

Georgia State University

ScholarWorks @ Georgia State University

---

ECON Publications

Department of Economics

---

2003

## The Uneasy Case Against Discriminatory Excise Taxation: Soft Drink Taxes in Ireland

Roy W. Bahl

*Georgia State University*, rbahl@gsu.edu

Richard M. Bird

*University of Toronto*, rbird@rotman.utoronto.ca

Mary Beth Walker

*Georgia State University*, mbwalker@gsu.edu

Follow this and additional works at: [https://scholarworks.gsu.edu/econ\\_facpub](https://scholarworks.gsu.edu/econ_facpub)



Part of the [Economics Commons](#)

---

### Recommended Citation

Bahl, R., Bird, R., & Walker, M. B. (2003). The Uneasy Case Against Discriminatory Excise Taxation: Soft Drink Taxes in Ireland. *Public Finance Review*, 31(5), 510–533. <https://doi.org/10.1177/1091142103253753>

This Article is brought to you for free and open access by the Department of Economics at ScholarWorks @ Georgia State University. It has been accepted for inclusion in ECON Publications by an authorized administrator of ScholarWorks @ Georgia State University. For more information, please contact [scholarworks@gsu.edu](mailto:scholarworks@gsu.edu).

# THE UNEASY CASE AGAINST DISCRIMINATORY EXCISE TAXATION: SOFT DRINK TAXES IN IRELAND

*ROY BAHL*

Georgia State University

*RICHARD BIRD*

University of Toronto

*MARY BETH WALKER*

Georgia State University

*This study uses an empirical case study to investigate the revenue implications of reducing a discriminatory excise tax. The case study is Ireland, which provides a natural experiment because it has both imposed and removed such a discriminatory tax (on soft drinks) in the past two decades. The authors find that soft drink consumption is price elastic, income elastic, and sensitive to weather. They estimate that 30% of the amount of surrendered excise tax revenue is recaptured by the value-added tax and income tax. The remaining 70% loss is further reduced by a small reduction in welfare costs, elimination of administration costs, and reduced compliance costs. The rate-revenue curve has a negative slope, even though demand is price elastic, presumably because marginal costs are rising and the tax reduction is not fully captured in the price reduction. In effect, the authors find undershifting and no evidence of a Laffer effect.*

**Keywords:** excise tax; discriminatory tax; soft drinks

## 1. INTRODUCTION

Excise taxes receive little attention in the public finance literature, perhaps because of the perception that such taxes are unimportant, soon will be unimportant, or at the very least should be unimportant in any modern tax system. This perception is far from true. In the Organization for Economic Cooperation and Development (OECD) countries, for example, taxes on specific goods and services on average ac-

counted for 12% of total tax revenues in 1999, compared to an 18% share for general sales taxes. The share of excise revenues ranged from 7% or less in a few countries (Sweden, Turkey, and the United States) to more than 15% in Portugal, Mexico, and Korea (OECD 2001). Most of these revenues are, unsurprisingly, yielded by levies on the three great taxable vices of modern life—drinking, smoking, and driving. In addition, however, almost every country continues to levy a number of taxes on other specific goods and services—for instance, in furtherance of environmental objectives (Fullerton 1996) or some moral, social, or political end (Shugart 1997).

A special excise tax that is found in a surprising number of countries is a tax on carbonated beverages. In some cases, the tax rate can be quite high. In 1998, for example, Zambia had a special 25% tax on such beverages (Kaunda 1998). In the mid-1990s, the excise tax rate exceeded 20% in several other African countries (Chad, Zimbabwe, Cameroon) and was above 50% in Uganda, Ethiopia, and Ghana (Bolnick and Haughton 1998; Baah-Nuakoh, Jackson, and Woode 1999). The Mexican Congress passed a 20% special excise on soft drinks in 2002. Although such taxes are most common in developing countries, similar discriminatory consumption taxation is not unknown in developed countries.<sup>1</sup>

There is a great deal of rhetoric about the advisability of a discriminatory tax on soft drinks. International agencies advise against discriminatory excises other than on goods that impose significant external effects, for example, alcohol, tobacco, and gasoline (Sunley 1998). Predictably, the soft drink industry is opposed and offers studies to support reduction or abolition of the tax. On the other hand, governments often succumb to the temptation of a low-cost and potentially lucrative revenue take. Despite these differences in view, there is relatively little by way of hard analysis of the impacts of removing or reducing an excise tax on soft drinks. This study is an attempt to fill this gap in the tax policy literature by offering a theoretical and empirical evaluation of a discriminatory excise in which significant externalities are not present.

The primary reason why developing countries turn to an excise on soft drinks is to raise revenues. They fall back on traditional reasoning: If demand is price inelastic, then a tax rate increase is unlikely to sig-

nificantly harm revenues. Indeed, it may be thought that the demand for such products is sufficiently inelastic to warrant some special taxation on “optimal tax” grounds. Or, to the contrary, such products might be sufficiently substitutable for some other taxed product—such as low-alcohol beer—that special taxation is deemed warranted for “competitive” or “fairness” reasons. In any case, bottlers are relatively few in number, so the tax is easily enforced, and increased taxes on soft drinks are unlikely to cause a political uproar.

Sometimes, the revenue-raising motive is dressed up with justifications related to social goals and politics. One such rationale may be environmental—that is, a tax to compensate for the proliferation of solid waste often associated (especially in more affluent countries) with the disposal of soft drink bottles (Dobbs 1993). The justification may be moral or social, far-fetched as this may seem to some. For example, soft drinks may be perceived as being associated with some foreign influence undesired by the controlling elite, or, more likely, the government may adopt a paternalistic view that the poor do not know what is good for them and should be discouraged from buying such products. In poorer countries, it may even be thought that the consumption of soft drinks is a sufficiently sound indicator of wealth and income to justify imposing such a tax in the name of progressivity.<sup>2</sup> All of these arguments have appeared at one time or another as justification for a discriminatory tax on soft drinks.

This article uses a case study of the practice, as well as an empirical analysis, to answer whether it is in the national interest to levy a special excise tax on soft drinks. In doing this, we revisit the so-called Laffer effect in a context of rate reduction for an excise tax. The case study is Ireland, which provides a good natural experiment because it has both imposed and removed such a discriminatory tax in the past two decades. The central question we address is the revenue-raising justification for higher tax rates on soft drinks. In particular, we examine empirically the assumption that the demand for soft drinks is price inelastic and estimate the total revenue impact of tax rate reduction.

