Bottle bills and curbside recycling collection

by Frank Ackerman and Todd Schatzki

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The results of one computer model study show that beverage container deposit legislation's effect on the economics of curbside recycling collection depends upon a community's tipping fee.

Three important questions about beverage container deposit legislation ("bottle bills") are often confused. First, does adoption of a bottle bill financially hurt existing curbside recycling collection programs? Second, does a bottle bill make sense economically in a community with a curbside recycling collection program? And third, does a bottle bill increase or decrease the total amount of material being recovered?

The answer to the first question is clear. There can be little doubt that adoption of a bottle bill worsens the financial balance sheets of existing curbside recycling collection programs. Bottle bill materials, especially aluminum cans, are among the most valuable post-consumer residential wastes. The loss of these materials is sure to mean a loss of revenues for most municipal recycling efforts.

But the second and third questions are more complex. Indeed the answers can only be that "it depends" on political judgments and local conditions.

To evaluate the interactions between a bottle bill and other local recycling efforts, the Tellus Institute's WastePlan, a computer program (see articles in the June 1990 and February 1991 issues of *Resource Recycling*) was used to model a "generic community" of 500,000 people. The size of the community was selected to favor curbside recycling collection: It ensures that the community is big enough to realize substantial economies of scale in the construction and operation of a local recycling processing facility. After describing our scenario analysis, we address each of the three general questions about bottle bills in the context of our generic community.

A word of caution: The materials collected by bottle bills and by curbside recycling collection programs overlap only partially. A curbside recycling program can pick up newspapers, other paper products, non-deposit containers and other materials that are not covered by a bottle bill. On the other hand, a bottle bill can recover deposit containers used in restaurants and other nonresidential settings, and reaches naturally into areas, such as multi-family buildings and small communities, which are not always served by curbside recycling collection. Thus the head-to-head comparison of the two strategies is not entirely appropriate: They are, in part, different means to different ends. However, the areas of overlap are great enough that a direct comparison may be valuable for solid waste planning purposes.

Four recycling scenarios

The community we modeled is assumed to generate 246,000 tons of residential waste annually from single-family dwellings. It has curbside garbage collection, with landfilling as the final means of disposal (at varying tipping fees, as explained below). For this community we modeled four scenarios, differing only in their recycling programs:

None. All waste is picked up in garbage collection and goes to the landfill.

Bottle bill. A state or national bottle bill program diverts 85 percent of the beer and soft drink containers into a separate collection system. All remaining wastes are landfilled. Total diversion of glass, metal and plastic containers from the community's residential waste stream is 12,000 tons annually.

Curbside recycling. A municipal curbside recycling collection program collects newspapers, glass bottles, aluminum cans and plastic containers, and sends them to a materials recovery facility (MRF). Diversion rates for the collected materials range from 42 percent to 56 percent. All remaining wastes are landfilled. Total diversion for the newspapers and containers is 35,000 tons annually.

