IMPACTS OF BEVERAGE CONTAINER REGULATIONS IN MINNESOTA

A report to
the Governor
and the
Minnesota Legislature

MINNESOTA STATE PLANNING AGENCY

January 1974

IMPACTS OF BEVERAGE CONTAINER REGULATION IN MINNESOTA

BY

Robert Dildine
and
Ron Rainey

MINNESOTA COUNCIL OF ECONOMIC ADVISORS

and

MINNESOTA STATE PLANNING AGENCY

101 Capitol Square Building
Saint Paul, Minnesota
January, 1974.

A REPORT

CONTENTS:

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1: INTRODUCTION

This report has been prepared in response to a request from Governor Wendell Anderson in his Special Message to the Sixty-Eighth Session of the Legislature of Minnesota, February 14, 1973, that the Minnesota Council of Economic Advisors study the economic impact of any ban or mandatory deposit on non-returnable beverage containers.

An all refillable beverage container system would have both positive and negative impacts. On the benefit side are possible reductions in the externalities associated with the overuse of mineral and environmental resources, decreases in the costs of solid waste disposal, and reduction in the incidence of littering. On the cost side are change-over costs associated with job losses and capital write-offs, the inconvenience and cost of returning beverage containers through the retailing and distribution system, and such possible side effects as increases in some classes of beverage prices, the distribution of social income among people with different tastes and incomes, and incentive to private automobile transportation. It has been our task to estimate and analyze these possible costs and benefits and to present our findings to the public and its representatives for evaluation and decision.

It is important to note that there is no analytic answer to the beverage container question. Social analysts differentiate between two kinds of decisions: efficiency decisions and welfare decisions. "Efficiency" means the use of a fixed amount of

resources to get the maximum output or, conversely, for a given amount of output, the use of the fewest amount of resources. Thus, in a complex society with a vast number of possible activities, efficiency requires, for any chosen combination of activities, the lowest possible per unit use of resources. These resources include not only steel and oil and other minerals, but also human labor and aggravation, land and free space, and the foregoing associated with the accumulation of capital stock and (resource saving) technology. Resources can generally be saved through substitution of one for another. Thus, mineral resources and capital accumulation can be substituted for human labor and aggravation in the production of market goods. The reverse is also true. A decision is required on the values to place on the resources. How much of each is to be saved and how much used? This is a second kind of decision requiring social judgment. These kinds of decisions are referred to as welfare decisions and generally involve the distribution of social income, with some people being made better off than others. The beverage container problem involves this kind of decision. A soft drink bottler who loses sales, a steel worker who loses his job, or a consumer who has no car, lose from an all refillable system. The losses of the individuals harmed may be great compared to the benefits to an individual of the reduction in litter and other possible benefits. On the other hand, the number of people harmed may be small compared to the number who benefit (or, conversely, are harmed by the no-deposit, no-return system). The weighing and evaluating of these individual costs and benefits is not an analytic problem, but a political one. Thus, the first and

foremost conclusion of this report is that the beverage container decision is properly made by the political system and not by the analyst.

One way of making the welfare decision is to let the market take its course. However, the way in which the market is allowed to operate is itself a welfare question and an efficiency question. In Chapter 2 and Chapter 8, we pursue the question of whether the beverage and beverage container market is such as to assure the efficiency and welfare promoted by a "perfectly competitive" economy. Arguing that it does not, we pursue the effects of the market problems and analyze the impact of beverage container regulation on those problems.

Difficulties arise in predicting future results from an uncertain data base. Data on present beverage container resource use, litter contribution, capital investment, and even volume of sales, are sketchy and uncertain. Making predictions about the effects of a change in containerization is a tenuous undertaking at best. Most of our results are expressed as expected values which mean that the true value is as likely to be less than the value given as it is likely to be greater. This is the standard presentation of forecasters, even when it is not spelled out.

Much of our estimates are based on data from the container and filling industry in Minnesota. They have been extremely cooperative and helpful in the course of this study, and left us with the feeling that they have as much concern about the well-being of the State of Minnesota as anyone else we have dealt with on

this problem. Their view is that the benefits from an all refillable system, less the loss of convenience, are not great enough to justify the costs imposed upon them. As mentioned before, however, this involves a social welfare decision properly taken by the political system. The estimates made from the industry data (which we have verified as far as possible) are the result of predetermined techniques and, we believe, not biased by their source.