The structure and the history of the taxation of soft drinks in Ireland are described briefly in the next section. In Section 3, we evaluate the rationale behind the imposition of this special excise tax, drawing on the Ireland case. A general model for evaluating the revenue impacts

of discriminatory taxes and an econometric analysis of the impact of special excises on the demand for soft drinks are presented in Sections 4 and 5, respectively. Aggregate revenue impacts of eliminating the excise tax on soft drinks are estimated with a simulation model in Section 6. The final section summarizes the results.

## 2. SOFT DRINK TAXES IN IRELAND

Soft drinks in Ireland have, over the years, been subject to two indirect taxes: (a) a special excise tax levied on physical production and (b) a value-added tax that treats soft drinks as an item of general consumption but also singles them out for discriminatory treatment.

A special excise tax was levied on a class of drink called *table waters* from 1916 to 1992.<sup>3</sup> This tax fell on aerated waters and any beverages (including syrups and other liquids intended to be consumed only in a diluted form) put up for sale in bottles, cans, casks, or other closed containers or receptacles. As soft drink products changed, the interpretation of the tax base also changed, often in subjective ways.<sup>4</sup> From 1975 through 1979, this special excise was levied at a rate of IR£0.10 per gallon produced and was collected directly from the producer.<sup>5</sup> In 1980, the rate was increased to IR£0.37 per gallon and held at that level until July 1990 when it was reduced to IR£0.29 per gallon; the tax was finally abolished in November 1992.

The excise tax increase in 1980 was prompted by the need to raise more revenue. The elimination of the special excise on table waters some 12 years later was a result of many considerations. The European Union (EU) was urging elimination of special excises on soft drinks in the name of tax rate harmonization,<sup>6</sup> fiscal pressure had lessened, revenues from the special excise tax had eroded significantly, and various commissions argued that special excises imposed efficiency costs (Government of Ireland 1984).

Carbonated beverages are also subject to the value-added tax (VAT). Most food and drink—including, for example, coffee and tea—sold in retail shops in Ireland is zero rated under the VAT and taxed at 12.5% if sold in restaurants or through vending machines. In contrast, soft drinks are taxable at the top rate of 21% (reduced from

23% in 1992), irrespective of whether the purchase is made in a retail shop or a restaurant. The VAT base for soft drinks includes the excise duty.

Soft drinks provide a significant tax base. Of the 12 largest food and drink sectors, soft drinks accounted for a rather astonishing 20% of the total retail spending in 1995 (Soft Drinks Association in Ireland 1996, data sheet no. 9). To get a true measure of the total contribution of the soft drink industry to government revenues, one would need to take into account income taxes, the VAT, and property taxes, as well as the special excise. Government statistics do not include an estimate of the full contribution of the soft drink “sector” because the only tax for which such revenue data are formally reported is the special excise.<sup>7</sup> In the last year before its abolition, the special excise tax on soft drinks accounted for less than 1% of total budgetary tax collections in Ireland.

### 3. WHY DISCRIMINATORY EXCISES?

To most fiscal economists, good tax policy begins with the rule of neutrality (i.e., the tax rate and base structure should not interfere with consumption, production, or investment choices). Despite the proliferating “optimal tax” literature, as a practical matter, many experts continue to agree with the classical view that the more broad based a tax, the closer it comes to this ideal.<sup>8</sup> Nevertheless, most countries do impose discriminatory excise taxes. The questions we ask are as follows: Why do they do so, and are there conditions under which such measures can be justified as good public policy?<sup>9</sup> Specifically, are soft drinks a particularly good candidate for discriminatory tax treatment in the name of increasing the national welfare? In this section, we consider these arguments in the Irish case.

The best economic justification for a discriminatory excise tax is that the additional tax is needed to compensate for an external effect related to the production and/or consumption of “undesirables.” For example, the consumption of alcohol imposes costs on society in the form of increased automobile accidents, drinking-related crime, and the maintenance of alcohol abuse centers. If such external costs are not

borne by the consumers and producers of the offending products, they will make socially inappropriate decisions. One rationale for discriminatory taxation is thus to compensate for such external costs, although in fact such taxes are seldom well designed for this purpose.<sup>10</sup> Nonetheless, in principle, discriminatory taxes used to compensate society for external costs can increase national welfare.

The externality justification, however, does not easily fit the situation of soft drinks. Consider, for example, the argument that the consumers of soft drinks should pay the environmental cost of aluminum, plastic, and glass containers that are not recycled and the share of recycling cost that is now borne by government. This argument is sound in principle, but it is estimated that only 2% of all household volume of waste is beverage containers (Soft Drinks Association of Ireland 1996), so it is unclear why this product should be singled out. All in all, it seems implausible that soft drinks impose a significant social cost on society in the form of health risk, in the inducement of aberrant behavior by those who consume soft drinks, or by requiring special costly public infrastructure to meet the needs related to increased soft drink consumption and production. Special taxes on soft drinks are not easily justified on economic efficiency grounds.<sup>11</sup>

A special excise tax may be levied “to keep morals in check.” Drinking and smoking are seen by some as immoral activities that ought to be discouraged, and higher taxes are imposed to raise the price of these activities in hopes of curtailing consumption. This argument is based on philosophical views rather than economics and cannot be evaluated using economic theory. In the unlikely event that consumption of soft drinks offends national sensibilities sufficiently to warrant public policy action, banning them would seem more rational than taxing them.

Government may fear that the production and consumption of non-essential goods and services will “crowd out” more productive uses of resources in the economy. Or it may wish to discourage luxury consumption in favor of increased savings or discourage the consumption of foreign-produced luxury goods in favor of consumption of domestically produced goods. The use of soft drink taxes to protect domestic industry is not unknown. In 2002, the Mexican Congress passed a 20% tax rate on the sale of carbonated beverages that contained fruit juice.