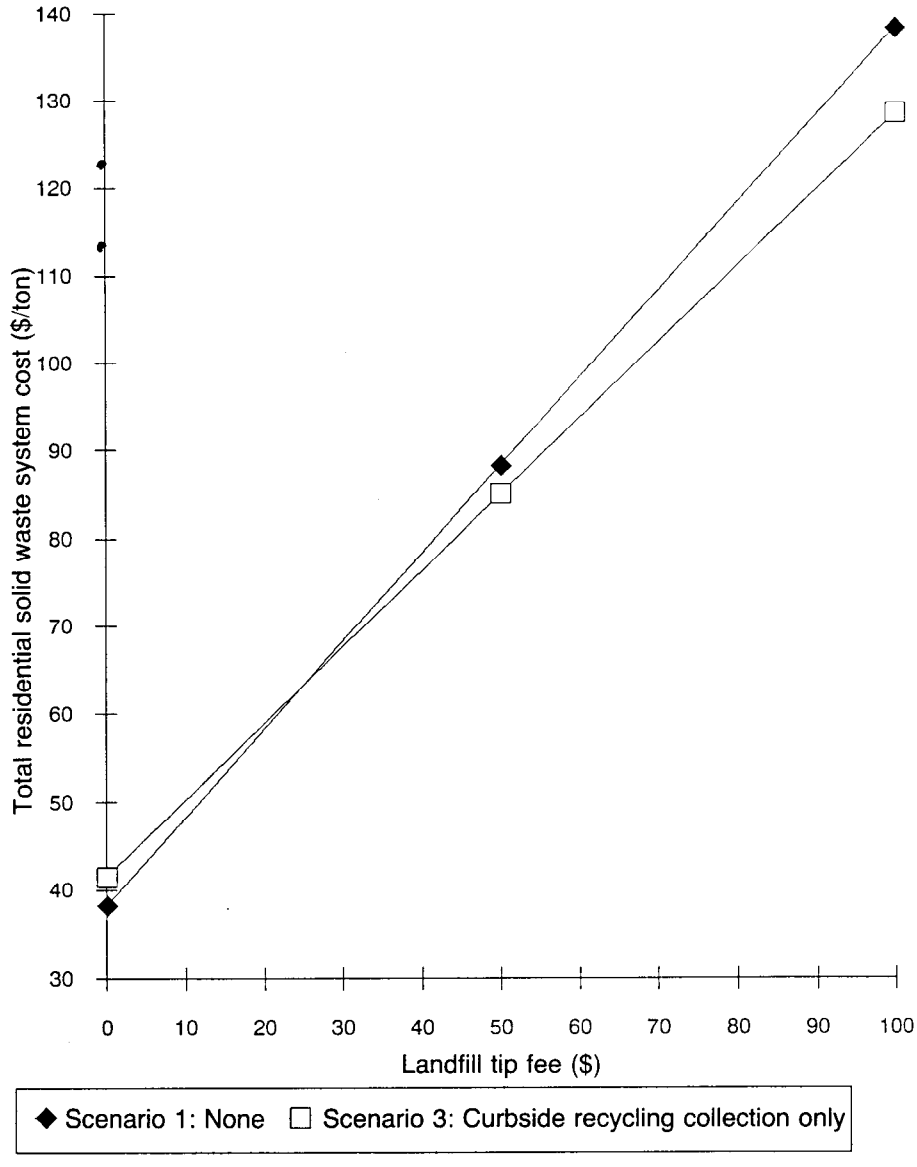
Both systems. Both the bottle bill and curbside recycling programs are in operation. The bottle bill collects the same amount of materials as the "bottle bill

onlY" scenario. In this last scenario, the curbside recycling collection program diverts the same percentages of the remaining waste stream (after bottle bill materials are deducted) as the "curbside recycling" scenario. Total diversion with the "both systems" approach is 41,000 tons annually. (In reality, bottle bill return rates might decline in this last scenario since some people might find it more convenient to set out bottle bill materials at the curb with other recyclables; however, there is little hard evidence about the size of this effect.)

The computer model makes assumptions about truck characteristics and assumed collection efficiencies in determining both curbside recycling and garbage collection costs. An important measure of collection efficiency, collection stops per hour, is assumed to be independent of volume in each collection system. However, in the recycling collection program, the lower collection volume when the bottle bill is in effect is assumed to cause less frequent set outs (households put their recyclables out for collection less frequently, because fewer materials are amassed).

The capital and operating costs of the MRF are assumed to be slightly lower in the "both systems" scenario, reflecting the smaller volume. It is assumed that bottle bill material is not processed by this MRF. The lower total costs and smaller MRF volume mean that the cost per ton is higher, reflecting the diseconomies of scale in running a smaller facility. However, the fee charged to each household in the curbside recycling service area will be lower.

Figure 1 — System waste management costs without bottle bill



Does a bottle bill financially hurt existing curbside recycling programs?

In general, bottle bill materials have higher value, relative to other residential recyclables; a municipal curbside recycling program, therefore, has lower revenues when a bottle bill is in effect.

The effect of varying tipping fees on each of the four scenarios was examined. Recycled materials do not have to be landfilled; this results in avoided costs, i.e., disposal cost savings. So the higher the tipping fee, the more attractive any given curbside and all other recycling options become.

