government by fiat imposes a corrective charge. There should be no difference between the corrective prices as a matter of method, if the government chooses to use corrective pricing, relative to other options. The government is claiming ownership of the particular property rights on behalf of the population.²³ Again, this charge is not a tax, at least in the ability to pay sense of the term (see the discussion in the next section). Welfare is increased, not decreased, with a consequent increase in real income. The only difference between the no-government and government action situations might be in relation to the use of revenues. The government, if efficient, will determine how revenues are used based on standard cost-benefit criteria or on distributional considerations.²⁴ Thus, a different income distribution and, accordingly, different consumption patterns may result. There is no way to determine whether drinking or driving will increase or decrease.

b. Taxation

Two bases for taxation have evolved in the literature: (1) benefit taxation, in which payment is made in exchange for specific benefits; and (2) ability to pay taxation, in which payment is made to but no specific benefit is received. Benefit taxation might be defined as “efficient user charges” if the payment is necessary in order to receive specific benefits: gasoline taxes as proxies for highway usage, recording fees, admission to public parks, payment for bus service on a per unit basis, and public provision of electricity among goods and services (I don’t get this?).²⁵

²² This statement has nothing to do with the difference between compensating and equivalent variation. As noted, all demand functions, ordinary and compensated as well, will shift. In addition, there could be a type of moral hazard that occurs, although it is not Pareto relevant. For instance, drinking could decrease. Driving might be a normal good, however, and thus nondrinkers will drive more, which in turn increases traffic, which in turn reduces highway safety. Thus, we cannot predict that the roads will be “safer” even if drunk driving is reduced.

²³ Alternatively, if the government uses the revenue for purposes other than compensation of nondrinkers, then the action might be interpreted as a tax because the government is confiscating resources from nondrinkers (not drinkers).

²⁴ In traditional tax analysis, such as Harberger (1964), it is standard to assume that the tax revenue is returned to the taxpayer in a lump-sum fashion. Such a redistribution might take place via increased health assistance if alcohol-related illness is independent of drinking levels at the margin. This might be one interpretation of how those who produce the negative externality are paying their own way. In the current context, however, such expenditures have nothing to do with paying their own way because these externalities should be ignored when doing welfare analysis. The compensation is above the amount necessary to make drivers no worse-off. Thus, refunding the revenue to those who are charged may not be what the advocates of such charges have in mind.

²⁵ The term “specific benefit” might be important. If specific marginal benefits cannot be related to specific marginal payments, then efficiency costs might be created.

Ability to pay taxation is a payment for which no specific benefit is received. Thus, by definition, a corrective charge or Pigovian tax is not a tax at least in this sense of the term. A generally applicable tax on certain consumption items, independent of the specific benefit, might be reasonable, but the criteria used to evaluate the use of such taxes are different from those used to determine the efficient price. In particular, in the optimal indirect tax literature, it is generally assumed that marginal cost is constant and the government's objective is to minimize the welfare cost of the various taxes.²⁶ In this current context, constant cost means production cost plus the corrective charge. For instance, see Figure 5. Absent taxes, the economy would be operating at an efficient level. Thus, any externalities will be internalized before taxes are imposed by what Musgrave (1959) defined as the allocation branch of the government.²⁷

In a second best world, and subject to other standard assumptions about preferences, the standard result is that commodity tax rates should vary inversely with the degree to which those commodities are complementary, in the compensated sense, with non-market activities (often defined as leisure). Thus, taxes on drinking and smoking might be imposed depending on these conditions. Note, however, that a welfare cost is created by this tax. This is shown in Figure 5 by the welfare triangle ABC. Note that the first corrective charge, specifically the benefit taxation (EF), increases welfare while the general tax clearly decreases welfare.

IV. A Proposal for Action and Clarification of Function

Different economic tools are required to address different types of problems. Corrective pricing (a Pigovian tax) is appropriate and necessary when markets fail, including when significant transaction costs and externalities are present. Pigovian taxes, however, are only one tool in the corrective action toolbox that includes quantitative restrictions, free trade in property rights (pollution permits for instance) and subsidies, among other actions. The practical choice will depend on the facts and circumstances, including transition considerations and administrative costs. In addition, corrective pricing has nothing to do with the market for the commodity whose consumption or production might have resulted in the need for corrective action. In the example above, it is the fact that individuals value highway safety, a separate market, which interacts with the market for alcoholic beverages that creates the externality. That is, the corrective price is not determined in the alcoholic beverage market, although it might be translated into units of that commodity given certain assumptions. In addition, the corrective price should not be analyzed using tax incidence analysis or to examine the income distributional aspects of the corrective charge any more than the

²⁶ The optimal indirect tax literature can be traced to Corlett and Hague (1954) and is based historically on Ramsey (1927).