Finally, the results of this study indicates that neither the costs nor the benefits of beverage container regulation in Minnesota are as great as have been believed. The impact of national beverage container regulation would be much greater on Minnesota, in terms of both costs and benefits, than the state regulation we have concentrated on here. This is because many of the benefits, such as resource saving, go into the national pool with Minnesota gaining only a fraction of the benefit and because Minnesota is a net exporter of non-returnable beverage containers and beverages in non-returnable containers. This is not to say that state action is inappropriate. We feel that the beverage container decision should be made one way or the other without further ado.

CHAPTER 2: BACKGROUND

Bottles and cans used as beverage containers are secondary consumption goods. Their value to the consumer is in providing a low cost means of obtaining and consuming the contained beverage. Proposals for beverage container regulation have arisen from a feeling that the array of beverage containers presently on the market does not represent the lowest cost means of procuring beverages when all social and private costs are considered. The consumer desires beverages for the utility he gets from them as a consumption good. He must, in consideration of the purchase and consumption of the beverage, also consider the cost of obtaining it. The cost includes outlays of money, time and effort. The outlays of money are to pay for labor and the resource costs of a container and its delivery. However, the consumer does not directly pay all container costs at the time he purchases the beverage. Some of the costs are paid for later, either by the consumer or by society. These costs include the cost of disposal in solid waste, the cost to society of either bearing or cleaning up litter, and perhaps the depletion of under-priced mineral resources. The purpose of this study is to investigate the possibility that government intervention in the beverage container market can reduce the social costs of beverage containers sufficiently to cover the costs of this intervention and produce net benefits to society.

The State of Minnesota has a large beverage and beverage container industry and beverages are a significant consumer good in the State. The five breweries, the over 200 beer wholesalers, the 57 soft drink bottlers, the four beverage can manufacturers operating

six plants, the two beverage bottle manufacturers and the many beverage retail outlets in the State of Minnesota would be affected by beverage container regulation. In addition, there are many suppliers outside the State borders which would also be affected. Minnesotans presently consume about 2.3 million barrels of beer per year and produce around 4.3 million barrels. Of this beer consumption, 22 percent is in kegs, 42 percent is in returnable bottles, 13 percent is in throwaway bottles and 23 percent is in cans. For package beer, 54 percent is in returnable bottles, 16 percent in non-returnable bottles and 30 percent in cans. National averages for 1972 are 19 percent returnables, 23 percent non-returnable glass and 58 percent cans. Beer sales have been growing nationally at an annual rate of 3.9 percent. (Minnesota's annual rate of growth has been slightly less than this at about 3 percent. Beer growth is relatively stable for large areas but fluctuates considerably for small samples.)

We estimate soft drink consumption in the State to be 13.39 billion ounces, almost all of which is produced in the State. We estimate soft drink sales to be 43 percent in returnable bottles, 14 percent in throwaway bottles and 26 percent in cans and 17 percent in bulk. Package sales are 52 percent returnables, 17 percent non-returnable glass, and 31 percent cans. National averages for 1970 were 47 percent returnables, 25 percent non-returnable bottles and 29 percent cans. The national average growth rate has been increasing significantly for soft drink sales. The annual rate of increase rose from 3.0 percent for 1955-1960 to 7.2 percent for 1965-1970.

These estimates are found in Tables 2.1 through 2.5.

Based on these figures and our estimate of industry averages of 12 trips per returnable bottle in the beer industry and 9 trips per bottle in the soft drink industry, we estimate that Minnesotans are consuming 69.7 million returnable bottles, 165.9 million non-returnable bottles and 465.9 million cans per year at the current rate.

Table 2.6 contains results of our survey of beverage prices in Minnesota. Price per pack and per ounce for beer and soft drinks are listed by container type. This includes an estimate of the likely price of beer in returnable bottles in packs smaller than the common 24 bottle case. Table 2.7 compares the price per ounce for each container with the price per ounce for other containers. The price per ounce and the container are listed horizontally and vertically. Reading across a row gives the percentage markup or markdown of the other containers compared to the container listed at the left of that row. (For example, premium strong beer in returnable quarts costs an average of 1.59¢ per ounce. The price per ounce in 12 oz. steel cans is 26.4 percent higher, 16 oz. cans are 14.5 percent higher and non-returnable quarts are 11.9 percent higher. Reading down in the column headed "Returnable Quart" shows that the price per ounce in returnable quarts is 9.4 percent lower than the price per ounce in cases of 12 oz. returnable bottles.)

Appendix A describes the estimation of beer and soft drink volume and containerization, Appendix B reports our price estimates and Appendix C discusses the basis of trippage rates.

