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Container Deposit Law--An Ecological Perspective

Working Paper No. 231

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It is widely recognized that our society needs to come to grips with its solid waste problem. Heavy use of one-way packaging coupled with inefficient methods of waste disposal are squandering valuable energy and material resources, choking the city dump, and littering the landscape (Ginter and Starling 1978). Throwaway beverage containers that are not recycled have been identified as a major contributor to this problem.

The most feasible alternatives for dealing with the beverage container problem all involve some type of "reverse channel process" (Zikmund and Stanton 1971). Three types of reverse channels for recycling solid waste from consumer sources have been identified: mechanical resource recovery centers, manufacturer-controlled recycling centers, and reverse channels using traditional middlemen (Guiltinan and Nwokoye 1975). Each of these channel types has its advantages and disadvantages (Fuller 1978). This article focuses on the reverse channel using traditional middlemen.

Twenty years ago it was quite common in the U.S. for wholesale distributors and retailers to handle the backward flow of containers. As part of their normal operations, retailers sold both beer and soft drinks in refillable containers and charged a deposit to encourage their return. However, as consumers became more interested in convenience (and willing to pay for it), this returnables system gave way to today's throwaway containers (Murphy 1974). In the 1970s, reverse channels using traditional middlemen were reinstituted in several states and localities through the passage of mandatory container deposit laws. States which now have such laws include Oregon, Vermont, Iowa, Maine, South Dakota, Connecticut, and Michigan. Delaware has a mandatory deposit law, but it will not become effective until similar legislation is

passed in Maryland and Pennsylvania. Container deposits are required in all
national parks, and a national deposit law has been introduced in Congress
several times.

Much of what is known about the operation of these deposit systems is
based on the Oregon experience. Oregon's "bottle bill"[1] was passed in 1971
and fully implemented in 1972. Since that time a number of attempts have been
made to assess its impact, using a variety of methodologies. By and large,
the data have supported the law on both economic and environmental grounds
(Murphy 1974; Gudger and Bailes 1974; Waggoner 1975). One viewpoint that is
not well represented in these evaluations is that of the consumer. Little
seems to be known about the reaction of consumers to their role as recyclers.
Likewise, little seems to be known about the consumer-retailer interface,
which is a crucial link in the reverse channel. The present study provides
some factual evidence about the functioning of a deposit system as seen from
the consumer's perspective.

The Question of Consumer Response

It has been asserted in several studies that Oregon consumers responded
positively to their deposit system. One investigator based this conclusion on
the fact that beer and soft drink sales were not adversely affected by the law
(Murphy 1974). Another investigator suggested that Oregon's high redemption
rates indicated that consumers found it convenient to return the containers
(Gudger and Bailes 1974). While these conclusions may be accurate, they are
inferential and are not based on an actual sampling of consumer opinion.

Somewhat more direct evidence regarding consumer response comes from a
1979 election in Maine where voters had the opportunity to repeal their two-
year-old deposit law. Despite the fact that industry spent over $200,000 in

advertising to defeat the law in the last ten days of the campaign, 84 percent voted to keep the deposit system.

Despite these favorable indications, there may be some danger in using the Oregon or Maine experiences to generalize about consumer response to deposit laws in particular, and recycling in general. An argument can be made that the "conservation ethic" is unusually strong in those states (Leigh and Warshaw 1977). This may be an important limitation pointing to the need for consumer research with a more representative population.

The Question of Retailer Response

A review of past events would suggest that the beverage industry is vehemently opposed to these bottle bills. On the basis of the large amounts of money spent for advertising by the industry in attempting to defeat deposit law referenda (e.g., $1.3 million in Michigan alone), this is a reasonable conclusion. Less clear, however, is the nature of industry response after a law of this type is enacted. Of particular interest are the activities of retailers which impinge directly on consumers and which may affect consumer satisfaction with the deposit system. These activities might occur anywhere on a continuum ranging from wholehearted support, to reluctant compliance, to legal opposition, to circumvention and outright sabotage.[2] It should be possible to obtain from a sampling of consumer opinion some indication of retailer cooperation, especially as it relates to the level of customer service being provided.

The Michigan Experience

The data reported in this study deal with the reaction of Michigan consumers to their container law. The law passed by a 64-to-35-percent margin in November, 1976, and was implemented in December, 1978. The law requires that

a deposit be charged on all soft drink, beer, and carbonated water containers

smaller than one gallon. A three-tier system is used to determine the deposit

amount. A 5¢ deposit is charged on "certified containers" which can be re-

used by more than one company 10¢ is charged on all other containers except

quarts and liters, for which the charge is 20¢. Retailers must refund the

deposit on a container if they sell the same brand as the empties. Violation

of the law by a retailer, distributor, or manufacturer is a misdemeanor that

carries a fine of $100 to $1,000 per day.

Michigan's experience with a deposit law is considered by many to be a

"test case" that will have a major influence on the adoption of similar laws

in other states and some influence on whether a national deposit law ever

passes Congress. This is primarily because Michigan is the only large, densely

populated, and industrialized state to have such a law.

