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Assessing the Costs of Mandatory Beverage Container Deposit Legislation*

by

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Problem Statement and Objectives

Presently there are nine states within the United States with mandatory deposit legislation applying to beverage containers with at least three more states (Florida, New Jersey and Pennsylvania) likely to enact deposit laws in the next year or two (*Wall Street Journal*, 1985). The legislation, commonly referred to as the "bottle bill," varies slightly from state to state. The essential function however is to require a minimum deposit on all beer and soft drink containers (typically 5 or 10 cents) as a means of encouraging consumers to return empties. The deposit, which is handled independently of the wholesale and retail prices of these products, is refunded on return of the empty container. The laws then seek to convert the predominantly one-way, disposable container flow to a two-way, refillable or recyclable system. This is done by requiring retailers to refund deposits for the brands and container types sold in the store. From the store the distributor has the responsibility of collecting the empties and returning the deposit to the retailer.

Returning empties to retail outlets accomplishes two principal objectives of the deposit legislation. It reduces beverage container litter, and through the concentration of spent containers by bottlers and distributors, makes recycling more feasible. The requirement that all containers carry a deposit also reduces the convenience of disposable containers compared to reusable ones. As a result, a sharp rise in refillable use was frequently forecast and described as a means of resource conservation (see, for example, Quinn and Sloan, 1975).

As a litter reduction measure, mandatory deposit legislation has succeeded admirably (see Syrek 1985). Resource recovery too has seemingly been largely accomplished with between 85 and 95 percent of containers returned, and the bulk ostensibly recycled [1] (Porter, 1983; RIG, 1985, pp. 55-60). The laws do however impose significant costs, particularly on brewers, bottlers, distributors and retailers. The purpose of this article is to quantify the costs of mandatory deposit legislation, net of recycling revenues. Emphasis is on the direct costs of the legislation, with no attempt made to estimate the

*This paper draws heavily on the Report of the Rockefeller Institute of Government to the Temporary State Commission on Returnable Beverage Containers to which David McCaffrey (Research Director) and William Ferretti made major contributions.

amount of foregone profits which are associated with any sales declines.

Methodology

The direct costs of mandatory deposit legislation include, primarily, the costs of handling empty containers from the point of sale to the time when they are recycled or land-filled. Computing net costs requires deducting from the gross figures the revenues generated from recycling. A second source of revenue for the beverage sector exists, the deposit on unredeemed containers. Under all bottle bill laws, these deposits are retained by the sector. However, while retained deposits provide an income source for the industry, the funds are only an income transfer from beverage consumers. Thus, while the amount of estimated retained deposit is reported here, it is not used in the computation of net costs under the law.

Overview of the Beverage Sector

Before attempting to describe how the data were compiled and analyzed, it is helpful to have an overview of the operation of the beverage sector within mandatory deposit legislation. The beverage sector, as the term is used here, refers to firms manufacturing and distributing soft drinks and malt beverages of both domestic and foreign manufacture. Despite the obvious similarities between the two groups of products, there are major differences which affect the costs of the legislation. Beer must be bottled where it is brewed. Hence beer has a multi-tiered distribution system. Under most laws the primary (first) distributor initiates the deposit for non-refillable containers. Deposits collected, but not redeemed, are retained by the deposit initiator. Refillable beer bottles however, must be returned to the brewery. The deposit for those containers is then initiated by the brewer.

Technology in the soft drink industry permits a physical separation of the production of the flavoring syrup, and the composition, or "bottling," of the consumable product.

Because soda bottling is not a technologically complicated process, it has been more economical to place smaller plants closer to the point of consumption. As the point of first sale for both refillable and non-refillable containers, soft drink bottlers initiate the deposits. Many bottlers also carry out their own distribution, so that the channels are both more direct and less complicated than for beer. Despite these differences, it has not been possible to estimate separately costs for beer and soft drinks. At the retail level the two products are essentially homogeneous so that a single handling cost is indicated.

Identification of Costs

Retail: Retailers are responsible for collecting deposits from consumers, and, when the empty container is returned, for refunding the deposit and sorting the container for collection by the appropriate distributor. Retailers do not retain any of the deposit, except for store label products when the retailer acts as the manufacturer and distributor. Retail costs consist largely of labor fees, although some retail and storage space charges must also be allocated to the returned containers. Automated receiving machines (reverse vending) are making advances in some areas, but are still uncommon in the retail sector and are not considered here. In New York State, retailers receive a 1.5 cent handling fee from distributors, again a form of income transfer when considering the overall costs of the legislation. Otherwise the costs must be absorbed by the retailer.