TABLE 2.1

MINNESOTA BEER PRODUCTION & CONSUMPTION [1]

(Estimated for 1973)
(In Barrels)

	Total Minnesota Production	Minnesota Production Consumed In Minnesota	Minnesota Beer Exports	Minnesota Beer Imports	Total Minnesota Consumption	% of Total Minnesota Consumption
Returnable Bottles	1,413,097	676,294	736,803	307,192	983,486	42.3
Throwaway Bottles Quarts	554,809	195,396	359,413	102,398	297,794	12.8
Cans (12 oz.) (16 oz.)	1,425,110	285,052	1,140,058	198,148	483,200	20.8
(12 oz. Aluminum)				54,612	54,612	2.4
Bulk	901,984	428,773	473,211	75,650	504,423	21.7
TOTAL	4,295,000	1,585,515	2,709,485	738,000	2,323,515	100.0

[1] See Appendix A for Derivation.

TABLE 2.2

PACKAGE BEER IN MINNESOTA BY NUMBER OF FILLINGS

(1,000's)

	Total Minnesota Production	Own Production Consumed	Exported	Imported	Total Minnesota Consumption	Percent By Volume
Returnable Bottles	467,264	223,628	243,636	101,557	325,185	54.0
Non-Returnable Bottles						
12 oz.	174,284	61,380	112,904	32,167	93,547	16.4
Quarts	3,440	1,211	2,229	634	1,845	
Cans						
12 oz. Steel	447,675	89,544	358,131	62,245	151,789	26.6
16 oz. Steel	17,671	3,535	14,136	2,457	5,992	
12 oz. Aluminum	-	-	-	18,058	18,058	3.0

TABLE 2.3

MINNESOTA SOFT DRINK PRODUCTION AND CONSUMPTION[1]
(Estimated for 1973)

	Minnesota Production (Billion Ounces)	Minnesota Net Exports (Billion Ounces)[2]	Minnesota Net Exports (Million Fillings)	MINNESOTA CONSUMPTION: Billion Ounces	Number of Fillings (Millions)	Percent of Total	Percent of Package Sales	
Returnable Bottles Under 20 Oz.	5.62	.26	18.0	5.36	370	40	48.2	51.8
Larger Returnable Bottles	.42	.02	0.6	.40	13	3	3.6	
No Return Bottles Under 20 Oz.	.28	.01	1.0	.27	27	2	2.4	16.8
Larger No Return Bottles	1.68	.08	2.6	1.60	43	12	14.4	
Cans	4.73	1.25	104.0	3.48	290	26	31.3	
Bulk (Premix and Postmix)	2.39	.11		2.28	-	17	-	
TOTAL	15.12	1.73		13.39	-	100	-	

[1] See Appendix A for derivation.

[2] We estimate that 15-16% of Minnesota production is exported from Minnesota and about 4% is imported into the state. Exports and imports occurring along the state's borders due to overlapping franchise operations account for most of the bottles traded. Canned soft drinks being sent to the Dakotas and Montana account for the bulk of the cans exported.

TABLE 2.4 NATIONAL TRENDS IN BEER AND SOFT DRINK SALES

BEER SALES			SOFT DRINK SALES		
Year	Million Barrels	Percent Change	Year	Billion Ounces	Percent Change
1965	99.5		1955	292.8	
1966	103.9	4.4	1960	339.6	16.0
1967	106.8	2.8	1965	447.6	+31.8
1968	111.0	3.9	1970	632.4	+41.3
1969	115.8	4.3	Average Annual Growth:		
1970	121.6	5.0	1955-1960		3.0%
1971	126.4	3.9	1960-1965		5.7%
1972	130.1	2.9	1965-1970		7.2%
Average Annual Growth:		3.9%			

Source: 1973 Brewers Almanac and Carbonated Beverages in the United States, American Can Company

TABLE 2.5 NATIONAL CONTAINER TRENDS

BEVERAGE CAN SHIPMENTS, U.S. TOTALS IN BILLION UNITS[1]

	1968	1969	1970	1971	1972
Soft Drinks	9.9	11.6	12.9	14.1	15.4
% Change	-	17%	11%	9%	9%
Beer	16.4	18.1	19.5	20.2	21.8
% Change	-	10%	8%	4%	8%
Beverage Cans as % of All Metal Can Shipments	35.9%	38.6%	40.7%	42.6%	44.5%

PACKAGED SOFT DRINKS, U.S. TOTALS IN BILLION UNITS[2]
PERCENT OF TOTAL
(12 OZ. EQUIVALENTS)