The Research Objectives

The objectives of this study can be summarized as follows: (A) to

describe the level of consumer satisfaction with Michigan's container law on

the basis of a representative sampling of consumer opinion, (B) to determine

what consumers like and dislike about the system and how this affects their

satisfaction/dissatisfaction, and (C) to determine how retailer activities

affect consumer satisfaction/dissatisfaction with the container law. Specific

hypotheses were formulated in each of these areas and tested against the re-

sults of a statewide consumer survey. The conceptual framework underlying

these hypotheses is described below.

The Level of Consumer Satisfaction

A review of the past literature suggests that ecologically concerned

consumers constitute only a small portion of the total U.S. population and

that the ecological movement is confined largely to the white, upper middle

class (Harry et al. 1969; Anderson and Cunningham 1972; McEvoy 1972; Stipak

1973; Kinnear, Taylor, and Ahmed 1974; Webster 1975; Murphy, Kangun, and

Locander 1978; Murphy 1978). This conclusion is certainly consistent with the

low level of market demand for returnables in Michigan prior to the 1976

election (15 to 25 percent) but not with the high level of support for the

bottle ban (64 percent in favor). Research that focused on this apparent con-

tradiction was undertaken at the time of the 1976 election. Those survey re-

sults indicated that Michigan consumers exhibited "normal" levels of ecological

concern, that ecological concern was related to support for the law but was not

a prerequisite for support, that supporters of the law were more likely than

opponents to vote in the election, and that 59 percent of the law's supporters

were customary users of throwaway beverage containers (Crosby, Taylor, and

Kinnear 1978; 1980).

These findings raised some question about the acceptability of the deposit

law once it was finally implemented in 1978. On the one hand, as many as half

of the consumers whose behavior would be affected by the law were initially

opposed to it. At the same time, supporters of the law seemed to have little

experience with recycling and may not have been well informed about the nature

of the proposed system. Because many of the supporters lacked a significant

commitment to environmental protection, it seemed likely that their support

would turn to dissatisfaction when they were faced with some of the negative

realities of the deposit system. These considerations suggested that the

deposit law would create substantial dissatisfaction after being implemented.

This point of view is reflected in the first hypothesis:

> H1: As the result of their experiences, more Michigan consumers are
> dissatisfied than satisfied with their container deposit law.

Sources of Satisfaction/Dissatisfaction

At the heart of most models of consumer satisfaction is the concept of reinforcement (Olson and Dover 1976; Madden, Little, and Dolich 1978; La Tour and Peat 1979). This concept is well articulated in Thibaut and Kelley's (1959) comparison level theory, which has been applied to marketing by La Tour and Peat. This theory posits that an individual assesses the rewards and costs of a social interaction by judging it against a comparison level, and that this assessment determines his satisfaction with the outcome of that interaction. This basic notion would seem to be applicable to consumer satisfaction with the Michigan container law, for which the comparison level is clearly the gratifications enjoyed under the previous throwaway systems. Unfortunately, identifying the rewards and costs associated with the returnables system is more problematic, since satisfaction with the law is affected not by a single interaction but by a complex network of interactions. This complexity, coupled with the general subject matter of the study, led to the adoption of an "ecological perspective" for identifying the sources of satisfaction/dissatisfaction.

The Ecological Model of Behavior

Beginning with Barker's (1965; 1968) initial work in ecological psychology, the ecological model of behavior has been successfully applied to the fields of community psychology (Kessler and Albee 1975; Holahan and Wilcox 1977) and school psychology (Carrol 1974; Thurman 1977; Thomas and Marshall 1977; Parker and Patterson 1979). According to this model, all behavior is viewed as occurring within an environmental context (ecosystem). The various habitats that compose the ecosystem are assumed to be connected both with the person and with each other. Consequently, a disturbance in one portion of the

ecosystem may set off a complex chain of events leading to consequences often unforeseen. The term "ecology" refers to the study of the interactions between individuals and their environments. These interactions involve reciprocal assocation, that is, the individual's actions affect his environment and vice versa. Another important concept is adaptation, the process by which a person copes with his environment. Effective coping results in a balance between the person and his physical and social environments.

An attempt to "map" the ecosystem is a useful first step in applying the ecological model. Figure 1 shows a map of the portion of the ecosystem thought to be affected by the imposition of the container return system. This figure depicts the natural environment as encompassing both the individual and the various social systems. The "marketing system" refers to the brewers, bottlers, distributors, and retailers, who are all members of both the forward and the reverse channels of distribution under this system. The interactions thought to affect consumer satisfaction with the container law are those that connect consumers to the other environmental entities in this map. Because of the interrelatedness of the ecosystem, the interactions between the other environmental entities (e.g., return system ↔ marketing system) can have secondary effects on consumer satisfaction.

Insert Figure 1 About Here

Consumer satisfaction under the deposit law is assumed to depend on the degree of congruence or balance between the individual and his behavioral ecology. Presumably, it was a lack of congruence under the throwaway system that led many consumers to favor the deposit law in 1976.[3] In order to assess the degree of congruence or balance, all relevant interactions between the person and his environment must be considered simultaneously.