Distributor: Distributors have major responsibility under the bottle bill laws as it is they who must collect the spent containers from retailers and process them for recycling or disposal. Labor is a major cost, especially as collection is typically a separate activity from delivery. Additional, but lower cost, labor is required in the sorting of containers by type (plastic, glass by color, aluminum, steel cans, etc.). Supplemental work and storage space, as well as trucks, are needed to carry out these activities. Some distributors contract for the performance of these functions with firms known as "collection agents."

Collection agents operate similarly to the distributors. For aluminum, and some colors of glass, recycling values exceed the trucking costs. Other materials, especially plastic (PVC) and green glass in some areas, must be discarded, a further cost.

Data Sources

The principal data source for this study is a 1984 survey of New York firms conducted for the Temporary State Commission on Returnable Beverage Containers. This commission, composed of government, industry and "public" representatives, was responsible to make recommendations on any changes in the New York law. Because of this direct involvement by the industry, the commission received excellent support for its data collection efforts. The authors served on the study team which collected and analyzed the data (RIG, 1985).

New York retailers, bottlers, brewers, distributors, and collection agents were surveyed using mail questionnaires. Typically the surveys, which were prepared with the assistance of industry and trade association personnel, were completed by the controllers office. Survey questions were detailed, covering, for a firm's fiscal year, volumes, employment, equipment expenditures, facility expenditures, depreciable life of each expenditure, and recycling revenues, where appropriate. Bottlers and distributors were further asked to record volumes of returned containers so that the return rates and the amount of retained deposits could be computed. Supplemental personal interviews were used with the largest firms of each type. The samples used were as follows:

<u>Industry Sector</u>	<u>Sample Size</u>	<u>Returned Questionnaires</u>
Supermarket chains	34	12 (529 stores)
Soft drink bottlers	50-60	34
Beer distributors	-130	52
Collection agents	50	37

Because the larger firms generally had a higher return rate for questionnaires, the volume of product represented by the surveys exceeded the proportion of responding firms. The percentage of New York beverage container volume represented by the survey responses can be put at approximately: 65 percent retailers, 70 percent soda bottlers, 50 percent beer distributors, and 35 percent collection agents.

Despite the exemplary access to data available for this study, there are two reasons not to rely on it exclusively for estimating national bottle bill costs. The first, and obvious, reason is labor costs. New York labor costs, especially with Metropolitan wages included, are high by national standards. But perhaps more significant is the discrepancy in reported costs. Some of the discrepancy could be attributed to excessive (or at times, insufficient) investment outlays as for example with trucks. Some firms applied the total cost of new trucks to container collection when in fact the trucks were only partly used for that activity, or the new trucks were used for delivery with older vehicles diverted to collection. These factors could be, and were, corrected. More problematic from a research perspective were firm-specific differences which had no apparent cause. They are attributable in part to size economies, but more significant is the management input, or experience level, a related factor. The New York data were collected about fourteen months after the advent of the legislation,

and indications from the later months was of a declining cost curve.

In order to remove the possible New York, and learning curve, bias from the figures, data from other states, as reported in the literature, are used also. These data represent information from six states, covering a five-year time period.

Analytical Methods

Labor costs, complete with fringe benefits, are incorporated as supplied. Equipment and facilities are computed as the annualized depreciated value based on the straight line method. Due to the sensitivity of the cost of capital for firms, no attempt was made to collect actual figures. Rather, an imputed value of 12 percent is used for all firms. All costs are calculated on a per-container basis. Average container return rates are calculated from firm-supplied figures on monthly unit sales and collection numbers. A two-month lag, as suggested by knowledgeable industry officials, is assumed from the data of sale until the container is rebated. The average container "float" during that two-month period is used to compute the value of held deposits. The much greater dollar amount of deposits retained from non-returned deposits is also calculated from the return rate.

Results

Results are presented first for retailing and wholesaling, then combined into an overall cost.

Retail Costs

Based on the New York data, reported retail handling costs ranged from 2.25 (for upstate New York supermarkets) to 3.49 cents (for New York City) per container (RIG, p. 79). These figures are close to the 2.37 cents value reported in an earlier industry study (FMI, 1980). Finally, an industry survey for New York, conducted concurrently with the commission analysis, reported simple average values of 2.76 cents per container range (Case and Co., 1985). Excluding the higher

figures from this last study as applying to very small stores handling a tiny portion of returned containers, all the data suggest costs in the 2.4 to 2.6 range. For this paper a representative national value of 2.25 cents per container is used.

Distributor Costs

New York distributor costs are calculated to be between 3.4 and 4.4 cents per container (RIG, p. 98). About 70 percent is labor, the remainder operational and investment costs.