Local soft drink bottlers began shifting from using imported fructose sweeteners to sugar. The government put a “hold” on the new tax in March 2002 (Mexico fructose tax 2002; Mexico to suspend 2002). Many questions can obviously be raised about such justifications for special excises—for example, how can governments identify “degrees of luxury” and tax accordingly?<sup>12</sup> What reason is there to believe that increased soft drink production does not increase value added in the economy but instead siphons off resources from other “more productive” sectors?

Some would evaluate the discriminatory excise of soft drinks on equity grounds. If soft drink consumption rises in proportion to income, special excises on luxuries might be justified as a progressive and (some would say) an equitable form of tax. But there is no evidence from Irish data that soft drink consumption is progressive over the full income range (Bahl and Walker 1998). The vertical equity argument on ability-to-pay grounds is not easily made, even in developing countries. Moreover, no tax on soft drinks is likely to be large enough to change the overall degree of tax progressivity significantly. Of course, special excise taxes do not pass the horizontal equity test because, by their very nature, they discriminate against one class of consumption.

The main reason most countries levy discriminatory excise taxes is for revenue, and as Kay and Keen (1987a, 1987b) have argued, the most effective revenue raiser is a specific rather than an ad valorem tax.<sup>13</sup> A good revenue target for an indirect tax is a commodity whose consumption is significant, whose production or consumption makes for relatively easy enforcement, whose taxation will not bring political outcry that will seriously damage politicians, and whose demand is price inelastic. Gasoline, alcoholic beverages, and tobacco are commodities that are widely believed to fit this profile (McLure and Thirsk 1978). Do soft drinks carry these same advantages—that is, are excise taxes on soft drinks relatively palatable to voters, can they be collected at reasonable administrative cost, and is the demand price inelastic? In the case of Ireland, the answers, respectively, are yes, yes with a qualification, and no.

With respect to political acceptability, although soft drink producers in Ireland were predictably unhappy about the discriminatory



treatment of their product, there was no consumer-led rebellion to throw this tax out, perhaps in part because it was not visible to consumers. With respect to administrative costs, the Irish special excise tax was relatively easy to assess and collect. However, the differential treatment of soft drinks under the Irish VAT led to some very messy and potentially costly classification problems that affected administrative costs.<sup>14</sup>

The price elasticity issue suggests an important difference between soft drinks and the commodities that are traditionally subject to a discriminatory excise tax. The demand for soft drinks is not price inelastic because there are good substitutes (and many of these substitutes are subject to differential tax treatment).<sup>15</sup> A more price-elastic demand implies that increased consumption of soft drinks will cushion the revenue loss occasioned by a tax rate reduction.

#### 4. MODELING THE REVENUE IMPACT OF A DISCRIMINATORY EXCISE

Because the demand for soft drinks is not price inelastic, rate reductions might be accomplished without significant revenue loss. Although complete elimination of a discriminatory excise will obviously result in a revenue loss, the loss may well be less than the amount of revenue raised by the tax at the time of its abolition.

To illustrate this argument, assume a full employment economy, with soft drinks subject to two taxes: a specific excise and an ad valorem VAT. In Figure 1, we track the response of revenues to changes in the rate of the specific excise tax. In the base year, the excise tax rate of  $r_1$  raises  $R_1$  in excise tax revenue. The line  $Aa$  shows the actual amount of excise tax revenue loss associated with a rate reduction from  $r_1$  to  $r_2$ , including income effects and the impacts of taste, preference factors, and so forth, as well as the possible effects of increasing costs of production. The similar curves  $Aa'$  and  $Aa''$  trace out the revenue consequences of price effects only. They are drawn here, alternately, to show a negative slope throughout or a backward-bending price-elastic segment in which rate reductions are accompanied by revenue increases. This last case is the so-called Laffer curve. The points  $R'_2$  and

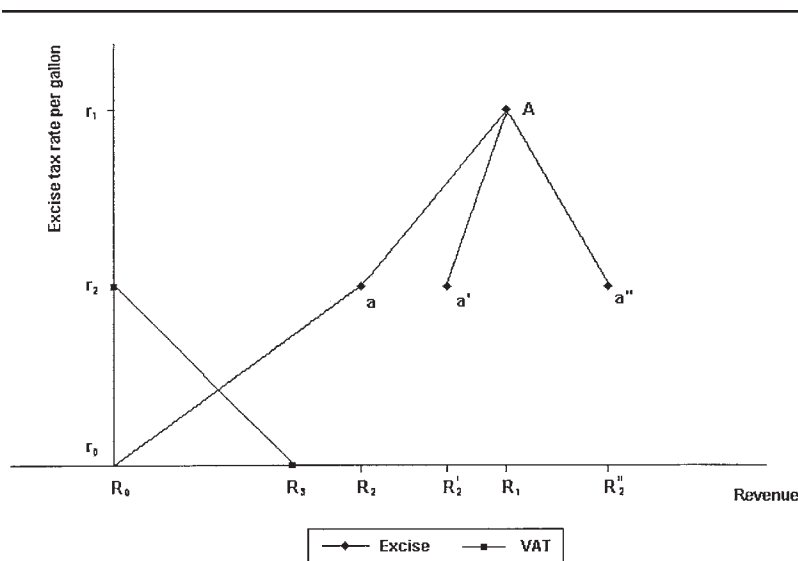


Figure 1: Possible Revenue Responses to a Change in the Excise Tax Rate

$R_2''$  show the hypothetical revenue losses. At any positive  $r_i$ , the actual yield after a rate reduction ( $R_i$ ) is less than the yield showing price effects only.

Let us assume that in Year 2 of this example the excise tax is eliminated (the rate is reduced from  $r_2$  to  $r_0$ ). The excise tax revenue loss is  $R_2R_0$ . However, there is also a parallel displacement effect taking place. With declining prices, soft drink consumption will increase, resulting in an increase in VAT revenues. The relationship between the increase in VAT revenues and the excise tax rate is complex, however, and depends on relative changes in demand and production costs. The relationship can be expressed as follows:

$$VATR = r_v[P_s(r_e)Q_s(P_s(r_e)) - r_iC(Q_s(\bullet)) + r_eQ_s(\bullet)],$$

where  $VATR$  denotes revenues from the VAT,  $r_v$  is the VAT rate,  $r_e$  is the tax rate on intermediate goods, and  $C(\bullet)$  represents production costs. Other variables have been defined previously. Here, as the excise tax rate declines, prices fall. If the price elasticity is greater than unity, ex-

penditures on soft drinks will rise in response to price reductions. However, production costs will also rise as the quantity supplied increases, and VAT will be levied on the cost of inputs purchased. Because these “input taxes” are creditable in determining VAT liability, the increase in production costs dampens the increase in VAT revenues.