²⁷ Benefit taxation might apply to public goods and externalities as well as public provision of private goods, such as local bus service. The point is that benefit taxation, if it is really taxation, is designed relative to efficient pricing of the commodity in question.

efficient price of candy bars determined in a competitive market can be deemed regressive or progressive.

Generally, applicable taxes are used to confiscate resources from the private to the public sector. Unlike corrective pricing, government has few options for taxation other than outright confiscation.²⁸ Welfare costs are created because people are not getting something directly in exchange for their payment, and individuals will try to avoid the tax by setting private values equal to net-of-tax values at the margin.

Given the importance of both tax analysis and corrective pricing, it may be practical and beneficial to separate the functions by employing different charges. For instance, two or three charges might be imposed for tobacco products and alcoholic beverages. Such distinctions might help consumers, policy analysts and even economists understand the specific purpose of the charge and to know when to use different analytical tools.

a. Corrective Charges

If the members of a society collectively decide that a corrective price imposed by government is the most effective method to achieve a desired result, then a corrective price can be imposed on those items deemed by society to be “bad.”

1. This charge should not be part of the generally applicable tax law because it is really a user charge, a corrective price (or a Pigovian tax). Governments generally do not include pricing for bus services, water or pollution charges or even mineral royalties in the tax law. Such a charge should be interpreted as payment in exchange for a specific benefit. The charge might be collected by the tax administration, if the tax administration has sufficient expertise, and if efficiency gains are created by joint collection.
2. The charge might be a per unit charge adjusted for inflation (not ad valorem). The charge is to force consumers to internalize the true social costs, including the marginal cost of the externality (the demand for highway safety for instance). That is, the efficient charge is not necessarily a fixed proportion of the market price through time. The private supply price of production can change through time via changes in relative input prices and other exogenous factors.²⁹

²⁸ Alternatively, the government might demand that the private sector supply public goods and services for free and not tax the supply, but this is simply another form of confiscation. Finally, the government might confiscate assets from the rich, however defined, and give those assets to the poor, however defined, if distribution is the objective of government policy.

²⁹ I am not implying that the optimal charge is independent of supply and demand conditions. Rather, the charge plays the same role as a wage which is quoted as a relative price and not as a proportion of the price of final output. Like the wage for labor, the charge is compensation for the opportunity cost of forgone consumption (or production) of other goods or services.

3. The charge should be based on the factor that is responsible for creating the negative effect: alcoholic content in the case of alcoholic beverages, tar, nicotine or other chemical content in the case of tobacco products. It is these elements, not the medium in which they are consumed, that create the negative externality. Such a charge might be most efficient, but administrative considerations might require that the charge be imposed on the medium in which the specific factor is embedded. In that case, it is important to attempt to make taxes uniform across alternatives (cigarettes and cigars, or beer, wine and hard liquor).
4. The level of the charge should be determined by some group other than the Ministry of Finance or Revenue Department (staff who are trained in tax analysis). Perhaps in the United States the charge might be computed by the National Highway Traffic Safety Administration, the Department of Health and Human Services or the Environmental Protection Agency, as the case may be.
 - i. The group that determines the charge should review the scientific and economic evidence periodically to determine how much to charge. There is no reason to believe that the real cost per unit is the same over, say, a five year period. The real cost could be falling (the externality of smoking could be falling because of reduced smoking, the externality of alcoholic beverages could be rising or falling depending on whether there are increases in highway tolls, gas prices, and other factors).³⁰
 - ii. The corrective charge should be imposed on domestic consumption and the charge should be clearly labeled so that consumers know the nature of the charge. This is no different from receiving an itemized bill for the delivery of a commodity with the invoice including a separate listing for the f.o.b. price, transport, insurance and taxes. The label might state something to the effect that the charge is levied to correct the market price for the costs imposed on others.
 - iii. The corrective charge should not be imposed for revenue purposes, but in order to determine the efficient domestic price. Revenue considerations might matter but only to the extent that the gains from imposing the charge are greater than the administrative costs because efficiency costs should be reduced.