Distribution cost data from other states are limited. In Michigan and Vermont they were placed at between 1.70 and 2.10 cents a container (ODP, 1982, p. 29). Collection costs for the New York collection agents however provides additional observations. The full range of reported costs is 1.01 to 1.60 cents per container, but for the three largest firms handling the bulk of the volume, it is closer to 0.95 (RIG, 1985, Table X-4). For the purposes of this paper, a target value of 1.87 cents is used.[2]

From the gross costs must be deducted the value of recycled material. Here there are only New York figures to use as a guide. This is limited as scrap prices, especially for lower value materials, tend to be localized. Given the northeastern prices, and the composition of the return container flow among glass, steel, aluminum and plastic, the estimated value per returned container was computed to be .5-.7 cents (RIG, 1985, Tables IX-1 and IX-2). The estimated total costs are shown in Table 1.

Table 1
Estimated Costs for
Handling Returned Containers

	Estimated Costs Per Container
Distributor level costs	1.87 cents
Retail level costs	2.25
Recycling revenues	<u>.50</u>
 Total Net Costs/ Container Redeemed	 3.62 cents

Sources and computations: see text

The Table 1 figures are on a per container *redeemed* basis, and reflect real resource costs by excluding pecuniary transfers such as taxes and retail handling fees (in New York State). But not all containers sold are redeemed. To compute the effect of that factor, several other calculations need to be made. First, the figures can be converted to a per container *sold* basis by multiplying by the return rate. That was between 80 and 85 percent in New York and about the same in Massachusetts (RIG, 1985, Table VI-1).[3] For states where the laws have been in effect longer, as represented by Michigan and Oregon, rates have been found to exceed 90 percent (Porter, 1983; ODP, 1982). Using a 90 percent rate, $3.6 \times .90 = 3.25$ cents per container *sold*.

Finally, these costs ignore any savings due to increases in refillable container use. Handling costs for refillables would be about the same as any other container, but the bottler/brewer saves the cost of a new container (less any washing and handling cost). The costs of disposable containers is not well documented, but if it is a net (of handling and cleaning costs) of two cents, and due to the deposit legislation, refillable rates rise to 25 percent, the savings is $2 \text{ cents} \times .25 = .5$

cents per container sold. This brings the total net cost per container sold to 2.75 cents. The post-law level of refillable container use is however highly speculative and the figure presented here is perhaps high (see Porter, 1983). Whether the customer benefits from this savings depends of course on competitive conditions. Competition will also affect how the retained deposit, an amount equal to 5 cents $\times .10 = .5$ cents per container, is shared.

Conclusions and Ramifications

Based on the analysis presented here, per container costs under mandatory deposit legislation for beverages are 2.75 cents. These are estimates only and can be adjusted upward or downward depending on what assumptions and data are used. The figures do represent the best presently available, and indicate two characteristics of deposit legislation. First, considerable additional effort is needed to measure the effects, including the costs, of these laws. Second, it is clear the legislation is relatively costly. With over 100 billion beverage containers sold annually, the total national cost would be in excess of \$3 billion. Most of this cost would ultimately be borne by beverage consumers.

Does the consumer receive his or her money's worth from these laws? A full social cost/benefit study exceeds the scope of this paper. Implications from the consumer surveys which have been done (see E. G. Syrek, 1985) are that consumers are well satisfied with the visible benefits of the bottle bill laws. Few however are probably aware of the full costs of the benefits they perceive.

There is little doubt but that bottle bills provide important societal benefits, particularly to the degree parks and roadsides are kept cleaner. Moreover, while there are perhaps more efficient means of achieving the same objectives, alternatives are probably not politically expedient. The challenge to the economist and the manager is then to improve the efficiency of the reverse flow of "product" from consumer to manufacturers.[4] Following many years of research into enhancing the

efficiency of a manufacturer-to-consumer distribution system, a highly efficient process has been developed in the United States. The backward flow however is in its infancy, suggesting that substantial economies may be achievable through research.

Endnotes

- [1] In New York State the actual portion recycled was calculated to be about 72 percent (RIG, 1985, Table XIII-4).
- [2] Some collection agencies are run by human service or voluntary organizations and do not operate for profit. Although these agents tend to have high costs, they account for a small proportion of volume.
- [3] Soft drinks containers seem to be returned less largely because of machine sales and the use of plastic (PET) 2-liter containers (50% of packaged volume). The lower urban return rates appear to be a convenience-related factor with smaller apartments and substantial shopping on foot. However, the urban figures relate to New York City only and may not apply to smaller cities or newer cities more oriented to automobile travel.
- [4] The role of technology in achieving this goal is critical. In New York and other deposit law states, reverse vending machines have proved extremely successful in encouraging recycling and reducing the space costs of redemption, particularly to small stores.

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