Consumer ↔ Natural Environment

The basic objectives of the deposit law all reflect an attempt to change the relationship between consumers and their natural environment. As noted previously, the law was aimed at: 1) reducing litter, 2) reducing solid waste tonnage, and 3) reducing resource consumption. While each of these objectives is important, they are not of equal salience to consumers when they assess the quality of their interactions with the environment. One would expect that the more immediate, proximal, and visible outcomes would have greater influence on satisfaction. This implies that the perceived effectiveness of the law in reducing litter is probably most relevant to consumer satisfaction, a conclusion which is supported by previous research indicating that "concern about litter as a source of pollution" was the most important reason why voters supported the law in 1976 (Crosby, Gill, and Taylor 1980).

Within a few months of its implementation, it was evident that the Michigan law was effective in reducing litter. A study comparing 1979 litter levels with those for 1978 showed that roadside container litter decreased by 82 percent and that roadside litter from all sources decreased by 41 percent (Ann Arbor News Oct. 14, 1979). Considering the magnitude of this effect, the relative visibility of this outcome, and consumers' apparent concern about litter, the following hypotheses were formulated:

H2(a): The Michigan container law is perceived by most consumers as having been effective in reducing litter.

H2(b): Satisfaction with the container law is positively associated with the perceived effectiveness of the law in reducing litter.

Consumer ↔ Return System

As noted by Thurman (1977), every environmental setting defines for the individual a functional set of behaviors that lead to the completion of a task

or job within that setting. The lack of a behavioral repertoire necessary to perform these setting-specific tasks places the individual in a noncongruent and presumably dissatisfying situation.

Viewed as a portion of the environment, the container return system defines for the consumer a set of functional behaviors consisting of reverse channel tasks. These include: sorting out containers from the household solid waste, accumulating homogeneous stocks of these containers, and transporting the containers to collection points (beverage stores) where larger stocks are accumulated. These tasks of sorting out and accumulating are inherent to any distribution process (Alderson 1957).

Two factors suggest that performing these channel tasks would be perceived by consumers as dissatisfying. One is that many consumers have had little or no experience participating in recycling. Therefore, they will lack an appropriate behavioral repertoire for performing the tasks and must undertake the process of developing one. This will tend to lengthen the adjustment process. Second, consumers have previously indicated a willingness to pay money (in the form of higher prices for throwaways) in order to avoid these tasks. This implies that the time and effort required to perform them is of value to consumers. These tasks should result in a perception of the returnables system as inconvienent relative to the throwaway system, which supports the following hypotheses:

H3(a): Most consumers find it inconvenient to perform the reverse channel tasks required of them under the Michigan container law.

H3(b): Satisfaction with the container law is positively associated with the perceived convenience of performing these tasks.

Consumers ↔ Marketing System ↔ Return System
_____

As mentioned before, changes in one part of the ecosystem may lead to

changes in other parts because of its interrelatedness. These changes might

be termed secondary effects. The imposition of the container return system

seems to have produced several secondary effects.

Consumers were not the only environmental entity whose behavior was

affected by the law. Members of the marketing system were also required to

adapt their behaviors to the changed environmental conditions. Their responses

to the reverse channel tasks imposed on them by the return system also affected

their forward channel activities and associated interactions with consumers.

This was a natural consequence of using the same middlemen in both channels.

The most obvious of these interactions concerns the impact of reverse

channel costs on product prices. Prior to the 1976 election, environmentalists

who supported the deposit law argued that beer and soft drink prices would most

likely decline because of the law. The argument of the environmentalists not-

withstanding, beer and soft drink prices rose dramatically in Michigan in the

first half-year of the law's implementation. Soft drink prices showed a 15 to

20 percent increase (Detroit Free Press Feb. 7, 1979). Beer prices increased

by nearly 50 percent (Detroit Free Press March 26, 1979). While a certain

amount of the increase was attributable to inflation, Michigan prices were

well above those in Wisconsin, Indiana, and Ohio, which are neighboring states

without deposit laws. Industry sources attributed much of this increase to

the $130 million in new capital investment needed to implement the law

(Ann Arbor News July 22, 1979).

This negative secondary effect of the return system on the marketing

system and utlimately on consumer prices is predicted to have a negative

impact on satisfaction. Previous research indicates that concern about the

effects of the deposit law on prices was the reason given most frequently for

being opposed to the law in 1976 (Crosby and Gill 1980). The following hypoth-

eses address this concern:

> H4(a): Most consumers perceive that the deposit law has resulted in
> a significant increase in the prices of soft drinks and beer.

> H4(b): Satisfaction with the container law is negatively associated
> with the amount of perceived price increase.

Another secondary effect felt to have negative consequences for consumer

satisfaction is also a consequence of using retailers as middlemen in both

channels. In a very real sense, the forward and reverse channels vie for

space in the retailer's back room. The retailer must use valuable storage

space for processing the returnables. Unless storage space is expanded, the

filled containers must be stored on display shelves. In order to keep the

amount of shelf space devoted to beverages from exploding, the retailer must

reduce this assortment of brands and container types (Tanner 1979). Presum-

ably, the proliferation in beverage lines that has historically occurred re-

flects an attempt by marketers to better serve the needs of consumers and has

contributed to their satisfaction; therefore, loss of this variety should

result in dissatisfaction relative to the previous system.