The increase in VAT revenue plotted against the *excise* tax rate is  $r_2R_3$  (see Figure 1), suggesting a recapture of  $R_0R_3$  of the revenue loss from eliminating the specific excise tax.<sup>16</sup> This leaves a net revenue loss of  $R_2R_3$  when the special excise tax is eliminated.<sup>17</sup> The general VAT rate could be increased to recapture all of the revenue loss and would be shown by  $r_2R_2$ . The empirical analysis presented in the next section is an estimation of these hypothesized tax responses for the Irish case.

## 5. EMPIRICAL ANALYSIS OF THE DEMAND FOR SOFT DRINKS

The goal in this empirical analysis is to measure the response of soft drink consumption to changes in the tax rate on soft drinks. Estimation is difficult both because of the complexities just noted and because many factors affect the level of soft drink consumption, such as increased production costs, economic growth, and even the weather. Moreover, there is the question of the extent to which the tax rate changes are actually passed forward in the price of soft drinks. To gain an idea of the effects of taxes on the demand for soft drinks, it is necessary to construct an empirical model that takes such factors into account. Ireland provides a natural experiment in that over the 21-year period for which we have data, the excise tax rate was lowered and then eliminated. Hence, there is a basis for estimating the tax impact on demand.<sup>18</sup>

Following traditional economic theory, we have specified a model to estimate the determinants of soft drink consumption in Ireland. The demand for soft drinks in Ireland might be explained by five factors:

- *The price of soft drinks, inclusive of any taxes.* The hypothesis is that the relationship is negative (i.e., that higher prices will discourage con-

sumption). The question is whether higher prices will discourage consumption in proportion to the price increase.

- *The level of income.* Soft drinks are a “normal” consumer good—that is, one could expect that the quantity of soft drinks consumed has increased over time, in a systematic way, with the increase in gross domestic product (GDP).
- *Population growth.* As the national population increases, the consumption of soft drinks will increase.
- *Consumer tastes.* To get a true measure of the response of soft drink consumption to price changes, we must control for other factors that affect demand. In particular, weather in Ireland is often cited as an important determinant of level of soft drink consumption, and we introduce a weather variable in this time-series analysis.
- *The price of other goods.* Other goods may serve as either substitutes or complements to soft drinks, and so changes in these prices will affect soft drink consumption.

Estimation of the demand for soft drinks is complicated by the fact that the observed soft drink price is determined by the interaction of supply and demand. To obtain statistically valid estimates of price elasticity of demand, we need a control for the impact of demand on price. The stochastic model we estimate provides such a control.

The model is specified in Equations (1) and (2):

$$Q_d = F(P_d, P_f, GDP, W, \text{error}), \quad (1)$$

$$P_d = F_2(C, T_1, T_2, P_f, Q_{d-1}, GDP, W, \text{error}), \quad (2)$$

where  $Q_d$  is per capita consumption of soft drinks (1,000 liters);<sup>19</sup>  $P_d$  is the price of soft drinks, as measured by the national price index for carbonated beverages;  $P_f$  is the price of food, as measured by the national price index for food items;  $GDP$  is per capita gross domestic product;  $W$  is the average high temperature in July;  $C$  is an index of the cost of production, measured here as the producer price index for drinks;  $T_1$  is the standard value-added tax rate; and  $T_2$  is the excise tax rate.

This model is estimated by instrumental variables methods, with all variables expressed in logarithms, for the period extending from 1975

**TABLE 1: Results of Regression Analysis on Per Capita Consumption of Soft Drinks in Ireland, 1975-1996**

	<i>Regression Coefficient<sup>a</sup></i>	<i>T Value</i>
Constant	-8.05	-19.40
Price index for soft drinks <sup>b</sup>	-1.102	-6.43
Price index for food products	0.004	0.01
Per capita gross domestic product	1.227	16.52
Average July temperature	0.318	2.79

a. All variables expressed in logarithms.

b. Endogenous variable.

through 1996. We have thus assumed constant elasticities with respect to all variables.<sup>20</sup>

The results of the econometric analysis, presented in Table 1, square with expectations. The explanatory variables that measure the price of soft drinks, income, and weather are highly significant and have the correct signs. From this equation, we can predict the level of soft drink consumption during the 1975 through 1996 period with a high degree of accuracy.

The estimated price elasticity of demand for soft drinks is  $-1.10$  and is statistically significant. Our best estimate is that a 10% reduction in the price of soft drinks would lead to an 11% increase in the number of liters consumed, if all else were held constant. This estimate of the average consumption response to price changes of soft drinks in Ireland takes into account the several changes made in the excise and VAT rates over this 20-year period.

The estimated income elasticity of demand for soft drinks is 1.23 and is also statistically significant. The implication of this result is that people will spend a larger share of their income on soft drinks as income increases.<sup>21</sup> These results also show that the consumption of soft drinks responds positively and significantly to warmer weather. A one-degree higher July temperature, on average, is associated with a 0.32% higher level of soft drink consumption. The Soft Drinks Association of Ireland (1996) classified 1989, 1990, and 1995 as "good summers" and 1986 and 1991 as "bad summers." Our results predict that, all other things held constant, soft drink consumption is about 2% higher in good than in bad summers.

The price of substitute goods, measured here as the price index for food, did not have an impact that was significantly different from zero. If the price of food products is dropped from the estimation, the price elasticity of soft drinks rises to 1.11, and the 95% confidence interval becomes (0.992, 1.257). We also tried the price of alcoholic beverages as an independent variable, but the results were much the same. If a price index for alcohol is used in place of the price of food, the price elasticity for soft drinks is 1.05, with a 95% confidence interval of (0.656, 1.452).

#### SIMULATION RESULT: RATE REDUCTION

Holding constant the effects of income growth and weather, a 1% soft drink price reduction leads consumers to increase the quantity of soft drinks purchased by 1.10%. The implication of this result is that although a *reduction* in the tax rate will lead to a revenue loss, the loss will be offset to a significant extent by additional taxes collected from increased consumption of soft drinks.