³⁰ Economic factors could also play a role in determining the efficient charge. There is no reason to believe that the corrective charge for smoking or drinking is independent of other prices and income.

- iv. The revenue from these charges should be separately accounted and reported in the government revenue statistics as revenues from corrective prices.
- v. Revenues should be used like any government revenue. There is no reason to believe that earmarking is efficient. Rather, the government, like any multiple product organization, should allocate funds in a welfare maximizing way, which might include reducing distortionary taxes, compensating victims or as general government expenditures. Whether a double dividend will result will depend on whether the social value of reducing distortionary taxes is greater than the value of using the funds for increased government expenditure, including compensation perhaps for the social cost of the activity.

b. General Consumption Taxes

Given a corrective price, there is no inherent economic reason to “tax” items like cigarettes and alcoholic beverages any differently than food and clothing depending on the nature of potential complementarities with non-market consumption. Thus, these items could be subject to the general sales tax or VAT, usually at a flat rate, to the extent that the VAT (or sales tax) is used. These taxes are ad valorem. The tax base should be the full cost, the market price plus the corrective charge plus any supplemental excise, and funds should be deposited into general revenue accounts. It is necessary to include the corrective charge in order to preserve price ratios of the estimated efficient prices.

c. A Supplemental Tax on Alcoholic Beverages, Tobacco Products, Motor Fuels and Other Commodities

The corrective charge should not be part of an excise system. There is a long history of imposing excise taxes on alcoholic beverages, tobacco products and motor fuels and these taxes have historically been designed for revenue, not social control. Thus, there might be a role for supplemental excises (above the general consumption tax) for purely revenue purposes and as a way to collect funds relatively efficiently if the welfare cost of such taxes is reasonable. That is, if the compensated own price elasticities of these commodities are low, then a supplemental tax might be appropriate. The purpose of this charge is not to reduce the quantity demanded to some socially optimal level (to reduce the consumption of bad things), but to take advantage of relatively inelastic demand functions.

This tax should be ad valorem and might simply be a supplemental charge on the VAT – in effect, have a two-rate VAT: for instance, tax rates might be 100% on alcoholic

beverages, tobacco products and motor fuels and 15% on all other consumption goods.³¹ The base should include the corrective charge.

V. Conclusion

Three points might be gleaned from this analysis. First, followers of Pigou did not do the economics profession any favors by defining corrective pricing as a tax. Corrective pricing is not taxation and is but one of a set of options that might be an efficient method to get private relative prices to equal social relative prices. Different instruments might be needed for different targets and there is no reason a priori to believe that tax analysis and the analysis of corrective pricing would yield identical results.³² Corrective pricing is determined relative to welfare improvements and the particular factors that are responsible for the externality (alcoholic content for instance), while revenue considerations may determine the level and perhaps even the form of the distortionary taxes.³³

Second, it is important to distinguish real from pecuniary externalities. Pecuniary externalities such as public financing and the benefit to nonsmokers from the early death of smokers do not require corrective pricing. In fact, attempts to incorporate these factors might reduce welfare (see Holcombe and Sobel (2001)). For instance, reducing the corrective charge for cigarettes by the value of social security gain will offset part of the corrective charge for the real externalities such as second hand smoke.

Third, an exogenous change in a price will decrease demand if the supply curve shifts to the left, all other things equal. This is almost axiomatic in economics because we are dealing with ordinary demand functions and, in simple models, shifts from one partial equilibrium efficient outcome to another equally efficient outcome are generally assumed. No welfare claims are made that one outcome is superior to the other, however, because both are efficient. No such claim can be made about government pricing, be it a corrective price or a tax, because pricing changes induced by government actions create, or offset, second order effects, either positive or negative, that would not otherwise be present. Thus, we need to know the reason for the price change – to correct the externality or to collect government revenue – how the government uses the funds and the measure of the welfare gains and losses before making any inference about policy changes that affect demand.

³¹ There is a potential problem with defining this tax to be a supplemental excise tax. For instance, some alcoholic beverages are used to produce other alcoholic beverages (champagne is used to produce cognac). Cascading might result and some credit system might be necessary, if such a credit system is cost effective.

³² Sadka (1978) develops a somewhat different decomposition for corrective pricing and taxes.