For each of our four scenarios, the community's total residential solid waste system cost per ton in comparison to the landfill tipping fee per ton was graphed, holding curbside recycling diversion rates and other program characteristics constant. The "no bottle bill" graph (Figure 1) compares the "no recycling" scenario to the "curbside recycling" scenario, at varying tipping fees. Similarly, the "bottle bill" graph (Figure 2) compares the "bottle bill only" scenario to the "both systems" scenario.

Qualitatively, the two graphs tell the same story. In each graph, at very low tipping fees the community's waste system costs are lower without curbside recycling collection. But at very high tipping fees, the costs are lower with curbside recycling. The point where the lines cross is the break-even tipping fee, at which the community's solid waste costs are the same with or without curbside recycling collection.

Quantitatively, there is a clear difference. The break-even tipping fee is $25 per ton on the "no bottle bill" graph, compared to $48 per ton on the "bottle bill" graph. These values may both sound low to some readers; recall that our generic community was designed to favor the economics of curbside recycling service. While the specific break-even values depend on the assumptions made about the community, the general pattern is to be expected: With a bottle bill, a higher tipping fee is required to make curbside recycling collection cost effective.

Is a bottle bill economically justified?

Turning to the second question, note that the scenario costs shown in the graphs are municipal waste system costs: The costs of the bottle bill redemption and handling system are not included. Recent

Franklin Associates, Ltd. estimates place net bottle bill system costs (handling costs at all stages, minus revenues from unclaimed deposits and from sale of recovered materials) at $278 per ton of collected material in New York, and $168 per ton in Vermont. If these costs are included, does the bottle bill become hopelessly expensive?

The answer is "yes" — if the bottle bill is viewed solely as a waste management strategy. Avoided waste management costs will not justify bottle bill expenditures at any plausible tipping fees. Here the appropriate comparisons are the "no recycling" versus "bottle bill" scenarios, and the "curbside recycling" versus "both systems" approaches.

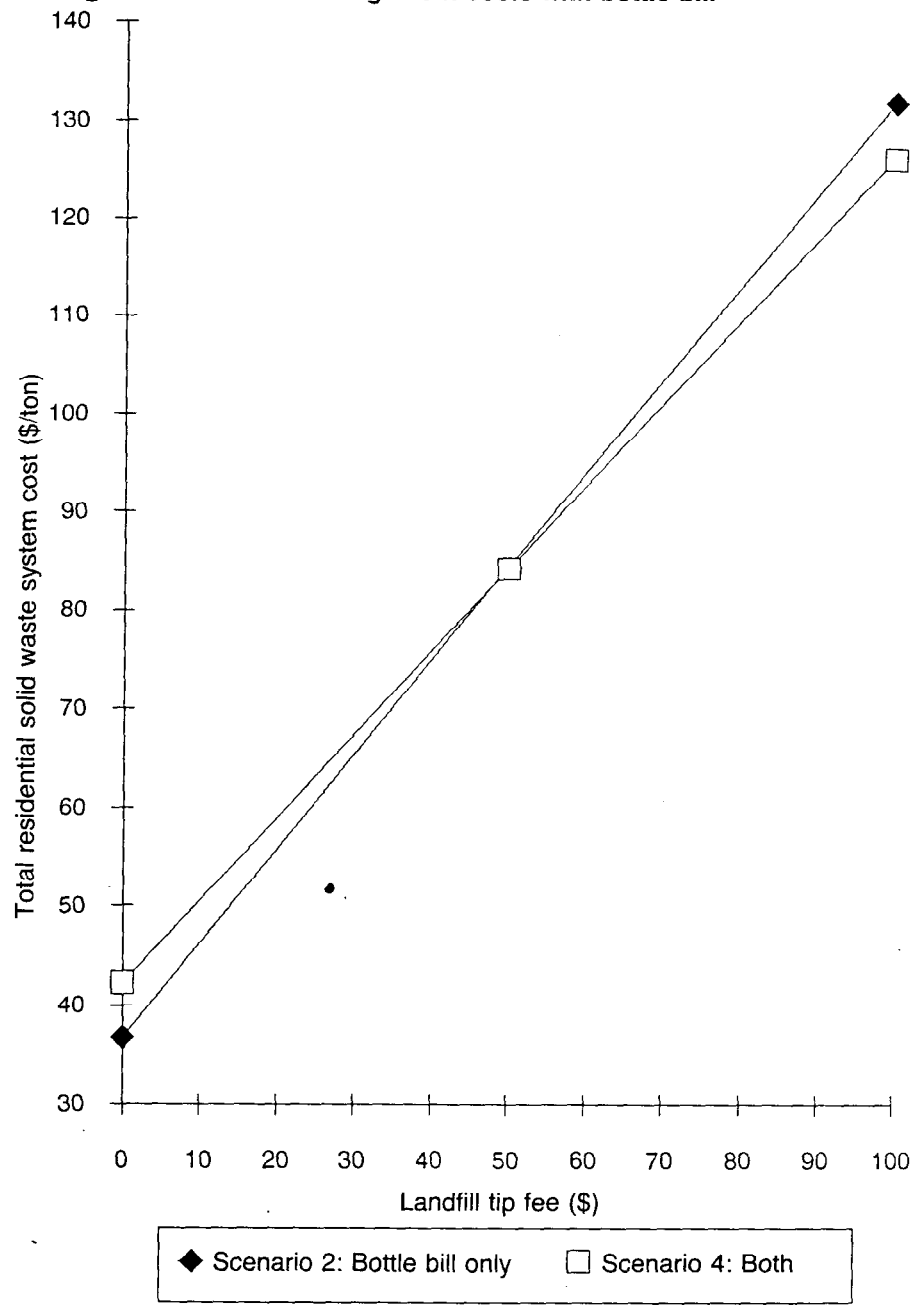
Comparing the first two scenarios, the only avoided costs that can be credited to the bottle bill are the avoided garbage collection and landfilling costs. But garbage collection costs do not decline in proportion to the amount of material diverted. With less garbage to be picked up at each stop, collection costs per ton will increase. Avoided garbage collection costs of $18 per ton of bottle bill material are estimated.