> H5(a): Most consumers perceive that the deposit law has made it more
> difficult to find their preferred brands and container types.

> H5(b): Satisfaction with the container law is positively associated
> with the perceived ease of finding the preferred brands and
> container types.

Consumers ↔ Marketing System

A final set of interactions believed to be important to satisfaction also

involves the consumers and the marketing system. Although technically these

interactions also have their origin with the imposition of the container law,

they are not considered here to be secondary effects. The difference between

these effects and the previous set (prices, assortment) is the degree to which the environment (i.e., the return system) dictates to the marketing system a particular set of responses. In the case of beverage prices and the beverage assortment, environmental control was almost complete.[4] Other responses, however, involve a high degree of decision freedom on the part of retailers and are largely strategic in nature. These responses refer to the level of customer service provided in the reverse channel by retailers, which should affect consumers' perceptions of the convenience of the system and thereby their satisfaction with it. There are at least two key interactions between consumers and the marketing system in the reverse channel: how easy or difficult it is to return containers at the point of return (POR) and how easy or difficult it is for consumers to obtain a refund of the deposit.

In deciding on a customer service level strategy, the retailer faces a bit of a dilemma. Individual retailers (or their organizations) who oppose the law may decide to do everything in the power to turn consumer sentiment against the law. This might involve providing little or no customer service. The problem with this strategy is that it may backfire, having more of a negative impact on the retailer's business than on consumer attitudes about the law. If there are other retailers who choose to cooperate with the law and are providing a high level of customer service, consumers may elect to take their business to them.

It is predicted that many individual retailers and grocer organizations will be inclined to take the risk of losing some customers and will offer a low level of customer service in the reverse channel, in the hopes of turning consumer sentiment against the law. This prediction is based on the assumption that many retailers find themselves in a desperate situation, caught between

the high costs of coping with the return system and the low margins of the

beverage business.

H6(a): Most consumers find it inconvenient to return their containers
at the store and difficult to obtain the deposit refund.

H6(b): Satisfaction with the container law is positively related to
the perceived convenience of the reverse channel.

Procedure

The Data

The data utilized in this study were obtained from a telephone survey of

302 Michigan consumers, eighteen years old and over. The interviews were con-

ducted in the summer of 1979, by which time the deposit system had been fully

operative for six to eight months. The survey represented the second wave of

an attitude tracking study. About half of the subjects had been previously

interviewed in 1976, just prior to the general election when the law was

passed.

A two-stage random digit dialing method was used in both waves of the

tracking study. This provided a probability sample of all the telephone

numbers in the state, listed and unlisted, while minimizing the number of

unproductive dialings. In households having more than one eligible adult, the

respondent was randomly selected. For quality control purposes, all calls

were made from a central location.

The demographic profile of the sample was very similar to the population

profile of the state, especially in terms of occupation, age, sex, and marital

status. The sample had slightly higher incomes and was somewhat better

educated than the population as a whole, but the differences were minor in

nature. The attitude item responses of those contacted in both waves of the

tracking study were compared to the responses of those contacted only in the

second wave. No important differences were detected.

The Measures

The measures obtained in this study are summarized in Table 1. Each measure related to a specific hypothesis previously developed. It should be noted that two different approaches to measuring satisfaction have been employed in the study. One measure, "Overall Satisfaction," was intended to tap the absolute level of consumer satisfaction with the deposit law. The other measure, "Voting Preference," was intended to tap the relative level of consumer satisfaction. In the latter case, the choice was between voting to maintain the law and voting to repeal it and return to a throwaway system. It was assumed that repondents would choose the more satisfying alternative, although either could be satisfying or dissatisfying in an absolute sense.

Insert Table 1 About Here

Results

Univariate Analysis

A univariate percentage distribution for each of the question items is reported in Table 2. The percentages are based on the number of respondents who held an opinion on the question. These data can be applied to testing the "evaluative-perceptual" hypotheses: H1, H2(a), H3(a), H4(a), H5(a), and H6(a).

Insert Table 2 About Here

Contrary to H1, substantially more consumers were found to be satisfied than dissatisfied with the deposit law. Two-thirds (64 percent) said they were either "very satisfied" or "somewhat satisfied." Only 26 percent of this sample expressed some degree of dissatisfaction. Similar results (not shown in Table 2) were obtained on the voting preference question. Three-fourths

(75 percent) of the respondents indicated they would vote to retain the return system rather than go back to the previous throwaway system. This high level of support for the deposit law on both questions clearly contradicts H1.

Responses to the two efficacy questions indicate that most consumers perceived the deposit law to be effective in reducing litter. A full 70 percent of the sample said that the law "almost entirely eliminated" or produced "a major reduction" in container litter. Likewise, 54 percent said the law reduced litter from all sources by that amount. On both questions only a negligible percentage indicated that the law had no effect. These data provide strong support for H2(a).