³³ I agree that, in general, all the taxes and corrective prices might be determined simultaneously in a second best world. Separation of function, however, is still appropriate in order to distinguish the role of a price as signal from a tax for revenue purposes.

Finally, this analysis can and perhaps should be extended to other externalities. For instance, there is current discussion about whether setting a cap and allowing trade in emission permits is preferred to a “carbon tax” – a corrective price to determine the non-negative shadow price of the atmosphere. Either option could yield identical results in a world where administrative costs are not a concern and lump sum transfers are possible. Different results, however, might result in practical situations. For instance, Prasad in a recent editorial (*New York Times* Tuesday March 25, 2008) claims that Denmark, Sweden, Norway and Finland have used carbon taxes but that Denmark’s policy is the only policy that has led to a reduction in emissions.³⁴ Prasad’s reasoning is that Denmark’s policy is targeted to using revenues to compensate those who reduced emissions, while the other countries used the revenues as part of general revenues. Thus, the right instrument to employ may depend on the objectives. If the objective is simply to internalize externalities, then corrective pricing with no restriction on revenue use might be reasonable. Alternatively, if the objectives are to reduce the quantity consumed (or produced) of a particular commodity, then quantitative restrictions and targeting revenues might be more reasonable.

³⁴ It could be the case that emissions in the other countries are lower than they would have been without the tax.