The economics of truck collection is a crucial and often misunderstood aspect of planning for curbside recycling programs. The most important costs, the capital cost of the truck and the labor cost for workers, are roughly fixed per hour of collection (once a truck and crew size have been selected). So any increase in tonnage collected per hour means a decrease in collection costs per ton, and vice versa. This means that curbside recycling collection is cheaper per ton if the truck collects more materials. But for garbage collection, it means that avoidable costs due to diversion of recyclables are very small — much smaller than average garbage collection costs. The $18 per ton estimate of avoided garbage collection costs is less than half the average garbage collection costs of $38 to $42 per ton used in the four scenarios (1).

In a community without curbside recycling collection, therefore, the bottle bill avoided costs are the tipping fee plus $18 per ton for collection costs. In other words, the tipping fee required to make the bottle bill pay for itself solely as a waste management option is just $18 per ton less than the bottle bill system costs.

Using the Franklin Associates estimates cited above, tipping fees would have to reach $260 per ton in New York or $150 per ton in Vermont before the bottle bill would become a cost-effective waste management option. Such values are beyond the planning horizon. As a ballpark estimate, avoided waste management costs for collection and disposal might equal roughly one-fourth of the net bottle bill costs in communities without curbside recycling collection.

Figure 2 — Waste management costs with bottle bill



In communities with local recycling, the last two scenarios, the situation is even worse. There are two distinct material flows caused by introduction of a bottle bill: Almost half of the bottle bill materials are diverted from the curbside recycling collection, while the remainder are diverted from garbage collection. These two diversions have opposite economic effects on the community's waste management costs. Bottle bill materials taken away from the curbside recycling program will reduce recycling revenues, raising municipal waste management system costs. On the other hand, materials diverted from landfilling will lower waste management costs through avoided garbage collection and landfilling expenses. On balance, the net avoided cost is insignificant at any realistic tipping fee.

This analysis does not consider the 25 percent (as estimated by the National

Container Recycling Coalition) of soft drink and beer containers used outside the home. A bottle bill would ensure the collection of these containers and decrease collection costs to restaurants, parks and other public places. This discussion of the bottle bill as a waste management option is limited to its effect on residential wastes discarded at home.