The sample opinion was about evenly split on whether it was convenient to perform the reverse channel tasks imposed by the deposit law. Half of the respondents (49 percent) said it was convenient to keep track of and store the containers and half (52 percent) said it was convenient to transport them to the store. Despite the variability in response, a much larger portion of consumers than was predicted by H3(a) find these tasks convenient.

The respondents were unified in their evaluation that the deposit law had increased soft drink and beer prices. Excluding the deposit amount, 42 percent claimed they paid "a lot more" because of the law and 38 percent said they paid "a little more." Only 1 percent of the sample claimed that prices had gone down. These data provide support for H4(a).

There was little evidence that the deposit law has adversely affected the availability of brands and container types, as predicted by H5(a). Consumers' responses to the two availability questions resembled compressed bell-shaped curves, with over 70 percent selecting the neutral category in both instances.

Retailers appeared to be providing a much higher level of customer service in the reverse channel than was predicted by H6(a). The majority of consumers

(70 percent) felt it was convenient to return containers once they were inside
the store. Consumers also gave retailers high marks on the ease of getting
their deposit back. Two-thirds of the sample (65 percent) said it was "very
easy" to obtain a refund and 93 percent said it was "very" or "fairly easy."

Correlation Analysis

Product-moment correlations were computed between all of the measures and
are reported in Table 3. Although strictly ordinal in nature, each of the
question items was treated as though it was intervally scaled. Codes were
assigned, giving higher numerical values to "more" of each attribute (e.g.,
4 = very convenient, 1 = very inconvenient). These data were then used to
test the "relational" hypotheses: H2(b), H3(b), H4(b), H5(b), and H6(b).

Insert Table 3 About Here

The bottom two rows of Table 3 show the correlation between each of the
perceptions and the satisfaction-related measures (Overall Satisfaction and
Voting Preference). At the 95 percent confidence level, all of the "rela-
tional" hypotheses were supported. There were, however, considerable differ-
ences among the perceptions with respect to the strength of their association
with the satisfaction measures. Also, the relationships between the percep-
tions and Voting Preference tended to be stronger than those between percep-
tions and Overall Satisfaction.

In general, the perceptions can be divided into three groups according to
the strength of their association with satisfaction: strong, moderate, and
weak. Relatively strong associations existed for the two efficacy perceptions
(Reduction of Container Litter and Reduction of All Litter) and the two per-
ceptions relating to the consumer's responsibilities in the reverse channel

(Convenience at Home and Convenience in Transit). Moderate levels of association existed for one reverse channel perception (Convenience in Store) and one forward channel perception (Price Effect). Relatively weak associations were found for the two availability perceptions (Brands and Containers) and the ease of obtaining the deposit refund (Refund Ease).

Summarized below are the results obtained from testing each of the hypotheses:

	(a) Direction of Perception	(b) Relationship to Satisfaction
H1: Consumer Satisfaction	Not Supported (Better)	—
H2: Effectiveness	Supported	Supported (Strong)
H3: Task Convenience	Not Supported (Better)	Supported (Strong)
H4: Price Effect	Supported	Supported (Moderate)
H5: Availability	Not Supported (No Effect)	Supported (Weak)
H6: Customer Service	Not Support (Better)	Supported (Moderate/Weak)

Multivariate Analysis

The bivariate correlations provide some indication of the value of each perception in explaining differences in satisfaction, subject to certain limitations. One limitation is that correlations exist between the perceptual items themselves, as indicated in Table 3. This suggests that several of the questions are tapping the same underlying sentiments to some degree. Another limitation is that the correlations are based on an overly simplistic model. The perceptions do not influence satisfaction in isolation from each other but rather combine simultaneously to affect satisfaction. The simple correlations provide no indication of the joint predictive power of all the perceptions combined, although that information is needed to evaluate the usefulness of the theoretical framework that has been employed. Factor analysis seemed to

be an appropriate method for dealing with the first of these limitations and multiple regression analysis an appropriate method for dealing with the second.

One model of factor analysis assumes that responses to individual question items can be decomposed into their common and unique parts (Rummel 1971). An attempt is made to find a small number of common factors that account for the intercorrelations between the question items (Schuessler 1971). It is assumed that the unique parts of the variables are uncorrelated with each other.

The factor analysis was performed on the matrix of correlations shown in Table 3 (exclusive of the satisfaction measures). Technically, the following steps were used: (1) a principal components analysis was used to determine the proper number of factors and to estimate commonalities; (2) Kaiser's Criterion was used to determine the number of factors to retain; (3) the squared multiple correlations were used as the initial commonality estimates for the iterative refactoring; and (4) an orthogonal or varimax rotation was performed on the factor matrix to find simple structure.

The final results of the factor analysis are reported in Table 4. Three orthogonal (uncorrelated) factors that accounted for the common variance (source of the intercorrelations) between the question items were extracted. Table 4 shows the rotated factor matrix and the factor loadings for each variable (the variable-factor correlations). The commonality estimates indicate the amount of common variance that each question item shared with the other question items.