Figure 1
Traditional Externality

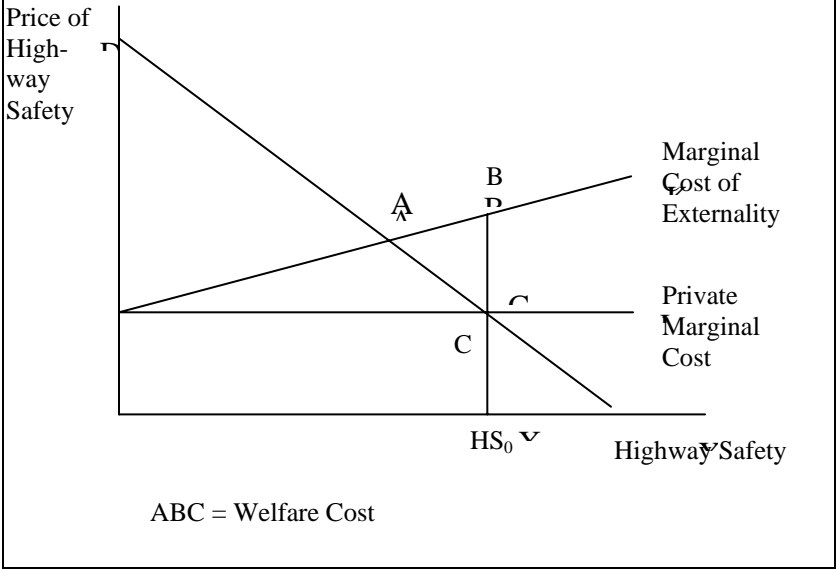


Figure 2
Drinking and Driving

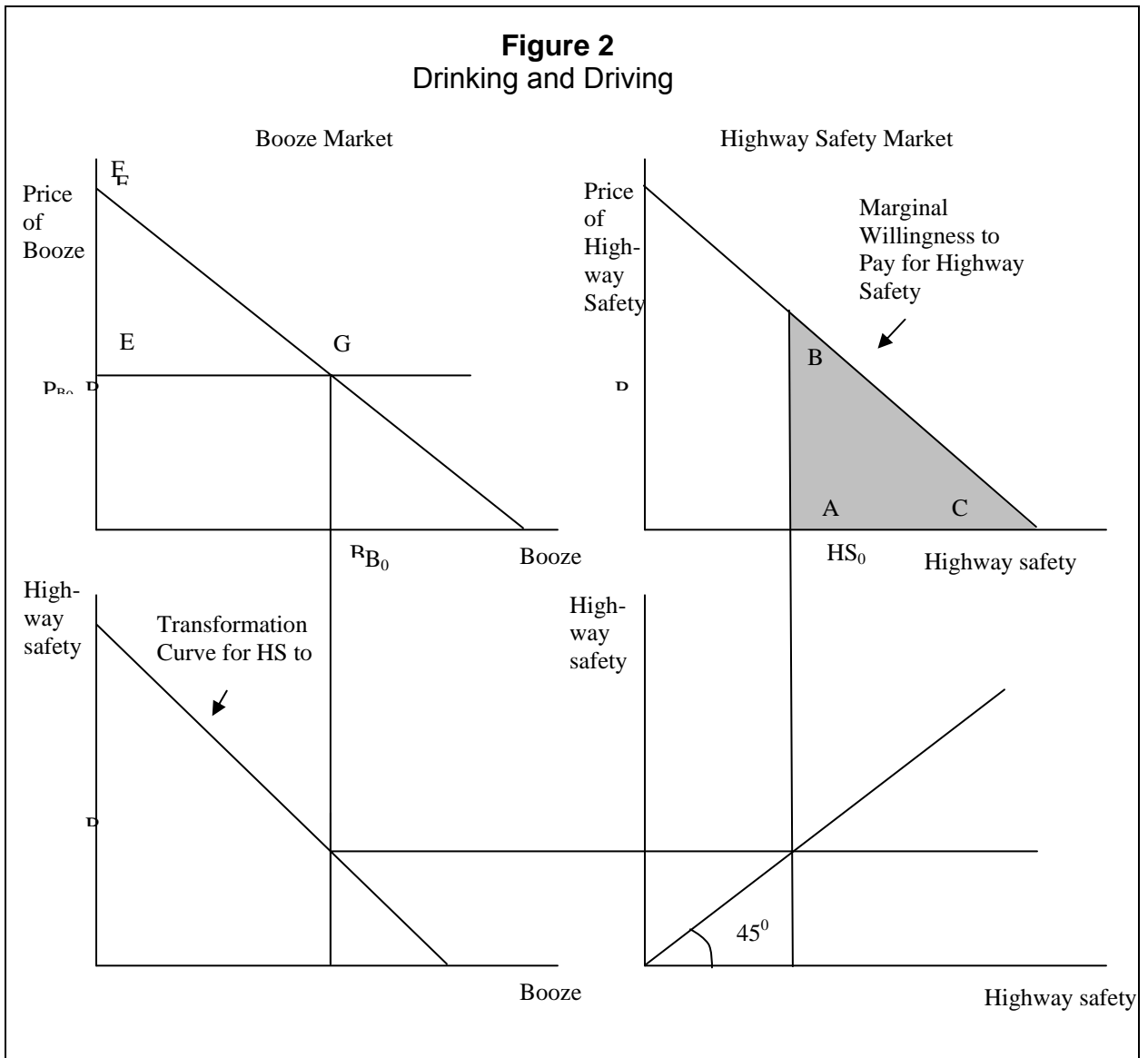


Figure 3
Drinking and Driving

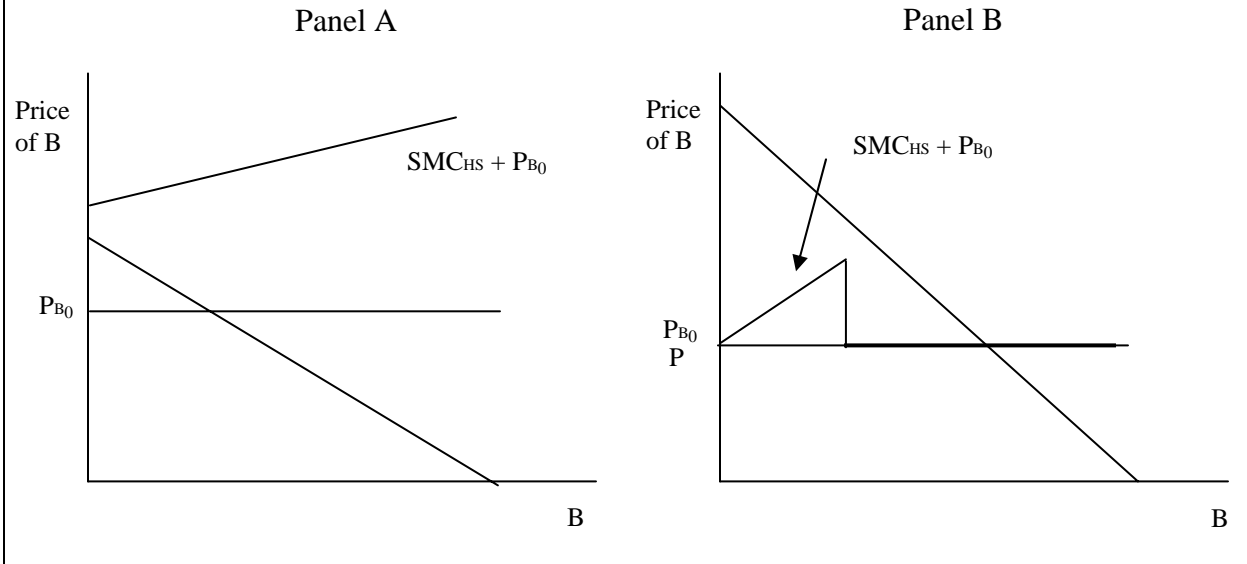


Figure 4a
Externality in Drinking Market

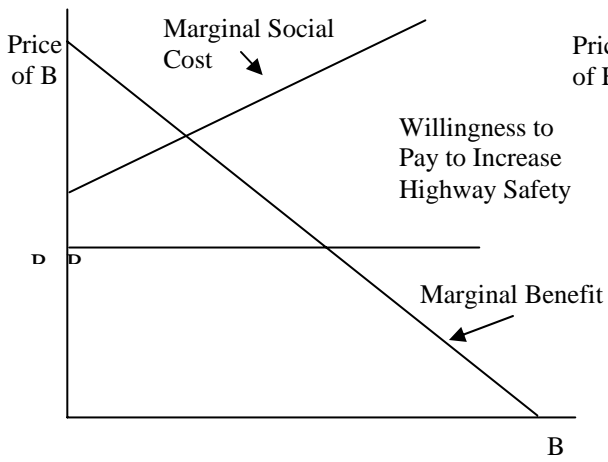


Figure 4b
Externality in Highway Safety Market

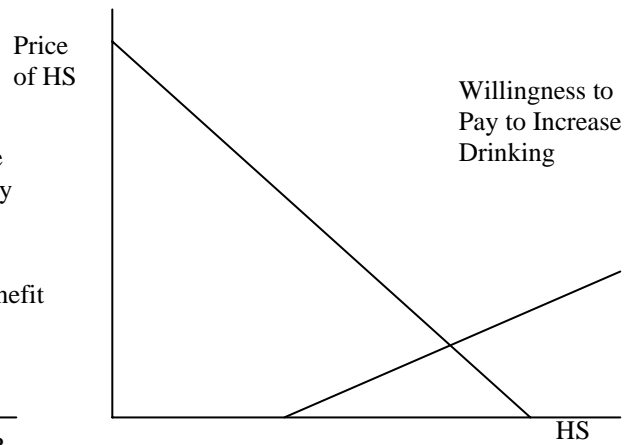
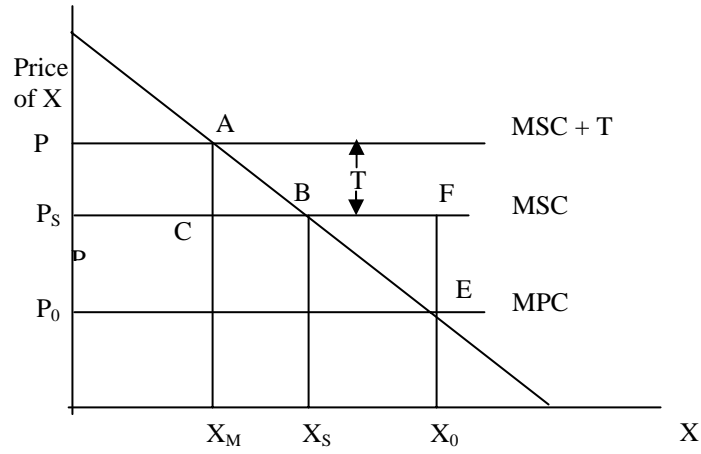


Figure 5
Welfare Cost and Welfare Gain



P_0 = Private Marginal Cost
 P_S = Social Effective Price
 P_M = Tax Inclusive Price

ABC = Welfare Cost
 BFE = Welfare Gain from
 Corrective Pricing

References

Arnott, Richard and Joseph E. Stiglitz. (1986) "Moral Hazard and Optimal Commodity Taxation." *Journal of Public Economics*, 29 (1), pp. 1-24.

Backhaus, Jurgen G. and Richard E. Wagner. (2004) *Handbook of Public Finance*. Boston, Dordrecht, New York, London: Kluwer Academic Publishers.

Baumol, William J. (1972) "On Taxation and the Control of Externalities." *The American Economic Review*, 62 (3), June 1972, pp. 307-322.