To demonstrate this result, we have carried out a simulation to estimate the revenue impact of the reduction in the tax rates on soft drinks that occurred between 1990 and 1992. The excise tax was lowered from IR£0.37 per gallon to IR£0.29 in July 1990 and then completely eliminated in 1992. The VAT rate to which soft drinks are subject was lowered from 23% to 21%, effective in January 1992. In this simulation, we ask three questions:

1. How much did the price of soft drinks change in response to changes in the excise tax rate, after abstracting from the effects of all other factors that may have had a price impact (e.g., changes in production cost)? We refer to this as the *tax-induced price change*.
2. What change in soft drink consumption can we attribute to this tax-induced price change?
3. Given the answers to the first two questions, what change in excise tax revenue can be attributed solely to the tax-induced price change?

With respect to the first question, the tax reduction drove soft drink prices down by about 5% between 1990 and 1992.<sup>22</sup> In fact, observed soft drink prices in Ireland did not fall between 1990 and 1992. How

could the consumer price index for soft drinks be rising when the tax rate was falling? There are a number of explanations. The cost of production was rising because of a tight factor market, and this more than offset the tax effect. Bad weather had a dampening effect on demand during part of the 1990 to 1992 period, and this had an offsetting effect. About 15% of the sale of soft drinks took place in pubs, where prices may be more “sticky.”

The actual price index for soft drinks was 378 in 1989, the year prior to the rate reduction, and had risen to 400 in 1992. However, our simulation results show that if the *only* change that took place during this period had been the tax rate changes, the price would have fallen. There were two different tax changes in this period. The specific tax was reduced in 1990 and abolished in 1992. Therefore, the net effect of lowering the tax rate is a price reduction (see Baker and Brechling 1992). Our simulation shows that the price index for soft drinks would have fallen from 378.1 in 1989 to 366 in 1990 and then to 358 in 1992 (a 5.3% decline overall) if *only* the tax regime had changed and all else had remained constant. Clearly, there was a price-dampening effect. However, as expected in an imperfectly competitive market, consumer prices did not fall by the full amount of the tax reduction.

The answer to the second question is that soft drink consumption increased by about 15%. Actual soft drink consumption increased by only 6.8% between 1990 and 1992, but if *only* the tax-induced price changes were considered, the increase would have been nearly 15%.<sup>23</sup> Therefore, our model answers the first two questions as expected: Holding weather and income levels at their actual 1990 and 1991 levels, we can conclude that the tax rate reduction by itself would have driven down soft drink prices (though not by the full amount of the tax) and would have led to increased soft drink consumption. As Musgrave (1959) demonstrated, specific (per unit) taxes will be fully shifted forward only in perfectly competitive industries. Our finding that the prices did not fall by the full amount of the tax suggests the possibility that marginal costs of production were rising as output expanded in the soft drink industry.

The third question relates to the impact on revenues. Actual excise tax collections from soft drinks fell from IR£18.3 million in 1989 to IR£15.0 million in 1990, a IR£3.3-million decline. If we consider *only*

the revenue change due to the tax-induced reduction in price, however, our simulation shows higher expected revenue yields in each year. The estimates of the tax yield due *only* to the tax rate reductions (holding income, production costs, weather, etc. constant) are 4.7%, 6.5%, and 12.5% higher than the actual yields in 1990, 1991, and 1992, respectively. These results are consistent with the hypothesis that the rate reduction on the excise tax was accomplished with relatively little revenue loss. The increased production costs due to nontax factors, as well as some price stickiness, led to price increases that more than offset the tax-induced price reductions. These price increases and cooler weather during 1990-1992 dampened consumption enough to lead to an actual revenue loss. In effect, we find undershifting.<sup>24</sup>

In Figure 2, we plot the excise tax rate against the level of excise tax revenues. The revenue losses actually observed are shown as *Aa*, a decline from IR£18.3 million in 1989 to IR£15.0 million in 1990. The estimated revenue losses resulting from the price effects alone (*Aa'*) are of lesser magnitude (i.e., revenues would have fallen only to IR£15.7 million in 1990). Note that the rate-revenue curve (price effects only) has a negative slope, even though demand is price elastic, presumably because marginal costs are rising and the tax reduction is not fully captured in the price reduction. We do not find evidence of a Laffer effect.

#### SIMULATION RESULTS: ELIMINATING THE EXCISE TAX

Complete elimination of the special excise tax on carbonated beverages occurred in November 1992. There was certainly a gross revenue cost to the government because the tax yielded nearly IR£16 million in its last year (1992). Again, however, the true revenue loss associated with abolishing the special excise is less than this amount because of increases in soft drink output and therefore in the VAT and income tax revenues. The story is as follows:

1. The elimination of the special excise tax drove down the price of soft drinks (though not by the full amount of the tax) and led to an increased consumption of soft drinks. Total consumer expenditures on soft drinks increased.