Insert Table 4 About Here

The highest loading of each variable was circled in Table 4 to assist in the interpretation of the factors. Factor 1 appears to be a relatively general factor. Variables with high loadings on Factor 1 were: Reduction-All Litter, Reduction-Beer/Soft Drinks, Convenience-Home, and Convenience-Transit. Thus, Factor 1 represents both the efficacy and task-convenience measures. The variable Price Impact also had its highest loading on Factor 1, but the absolute magnitude was fairly low (.25). It appears that Price Impact is a very unique variable, since it shared only 10 percent of its variance with the other variables.

Variables with high loadings on Factor 2 were Convenience-Store and Refund Ease. Both of these variables reflect the level of customer service provided by the retailer in the reverse channel. Variables with high loadings on Factor 3 were Availability-Brands and Availability-Containers. These variables reflect the forward channel impacts of the deposit law other than price.

The results of the factor analysis served as input for the regression analysis. The purpose of the regression analysis was to find the best fitting linear equation for predicting satisfaction, on the basis of a set of independent variables. As noted earlier, however, the question items exhibited fairly high intercorrelations, which violates one of the assumptions of regression—limited multicollinearity. This is not a problem, however, if the factors are used as independent variables, since they are known to be orthogonal.

The exact procedure used involved a stepwise regression, which is a method for selecting the best regression equation (Draper and Smith 1966). Variables enter the equation in order of their ability to dispel any remaining unexplained variance in the dependent variable, provided the entry criterion is satisfied (in terms of minimum explained variance). Variables can later be deleted if they fail to satisfy an exit criterion (also in terms of minimum

explained variance). One restriction placed on the stepwise regression in this study was that Factors 1 to 3 had to enter the equation first.

A stepwise regression procedure with forced factor entry was run for each of the dependent variables: Overall Satisfaction and Voting Preference. These results appear in Table 5. The regression model provided a much better prediction of Voting Preference than of Overall Satisfaction. Fifty-one percent of the variance in Voting Preference was accounted for, compared to 29 percent of the variance in Overall Satisfaction. Factor 1 contributed the bulk of the explained variance in both models, although all the factors had significant coefficients.

Insert Table 5 About Here

According to the statistical procedure used, the individual question items could also enter the equation. Since the common parts of these items were already accounted for in the factors, this was a test to determine whether their unique parts could contribute to explaining the variance in the dependent variable. The only variable able to satisfy the entry criterion (had to be significant at $p < .10$) was Price Impact, and its entry explained about 1 percent of the variance in both models.

Interpretation

Despite their lack of experience with recycling, Michigan consumers exhibited a much higher level of acceptance of the return system than was anticipated. This would indicate that consumers perceived a positive net benefit associated with the deposit law. This "net benefit" refers to the rewards minus the costs of the return system in comparison to the previous throwaway system.

The perception of consumers that the deposit law was effective in reducing litter agrees with published reports of controlled litter counts. It might be concluded that these consumers were fairly sensitive to changes in their environmental cues. This sensitivity may have been brought about by the high level of attention given the deposit law issue from 1976 to 1979. With the passage of time, the saliency of this effect could decrease.

The fact that half of the respondents found it convenient to perform the required reverse channel tasks indicates a fairly rapid rate of behavioral adaptation on the part of these consumers. It is important to recall that few consumers were participating in recycling at the time of the law's implementation. Despite this, many seemed to have developed a convenient (i.e., efficient) behavioral repertoire in a period of about six to eight months. Presumably, the percentage finding recycling convenient will increase (albeit at a slowing rate) as additional experience is gained. These results seem to mitigate the concern of Zikmund and Stanton (1971) that the consumers' "throwaway lifestyle" is the greatest barrier to the effective recycling of household solid waste.

The inflationary effect of the deposit law on beverage prices is a fact of life that was clearly perceived by most consumers. The consensual nature of this opinion may explain why the (negative) association between Price Effect and satisfaction was only moderately strong. The magnitude of the correlation coefficient is affected by the variability in responses, and this variability was relatively low for the Price Effect question. Therefore, it would probably be a mistake to discount the importance of this perception. It may be that a perceived price increase was a source of some dissatisfaction for the majority of respondents.

The effect of the deposit law on the availability of brands and container types appeared to be a "non-issue" for most of the respondents. This does not necessarily refute the argument that retailers were forced to reduce their assortments because of the law, but it is only logical that these reductions would primarily involve the marginal brands (i.e., those representing a low market share) and would not be perceived by the cadre of consumers who are loyal buyers of the dominant brands. It is probably safe to conclude, however, that the availability of the dominant brands and most popular container types was largely unaffected.

The results indicate that retailers are providing a much higher level of customer service in the reverse channel than was predicted. As was the case for the Price Effect, a lack of variability in the customer service items may have contributed to a relatively weak association with satisfaction. Likewise, it would be a mistake to totally discount the importance of the customer service factors. The high level of customer service being provided may indicate that retailers place great emphasis on maintaining a loyal customer base and would do little to jeopardize this franchise, even in a tight financial situation. A second explanation is that many retail managers are also motivated by a sense of social responsibility and a desire to "make the deposit law work." Both of these explanations may be true to some extent.

There appears to have been some value in using an ecological approach to study satisfaction with the deposit law. Although some person-environment interactions were undoubtedly overlooked, many of the important ones seem to have been identified. This was most evident in the case of Voting Preference, where the regression model accounted for over half of the variance in this dependent variable.