Bovenberg, A. Lans and Ruud A. de Mooij (1994) "Environmental Levies and Distortionary Taxation." *The American Economic Review*, 84 (4), September 1994, pp. 1085-1089.

Chaloupka, Frank J. and Kenneth E. Warner. (2000) "The Economics of Smoking." In Culyer, Anthony J. and Joseph P. Newhouse (eds.), *The Handbook of Health Economics*, 1B. Amsterdam, New York: Elsevier.

Coase, Ronald. (1960) "The Problem of Social Cost." *The Journal of Law and Economics*, 3 (1), October 1960, pp. 1-44.

Cook, Philip J. (2007) *Paying the Tab: The Economics of Alcohol Policy*. Princeton, NJ: Princeton University Press.

Corlett, W. J. and D. C. Hague. (1953-54) "Complementarity and the Excess Burden of Taxation." *The Review of Economic Studies*, 21 (1), pp. 21-30.

Gravelle, J. G. and Dennis Zimmerman. (1994) "Cigarette Taxes to Fund Health Care Reform: An Economic Analysis." Washington DC. US Government Printing Office.

Gruber, Jonathan. (2001) "Tobacco at the Crossroads: The Past and Future of Smoking Regulation in the United States." *The Journal of Economic Perspectives*, 15(2), Spring 2001, pp. 193 – 212.

Gruber, Jonathan and Botond Koszegi. (2001) "Is Addiction 'Rational'? Theory and Evidence." *The Quarterly Journal of Economics*, 116 (4), pp. 1261-1303.

Harberger, Arnold C. (1964) "The Measurement of Waste." *The American Economic Review*, 54 (3), Papers and Proceedings of the Seventy-sixth Annual Meeting of the American Economic Association, May 1964, pp. 58-76.

Harberger, Arnold C. (1974) "Three Basic Postulates for Applied Welfare Economics: An Interpretive Essay." In Harberger, Arnold C (ed.), *Taxation and Welfare*. Boston: Little, Brown & Company.

Holcombe, Randall G. and Russell S. Sobel. (2001) "Public Policy Toward Pecuniary Externalities." *Public Finance Review*, 29 (4), pp. 304-325.

Manning, Willard G. et.al. (1991) *The Costs of Poor Health Habits*. Cambridge: Harvard University Press.

Meade, J. E. (1952) "External Economies and Diseconomies in a Competitive Situation." *The Economic Journal*, 62 (245), March 1952, 54-67.

Mishan, E.J. (1971) "The Postwar Literature on Externalities: An Interpretive Essay." *Journal of Economic Literature*, 9 (1), March 1971, pp. 1-28.

Musgrave, Richard A. (1959) *The Theory of Public Finance: A Study in Public Economy*. New York: McGraw-Hill.

Pigou, Arthur C. (1924) *The Economics of Welfare*. New Brunswick, NJ: Transaction Publishers, 2002.

Prasad, Monica. (2008) "On Carbon, Tax and Don't Spend." *New York Times*, Tuesday, March 25, 2008.

Ramsey, F. P. (1927) "A Contribution to the Theory of Taxation." *The Economic Journal*, 37 (145), March 1927, pp. 47-61.

Sadka, Efraim. (1978) "On the Optimal Taxation of Consumption Externalities." *The Quarterly Journal of Economics*, 92 (1), February 1978, pp.165-174.

Schelling, T.C. (1968). "The Life you Save May Be Your Own". In Samuel B. Chase, Jr. (ed.), *Problems in Public Expenditure Analysis*, pp. 127 – 162. Washington, DC: Brookings Institution.

Scitovsky, Tibor. (1954) "Two Concepts of External Economies." *The Journal of Political Economy*, 62 (2), April, 1954, pp. 143-151.

Simpson, Brian P. (2005) *Markets Don't Fail!* Lanham, MD: Lexington Books.

Sloan, Frank A. et. al. (2004) *The Price of Smoking*. Cambridge: The MIT Press.

Starrett, David A. (1972) "Fundamental Nonconvexities in the Theory of Externalities." *Journal of Economic Theory*, 4, pp. 180-199.

Viscusi, W. K. (1995) "Cigarette Taxation and the Social Consequences of Smoking." In James M. Poterba (ed.), *Tax Policy and the Economy*, 9. Cambridge: The MIT Press.