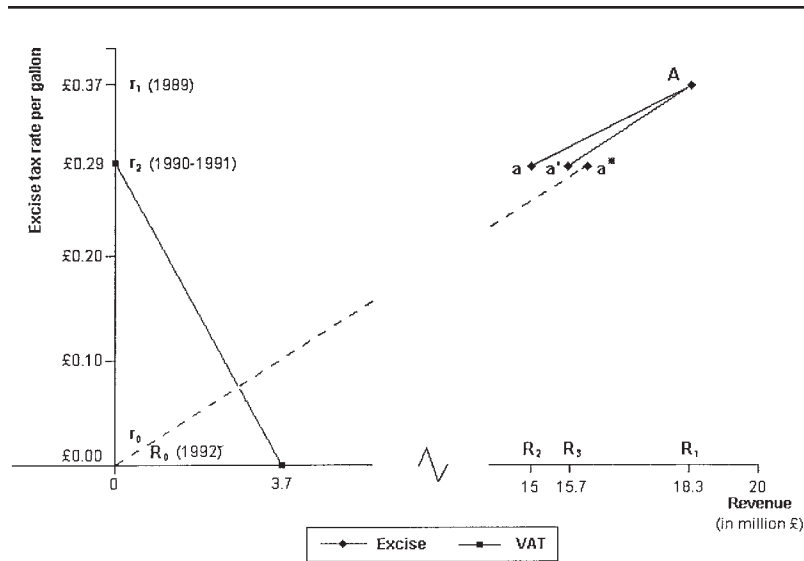


Figure 2: Actual Revenue Responses to Changes in the Excise Tax Rate

2. As the excise tax was reduced and the price of soft drinks fell, the consumption of soft drinks increased by a slightly more than proportionate amount. After the tax change, total expenditures on soft drinks were higher than before, and the quantity produced was greater. As soft drink producers began to expand the amount of labor and capital they needed to increase production, and assuming they are price takers in factor markets, they simply attracted productive factors away from other industries. At the end of this adjustment process, total value added was larger by approximately the amount of the excise tax reduction. Of this amount, about 21% (the VAT rate) was returned to government in the form of increased VAT on soft drinks.<sup>25</sup>
3. The increased value added in the soft drink industry is subject to other taxes as well. The increased labor income is subject to the individual income tax, and the increased profits are subject to the corporate income tax. Additional amounts of the revenue loss may be made up from these and other taxes.

The net revenue loss to the government will thus be equal to the *difference* between the amount previously raised from the excise tax and

**TABLE 2: Net Revenue Cost of Elimination of the Special Excise Tax on Soft Drinks**

	<i>Amount (in IR£ millions)</i>	<i>%</i>
1. Special excise tax revenue loss	16.0	100
2. Value-added tax increase from soft drinks	3.36	21
3. Individual income tax increase	1.26	7.9
4. Corporate income tax increase	0.19	1.2
5. Net revenue loss	11.19	69.9

NOTE: Assumes that the labor/capital shares are 75/25 of increased value added, net of value added tax; that the average rate of individual income tax is 10.5%; and that the average rate of tax on profits and capital income is 4.8%.

the amount of recapture in the form of increased VAT and income tax from the soft drink industry. We make a rough estimate of this in Table 2.

- In row 1, we show the excise tax revenue loss of IR£16.0 million in 1992 to be 100% of the amount to be made up. Of this, about 21% is recaptured directly in the form of increased VAT revenues (row 2).<sup>26</sup>
- In row 3, we estimate the increased individual income tax collected from increased payrolls. To make this estimate, we first assume that the labor and capital shares of increased value added (after payment of value-added tax) are 75/25. The 75% of increased value added that is in the form of payrolls is assumed to be taxed at an average rate of 10.5%. The estimated individual income tax revenue increase, then, is equivalent to  $(.75)(10.5) = 7.9$  (i.e., 7.9% of the excise tax revenue loss is recaptured in the form of increased individual income tax).<sup>27</sup>
- In row 4, we show the increased amount of tax collected from capital (i.e., for the company income tax and the tax on capital income received by individuals). Using the same 75/25 assumption for the labor/capital share as above, and assuming an average effective tax rate of 4.8% on company profits and capital income received by individuals, we may calculate the revenue recaptured from taxes on capital as  $(.25)(4.8) = 1.2$ . That is, about 1.2% of the revenue loss is recaptured from income taxes on capital.

By these calculations, about 30% of the amount of surrendered excise tax revenue is recaptured in VAT and income tax. This leaves an amount equivalent to 70% of excise tax collections to be made up.

Returning to Figure 2, we can trace the revenue consequences of the elimination of the excise tax. Revenues in 1990 were IR£15 million (point *a*) and grew to IR£16 million in 1992 (point *a\**), at which time the excise tax was eliminated. We estimate a recapture of IR£3.7 million in VAT revenues, hence a loss of IR£12.64 million. As noted in Table 2, recapture of other taxes reduces the net revenue loss to IR£11.19 million.

How might one view this remaining revenue “gap”? In fact, other potentially offsetting effects could make the revenue sacrifice less costly.

First, the elimination of the cost of administering the excise tax will cover some of this remaining revenue loss. A unit within the revenue department could be eliminated. In addition, the compliance costs imposed on payers would also be reduced. It was not possible to estimate these costs for Ireland, although one suspects that they will be very small.

Second, welfare costs associated with the special excise might have been reduced with the elimination of this tax. To calculate the familiar Harberger (1974) measure of welfare cost (*W*), we assume no preexisting distortion and make an estimate of the income-compensated demand price elasticity. From the Slutsky identity,

$$\eta^c = \eta^p + S\eta^y,$$

where  $\eta^c$  is compensated elasticity,  $\eta^p$  is price elasticity,  $\eta^y$  is income elasticity, and *S* is expenditure share of carbonated beverages.

We have estimated that  $\eta^p = 1.10$ ,  $\eta^y = 1.23$ , and  $S = 0.05$ ; hence, our estimate of the compensated demand elasticity is 1.03.

We substitute 1992 values into the following:

$$W = 0.5\eta^2 Q/P,$$

where *Q* is the quantity of soft drinks consumed in 1992, *P* is the price of soft drinks in 1992, and *T* is the tax rate on soft drinks in the year it was abolished.

This calculation leads to an estimated welfare gain of less than 1% of the revenue loss.<sup>28</sup> This result is no surprise. Soft drinks account for such a small proportion of total consumption that discriminatory taxa-

tion will not impose a large excess burden. The excess burden problem becomes more of a public policy concern when large numbers of goods are “singled out” for discriminatory treatment.

Rather than open the doors for such “special tax treatment,” one could raise the equivalent amount of revenue from an existing broad-based tax. In this simulation, we can estimate that an increase in the general VAT rate from 21% to 21.1% would have more than covered the entire revenue shortfall from elimination of the special excise on soft drinks.

## 6. CONCLUSIONS

Was moving away from discriminatory tax treatment of soft drinks good public policy in Ireland? There was a revenue loss associated with an excise tax rate reduction in the 1989-1990 period, and there was a revenue loss associated with eliminating the tax in 1992. Because the own-price elasticity of demand for soft drinks is above unity, about one third of the revenue loss from the two rate cuts was recaptured in the form of income taxes and VAT on increased consumption. With a relatively small revenue sacrifice, administrative costs were lowered, a tax-induced distortion was removed from consumer choices, and perhaps the door was closed for other, similar “special” excises.