The relative nature of the Voting Preference variable may explain why a higher R^2 was obtained for that variable than for the absolute measure of Overall Satisfaction. Note that many of the perceptual questions were measured on a relative basis involving a comparison to the situation that existed under the previous throwaway system. This comparison is explicit for the Price Effect and Availability questions and implicit for the rest (it can be assumed that the throwaway system provided "maximum" convenience). It should perhaps be expected that a better prediction would be obtained if both the independent and the dependent variables were expressed in relative terms.

The high loadings of two dissimilar sets of variables on Factor 1 (the effectiveness and task-convenience measures) may reflect the influence of in-dividual difference factors not included in this analysis. A different method for applying the ecological model involves measuring the characteristics of the individual and the environment separately, and then testing for statistical interactions. Here, a more direct approach was used, in which respondents provided self-reports about these person-environment interactions. Character-istics of the individuals and their predispositions probably account for the response patterns represented by Factor 1 (high effectiveness and high con-venience, low effectiveness and low convenience). Simply put, consumers differed in their motivation to adapt to the return system. The influence of these background variables is the subject of research currently under way.

This ecological approach to behavioral analysis may ultimately prove useful to the study of consumer satisfaction with products and services. Instead of focusing, as in the present study, on the product or service itself, the entire ecosystem surrounding the purchase and use of the product/service would be examined. This would include not only the interaction of consumers

with the product but also their interactions with salespeople, the media, reference groups, competitors, and so forth.

Conclusion

It would appear that Michigan's container deposit system is considered a success from the consumers' viewpoint. This is no small achievement in a state that is heavily urbanized and contains a large working class. Provided that consumers have experienced most of the "costs" of the system already, it appears unlikely that the deposit law will be repealed in the near future. This is not to say that consumers would prefer the deposit system over every possible alternative, especially if that alternative offered the same benefits with fewer costs.

The results also provide some encouragement for the extension of the bottle ban idea to other states. This concept has run into trouble in other states, such as Ohio where there was great fear about the effects of the law on prices. This may be partly attributable to the amount of press coverage the price effect received. If it were possible to better publicize the benefits to the environment as well as the satisfaction of Michigan consumers, voter sentiment in other states might be swayed more in favor of this idea.

Finally, the results provide some encouragement for the recycling concept in general. Much has been made about the public's resistance to recycling and the lack of ecological concern needed to sustain a recycling system. The findings of this study suggest a contrary view. Given an incentive that induces trial of the concept, consumers can adapt to recycling quite readily. Perhaps this reflects an old adage from psychology, that "sometimes it is easier to act yourself into a new way of thinking than to think yourself into a new way of acting."

Footnotes

[1] The term "bottle bill" is actually a misnomer, since the bill also applies to cans.

[2] Press accounts from Oregon, Vermont, Maine, and Michigan have reported instances involving each of these behaviors.

[3] Under the throwaway system the interaction of consumers with the marketing system was positive (convenient), while there interaction with the natural environment was negative (perception of a littered landscape).

[4] Some have argued that retailers set beverage prices artificially high to negatively influence consumer attitudes about the law. Authorities have been unable to prove that this is a widespread phenomenon.

Table 1

The Measures

Label	Description
H1. Overall Satisfaction:	Satisfaction with the system used to implement the deposit law.
H1. Voting Preference:	How the respondent would vote on a hypothetical referendum to repeal the law.
H2. Reduction-All Litter:	Degree to which the system is perceived as having reduced the total amount of litter in the state.
H2. Reduction-Beer/Soft Drinks:	Degree to which the system is perceived as having reduced litter from beer and soft drink containers.
H3. Convenience-Home:	How convenient it is to keep track of and store containers in the home.
H3. Convenience-Transit:	How convenient it is to transport the containers to the store.
H4. Price Impact:	Perceived effect of the system on the cost of soft drinks and beer, exclusive of the deposit.
H5. Availability-Brands:	Perceived effect of the system on the availability of favorite brands of soft drinks and beer.
H5. Availability-Containers:	Perceived effect of the system on the availability of favorite types and sizes of containers.
H6. Convenience-Store:	How convenient it is to return the containers once inside the store.
H6. Refund Ease:	How easy it is to get the deposit back.

Table 2

Consumer Evaluation of Michigan's Container Return System

H1. Overall Satisfaction		H4. Price Impact	
5 = Very Satisfied	27%	5 = A Lot More	42%
4 = Somewhat Satisfied	37	4 = A Little More	38
3 = Neither Satisfied/Dissatisfied	10	3 = About Same	19
2 = Somewhat Dissatisfied	17	2 = A Little Less	1
1 = Very Dissatisfied	9	1 = A Lot Less	—
Total	100%	Total	100%
Base	(299)	Base	(281)

H2. Reduction-Beer/Soft Drinks		H5. Availability-Brands	
4 = Almost Entirely	16%	5 = Much Easier to Find	2%
3 = Major	54	4 = Easier to Find	11
2 = Minor	24	3 = Neither Easier/More Difficult	76
1 = No Effect	6	2 = More Difficult to Find	8
Total	100%	1 = Much More Difficult to Find	3
Base	(296)	Total	100%
		Base	(290)