The bottle bill need not be viewed solely as a waste management option. It also plays a substantial role in litter prevention. In these four scenarios, annual bottle bill material collection amounts to 46 pounds per capita. Using this figure, the net bottle bill system costs may be translated into $4.00 per person per year (Vermont) or $6.40 per person per year (New York). For a region without curbside recycling, collection perhaps one-quarter of these amounts could be credited to avoided waste management costs. The remainder of the per-person charges, $3.00 to $4.80, might be assigned to the litter prevention savings associated with bottle bills.

Is this a reasonable amount to pay for litter prevention? There is no objective answer; it is a question of social and political values. To add an anecdotal note to the discussion, one of us (Ackerman) is old enough to remember taking toddlers to urban playgrounds both before and after the introduction of the Massachusetts bottle bill. The difference in the level of broken glass — omnipresent before the bottle bill, virtually absent afterwards — has important implications for child safety as well as aesthetics.

Can a bottle bill decrease overall recycling rates?

This third question is the most complex. In some communities, a bottle bill increases total diversion of materials from landfills; in others, it may discourage curbside recycling programs and hence reduce diversion. The overall net impact is hard to assess. Our scenario results can provide some insight into the complexities involved. To apply these results, one must assume that the whole country or the region being analyzed is made up of communities exactly like our generic community differing only in tipping fees and curbside recycling programs. Even in that much-simplified case, the answer to the third question is still indeterminate.

We will make three simplifying assumptions (of which only the first is relatively realistic). First, assume that all communities are facing steady increases in tipping fees over time, but from different starting points. Second, assume that the calculations of break-even points, as shown in the graphs, apply to all the communities. Third, assume that each community begins curbside recycling, as in the model, at the moment when the tipping fee reaches the break-even point. That is, curbside recycling starts when the tipping fee reaches $25 per ton in the absence of a bottle bill, or $48 per ton in the presence of a bottle bill. (For simplicity, other recycling options, such as drop-off recycling programs, will be ignored. Also, policy options that may affect recycling diversion rates, program efficiency or other parameters will not be considered. Curbside recycling collection is either turned on, or off, exactly as in the scenarios as developed.)

Even under these assumptions, the effect of a bottle bill on total material recovery rates depends on the pattern of tipping fees in the region being analyzed. The results are different in communities with tipping fees under $25 per ton, between $25 and $48 per ton, and above $48 per ton.

When the tipping fee is under $25 per ton, there will be no curbside recycling collection in any case, so the bottle bill increases total recycling. At the other extreme, above $48 per ton there will be curbside recycling in any case, so again the bottle bill increases the quantity of recycling.

It is in the middle range, between $25 and $48 per ton, that the bottle bill discourages recycling. Here there will be curbside recycling service if, and only if, there is no bottle bill. Since curbside recycling collection diverts more material than a bottle bill, these mid-range communities will recover more material in the absence of a bottle bill.

Thus the answer to the third question, regarding the impact of a bottle bill on total diversion, is that "it depends." Even under the simplifying assumptions, it depends on the relative numbers of communities with very low and very high tipping fees versus the number of communities with mid-range landfill costs. In reality, leaving simplifying assumptions aside, we would expect similar patterns to hold, perhaps with different or somewhat blurry lines between low, medium and high tipping fees.

It is easy to imagine that the answer is different for different states. Some states may have a concentration of mid-range tipping fee communities, where a bottle bill would delay or undermine economically marginal curbside recycling programs. In such states, a bottle bill would reduce total diversion, or equivalently, increase the amount of waste destined for final disposal.

Other states may have a preponderance of low tipping fees, implying that curbside recycling is not yet economically viable — or high tipping fees, implying that program recycling collection is, or soon will be, universal. In such states, a bottle bill would increase total diversion and decrease landfill requirements. Even where it increases total diversion, a bottle bill is a more expensive form of waste management than curbside recycling collection, but it need not be evaluated solely for its waste management benefits. **RR**

End note

(1) We assume optimal staffing, route planning and truck purchasing for the purposes of this analysis. In the real world, collection costs are, of course also influenced by union contracts, franchise agreements and the existing fleet of trucks. However, under any circumstances the avoidable garbage collection costs due to recycling are far smaller than average costs.