Would other countries experience a similar pattern of revenue loss and offsetting benefits should they choose to eliminate discriminatory excises on soft drinks? This seems likely for the industrialized economies. The finding that demand is price elastic should fit other industrialized economies, as should the administrative cost savings that come from eliminating an excise tax department. Even in developing countries, there is some evidence of price elasticity of demand for soft drinks (Baah-Nuakoh, Jackson, and Woode 1999). In developing countries, however, accessible alternative sources of revenue are generally harder to find. Moreover, although the evidence is by no means clear, there may be a bit more substance to the distributional arguments in support of such taxes.

We are left with this. A country choosing to eliminate a special excise on soft drinks will lose revenue but not the full amount expected because a price-elastic demand will lead to some recapture from other taxes. A country choosing to enact a special excise on soft drinks will gain revenue but likewise not the full amount expected. The policy question becomes whether the net revenue gain from such an excise is worth the welfare cost consequences that would arise should the door be opened for a family of special excises. If not, one is back to Sunley's (1998) rule that countries should choose to levy excises only on products whose consumption imposes significant external costs.

## NOTES

1. Special excise taxes on soft drinks are levied in Austria, Belgium, Denmark, France, Netherlands, and Finland.

2. The "progressivity" rationale may also be used to support high excise taxes on "modern" soft drinks produced by international firms, when the underlying objective is to serve the protectionist purpose of fostering small "traditional" producers.

3. The excise tax on table waters was originally introduced in British-ruled Ireland to cover the cost of the Boer War.

4. Exceptions were made for (a) any liquor where the retail sale requires an excise license; (b) milk and milk products, whether or not flavored; (c) soups and broths; and (4) fruit and vegetable juices that, in the opinion of the revenue commissioners, have not lost their original character through the addition of water or of other substances for sweetening, preservative, or other purposes.

5. Imported table waters were subject to a parallel tax treatment.

6. For a discussion of the early European Community (EC) views on a framework for harmonizing excises, see Cnossen (1987).

7. One could gross up excise tax collections and make an estimate of the value-added tax (VAT) contribution, but no similarly reasonable approach is available for the income or property taxes.

8. A useful discussion of this issue may be found in Keen (1998).

9. The traditional justification is presented well in Tanzi (1995, 56-64). For a more detailed discussion, see Cnossen (1991).

10. For example, the Irish Tax Commission cited one study that placed the external costs of alcohol consumption at about 40% of excise collections for alcoholic beverages during that period. Walsh (1980, 113) noted the following: "The estimate for 1976 indicated that the cost of alcohol consumption borne by the state in that year was £63 million, whereas excise duties on alcohol amounted to £158 million." For a good discussion of this issue, see Kay and Keen in Cnossen (1987).

11. As the Irish Tax Commission (Government of Ireland 1984, 123) put it,

We see no justification on efficiency grounds for special taxes on table waters. We reject the argument that table waters, which are used as “mixers” for alcoholic drinks should bear some of the tax required to be raised to offset the costs of alcohol abuse. . . . Table waters, although sometimes used in conjunction with alcohol, also provide a substitute for alcohol. We recommend that the excise duties on table waters be abolished.

12. For discussions of this issue, see Keen (1998), Tanzi (1991, chaps. 8, 10), Bird (1992, chap. 9), and Due (1988, chap. 4).

13. For further discussion, see Keen (1998) and Bohanon and Van Cott (1984).

14. To give some sense of the administrative “messiness,” we may observe the following for Ireland:

- The special excise was levied at a higher rate on soft drinks than on other nonalcoholic beverages, including milk, tea, and pure fruit juices.
- Soft drinks, alcohol, bottled waters, and health drinks are all taxable at 21% under VAT no matter where they are purchased. Coffee and tea are zero rated if purchased in a retail outlet but 12.5% if purchased in a restaurant. Fruit juices are taxed at 21% unless purchased in a restaurant, in which case they are taxed at 12.5%.
- Soft drinks are taxed at 21% if purchased from a vending machine, but fruit juices are taxed at 12.5% if purchased from the same vending machine.
- Prior to 1992, bottled waters were subject to a zero rate, but bottled waters with flavoring (e.g., sparkling water with lime) were subject to the standard VAT rate.
- Cold take-away food and (zero-rated) drinks (e.g., sandwich and milk) are taxable at 12.5%, whereas the same sandwich with a soft drink is taxed at 21%. However, in the latter case, the proprietor may choose not to establish an inclusive price, in which case the VAT is 12.5% on the sandwich and 21% on the soft drink.

15. In a review of the soft drink industry in the European economy, Canadean (1997) suggested the wide range of consumer choices available. In a supermarket in Britain, there were 450 “buying options” for nonalcoholic beverages. Using a similar measurement method, it estimated that there were 320 in Belgium, 480 in France, 500 in Germany, 235 in Netherlands, 250 in Spain, and 170 in Italy.

16. For simplicity, we have not plotted the VAT displacement for a rate reduction in Figure 1.

17. A higher VAT rate would cause the recapture curve to pivot out from  $r^2$  and further reduce the revenue loss.

18. Data for this study were drawn from various Government of Ireland Reports, including the annual statistical report and the annual financial statements from the Soft Drinks Association of Ireland (1996) and the *Government Finance Statistics Yearbook* from the International Monetary Fund (various years).

19. The dependent variable includes both domestic production and imports.

20. The model was also estimated in a linear form. There are at least two important caveats to this analysis. Data on the price of all substitute products were not available; hence, we are unable to estimate all relevant cross-price effects. Even if data were available, the number of degrees of freedom available would not have allowed us to estimate more than the most important of the cross-price effects. We have estimated the cross-price effects for only food and alcoholic beverages. Second, we have not taken account of price levels in Northern Ireland, and previous

research has shown that smuggling and reexport can be an important revenue issue when price levels for certain commodities become too disparate (Fitzgerald et al. 1988).

21. One cannot move easily from this result to an inference that there is progressivity in the distribution of tax burdens. A progressive tax refers to a tax burden that increases with income level, as might be seen from study of a cross section of taxpayers at different income levels at a point in time. The elasticity reported here is based on a time series that shows how all consumers alter their spending over time. A high time-series elasticity does not necessarily imply progressivity.

22. The tax was abolished in November 1992.

23. About 5.83% is the marginal effect of the tax rate reduction, and 9.2% is due to the combination of gross domestic product (GDP) and weather (held constant at their 1990 and 1991 levels). This assumes a perfectly elastic supply during this period.