H2. Reduction-All Litter		H5. Availability-Containers	
4 = Almost Entirely	5%	5 = Much Easier To Find	3%
3 = Major	49	4 = Easier To Find	10
2 = Minor	37	3 = Neither Easier/More Difficult	71
1 = No Effect	9	2 = More Difficult To Find	14
Total	100%	1 = Much More Difficult to Find	2
Base	(290)	Total	100%
		Base	(289)

H3. Convenience-Home		H6. Convenience-Store	
4 = Very Convenient	17%	4 = Very Convenient	37%
3 = Fairly Convenient	32	3 = Fairly Convenient	33
2 = Fairly Inconvenient	30	2 = Fairly Inconvenient	15
1 = Very Inconvient	21	1 = Very Inconvenient	15
Total	100%	Total	100%
Base	(287)	Base	(278)

H3. Convenience-Transit		H6. Refund Ease	
4 = Very Convenient	15%	4 = Very Easy	65%
3 = Fairly Convenient	37	3 = Fairly Easy	28
2 = Fairly Inconvenient	28	2 = Fairly Difficult	4
1 = Very Inconvenient	20	1 = Very Difficult	3
Total	100%	Total	100%
Base	(287)	Base	(287)

Table 3

Correlation Matrix[a]

	Reduction Beer/Soft Drinks (H2)	Reduction All Litter (H2)	Convenience At Home (H3)	Convenience In Transit (H3)	Price Impact (H4)	Availability Brands (H5)	Availability Containers (H5)	Convenience In Store (H6)	Refund Ease (H6)
Reduction Beer/Soft Drinks	1.00	.62	.37	.34	-.23	.20	.13	.26	.12
Reduction All Litter		1.00	.50	.39	-.14	.20	.18	.31	.10[b]
Convenience At Home			1.00	.76	-.26	.22	.26	.45	.22
Convenience In Transit				1.00	-.25	.22	.31	.43	.20
Price Impact					1.00	-.08[c]	-.11[b]	-.18	-.13
Availability of Brands						1.00	.42	.18	.09[c]
Availability of Containers							1.00	.29	.17
Convenience In Store								1.00	.53
Refund Ease									1.00
Overall Satisfaction	.36	.39	.45	.38	-.29	.18	.20	.32	.16
Voting Preference	.52	.53	.60	.56	-.34	.21	.22	.42	.20

[a] Unless indicated otherwise, all r's are significant at the 95% confidence level.

[b] Significant at the 90% but not the 95% confidence level.

[c] Not significant at the 90% confidence level.

Table 4

Factor Analysis of Perceptual Variables with Varimax Rotation

	Rotated Factor Matrix (Loadings)			Commonality Estimates	
	Factor 1	Factor 2	Factor 3	Input	Output
Reduction-Beer/Soft Drinks	.66	.05	.09	.45	.45
Reduction-All Litter	.74	.05	.12	.56	.56
Convenience-Home	.67	.37	.21	.64	.62
Convenience-Transit	.59	.37	.26	.60	.55
Price Impact	-.25	-.17	-.06	.10	.10
Availability-Brands	.16	.03	.59	.37	.37
Availability-Containers	.10	.20	.65	.46	.47
Convenience-Store	.28	.72	.18	.61	.62
Refund Ease	.05	.62	.07	.39	.39
% Total Variance	22%	14%	11%		
% Common Variance	47%	30%	23%		

Table 5

Stepwise Regression Analysis of Overall Satisfaction

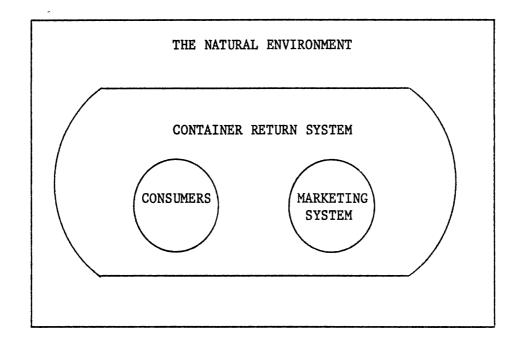| Independent Variables	F-Value	Significance Level	Adjusted R^2	Standard Coefficient (Final Stage)
Factor 1*	98.962	.000	.253	.435
Factor 2*	9.452	.002	.274	.126
Factor 3*	2.745	.090	.278	.079
Price Impact	6.107	.010	.291	-.130

Stepwise Regression Analysis of Voting Preference

Independent Variables	F-Value	Significance Level	Adjusted R^2	Standard Coefficient (Final Stage)
Factor 1*	235.315	.000	.447	.585
Factor 2*	27.520	.005	.494	.196
Factor 3*	4.784	.030	.500	.089
Price Impact	6.756	.010	.510	-.114

*Forced to enter before individual question items were allowed to enter.

Figure 1

Map of the portion of the ecosystem affected by the law.

THE NATURAL ENVIRONMENT

CONTAINER RETURN SYSTEM

CONSUMERS

MARKETING
SYSTEM

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