24. In a study of the shifting of excise tax rate increases in the United Kingdom, Baker and Brechling (1992) could not reject the hypothesis that there was a full forward shifting in the case of petrol and spirits. For tobacco, however, they found "undershifting."

25. The actual recapture of revenue is less than the full 21% of the increased value added. This is because production costs for soft drinks were driven up as output expanded and the increased VAT on inputs was credited. We cannot estimate this amount but argue that it would be small because some of these inputs were already subject to VAT in the sectors from which they were attracted.

26. For purposes of this illustration, we assume that the price elasticity of demand is unitary (i.e., consumers spend as much on soft drinks after tax reform as they did before tax reform). In fact, our elasticity estimate suggests that they might spend a small percentage more. We also do not factor the excise tax collections into the base of the VAT. Because excises are less than 1% of total revenues, the result would not be appreciably changed.

27. The top marginal personal income tax rate in Ireland in the period concerned was 48%, with a lower rate charged to capital gains; the top corporate rate is 38%, with a lower rate charged to certain manufacturers. Personal income taxes in Ireland were 10.5% of GDP in Ireland in 1996. Taxes on corporate income and property were equivalent to 4.8% of GDP (Organization for Economic Cooperation and Development 2001).

28. We use the average wholesale price of soft drinks during the 1991-1992 period to obtain the estimate. The estimated welfare loss is IR£763,470.

## REFERENCES

- Baah-Nuakoh, A., Henry Jackson, and S. Woode. 1999. Fiscal impact study on the soft drink industry in Ghana. Unpublished report, University of Ghana, Legon.
- Bahl, Roy, and Mary Beth Walker. 1998. Discriminatory taxation of carbonated beverages: The case of Ireland. ISP Working Paper 98-2, International Studies Program.
- Baker, P., and V. Brechling. 1992. The impact of excise duty changes on retail prices in the United Kingdom. *Fiscal Studies* 13 (2): 48-65.
- Bird, Richard. 1992. *Tax policy and economic development*. Baltimore: Johns Hopkins University Press.

- Bohanon, C. E., and T. N. Van Cott. 1984. Specific taxes, product quality and rate-revenue analysis. *Public Finance Quarterly* 12:500-1.
- Bolnick, Bruce, and Jonathan Haughton. 1998. Tax policy in sub-Saharan Africa: Examining the role of excise taxation. EAGER/PSGE, Harvard Institute for International Development, Cambridge, MA.
- Canadean. 1997. *Soft drinks and the European economy*. Hampshire, UK: Canadean.
- Cnossen, Sijbren. 1987. Tax structure developments. In *Tax coordination in the European Community*, edited by Sijbren Cnossen. Norwell, MA: Kluwer Law and Taxation Publishers.
- . 1991. The extended excise tax system. In *The Jamaican tax reform*, edited by Roy Bahl, 537-56. Boston: Lincoln Institute of Land Policy.
- Dobbs, Ian M. 1993. Litter and waste management: Disposal taxes versus user charges. *Canadian Journal of Economics* 24 (1): 221-27.
- Due, John F. 1988. *Indirect taxation in developing countries*. Baltimore: Johns Hopkins University Press.
- Fitzgerald, J. D., T. P. Quinn, B. J. Whelan, and J. A. Williams. 1988. *An analysis of cross border shopping*. Dublin, Ireland: Economic and Social Research Institute.
- Fullerton, Don. 1996. Why have separate environmental taxes? In *Tax policy and the economy*, edited by James Poterba, vol. 10, 33-70. Cambridge, MA: MIT Press.
- Government of Ireland. 1984. *Indirect taxation: Third report of the Commission on Taxation*. Dublin: Government of Ireland.
- Harberger, Arnold. 1974. *Taxation and welfare*. Boston: Little, Brown.
- Kaunda, Joe. 1998. Government reduces Coke's duty. *The Zambia Post*, no. 987.
- Kay, J. A., and Michael J. Keen. 1987a. Commodity taxation for maximum revenue. *Public Finance Quarterly* 15:371-85.
- . 1987b. Optimal tax perspective on tax coordination. In *Tax coordination in the European Community*, edited by Sijbren Cnossen. Norwell, MA: Kluwer Law and Taxation Publishers.
- Keen, Michael J. 1998. The balance between specific and ad valorem taxation. *Fiscal Studies* 19 (1): 1-37.
- McLure, Charles, and Wayne Thirsk. 1978. The inequity of taxing iniquity. *Economic Development and Cultural Change* 26:487-503.
- Mexico fructose tax. 2002. *Tax Notes International*, 21 January, 224.
- Mexico to suspend controversial fructose tax. 2002. *Wall Street Journal* [interactive ed.], 4 March.
- Musgrave, Richard. 1959. *The theory of public finance*. New York: McGraw-Hill.
- Organization for Economic Cooperation and Development (OECD). 2001. *Revenue statistics*. Paris: OECD.
- Shugart, William F., ed. 1997. *Taxing choice*. New Brunswick, NJ: Transaction Publishers.
- Soft Drinks Association of Ireland. 1996. *Soft drinks in Ireland: 1995 data sheets*. Dublin: Soft Drinks Association of Ireland.
- Sunley, Emil. 1998. The design and administration of alcohol, tobacco, and petroleum excises: A guide for developing and transition countries. Working Paper FAD/98/1, Fiscal Affairs Department, International Monetary Fund.
- Tanzi, Vito. 1991. *Public finance in developing countries*. Brookfield, VT: Edward Edgar.
- . 1995. *Taxation in an integrating world*. Washington, DC: Brookings Institution.
- Walsh, B. M. 1980. *Drinking in Ireland*. Dublin: Economic and Social Research Institute.



*Roy Bahl is the dean and professor of economics at the Andrew Young School of Policy Studies, Georgia State University. He has written on government finance and consulted with countries around the world.*

*Richard Bird is professor emeritus of economics and codirector of the International Tax Program, Rotman School of Management, University of Toronto. He has published widely in the area of public finance all over the world and has consulted with many governments around the world.*

*Mary Beth Walker is an associate professor of economics at the Andrew Young School of Policy Studies, Georgia State University. Her field specialty is econometrics.*