	Returnables		Non-Returnable Bottles		Cans	
1955	19.2	97.5%	.2	1.0%	.3	1.5%
1960	22.3	94.8%	.4	1.7%	.8	3.5%
1965	26.8	83.5%	1.4	4.4%	3.9	12.1%
1970	20.3	46.5%	10.7	25.0%	12.6	28.9%

PACKAGED BEER, U.S. TOTALS IN BILLION UNITS[3]
PERCENT OF TOTAL

	Returnables		Non-Returnable Bottles		Cans	
1965	11.2	41%	5.1	19%	11.0	40%
1966	10.7	38%	5.5	19%	12.4	43%
1967	10.2	35%	6.3	21%	13.0	44%
1968	9.8	31%	6.7	22%	14.5	47%
1969	9.1	28%	7.9	24%	15.8	48%
1970	8.2	24%	8.3	24%	18.1	52%
1971	7.8	22%	8.5	23%	20.0	55%
1972	6.9	19%	8.8	23%	22.0	58%

1. Can Manufacturers Institute Annual Report, 1972
2. American Can Co., Carbonated Beverages in the United States
3. United States Brewers Association, Brewers Almanac 1973

TABLE 2.5 (cont'd.) NATIONAL CONTAINER TRENDS

GLASS CONTAINER SHIPMENTS, U.S. TOTALS IN BILLION UNITS[4]

	SOFT DRINKS Number & Percent Change				BEER Number & Percent Change				Non-R's as % Bev. Cont. Shipments	Bev. Cont. % of All Glass Cont.
	Returnable		Non-Returnable		Returnable		Non-Returnable			
1972	1.5	+5%	8.8	+5%	.24	-10%	7.6	+3%	91%	47%
1971	1.4	-15%	8.25	-1%	.27	-19%	7.4	+2%	90%	47%
1970	1.6	-	8.3	+31%	.34	-30%	7.2	+5%	89%	46%
1969	1.6	-6%	6.4	+37%	.48	+1%	6.9	+15%	86%	43%
1968	1.7	-9%	4.6	+30%	.48	-24%	6.0	+4%	83%	40%
1967	1.9	-	3.6	+81%	.62	+8%	5.8	+15%	79%	36%
1966	1.9	-	2.0	+97%	.58	+15%	5.0	+7%	74%	32%
1965	1.9	-	1.0	+60%	.50	+21%	4.7	+8%	70%	29%
1964	1.9	+8%	.63	+13%	.42	+7%	4.4	+14%	68%	28%
1963	1.8	+13%	.56	+18%	.39	+10%	3.9	+13%	67%	26%
1962	1.6	+18%	.48	+19%	.35	-6%	3.4	+23%	67%	23%
1961	1.3	-5%	.40	+61%	.37	-13%	2.8	+43%	65%	21%
1960	1.4	-1%	.25	+18%	.43	-1%	1.9	+36%	54%	18%

4. Glass Container Manufacturers Institute, Glass Containers, 1972

TABLE 2.6 MINNESOTA BEVERAGE COSTS BY CONTAINER TYPE[1]

Container	Pack Size	Premium Average Price (Total Dollars)	Premium Average Price (Cents Per Ounce)	Discount Average Price (Total Dollars)	Discount Average Price (Cents Per Ounce)
BEER, STRONG:					
12 oz. returnable bottle	24	$5.01*	1.74¢	$3.11*	1.08¢
32 oz. returnable bottle	1	$ .51*	1.59¢	--	--
12 oz. non-returnable bottle	6	$1.45	2.01¢	$1.15	1.59¢
32 oz. non-returnable bottle	1	$ .57	1.78¢	--	--
12 oz. cans	6	$1.45	2.01¢	$1.15	1.59¢
16 oz. cans	6	$1.75	1.82¢	$1.45	1.53¢
BEER, 3.2%					
12 oz. returnable bottle	24	$4.32*	1.50¢	$2.97*	1.03¢
32 oz. returnable bottle	1	$ .61*	1.91¢	--	--
12 oz. non-returnable bottle	6	$1.40	1.94¢	$1.15	1.60¢
32 oz. non-returnable bottle	1	$ .58	1.82¢	--	--
12 oz. cans	6	$1.41	1.96¢	$1.16	1.61¢
16 oz. cans	6	$1.67	1.74¢	$1.40	1.45¢
SOFT DRINK:					
16 oz. returnable bottle	8	$1.20*	.94¢	$ .95*	.74¢
32 oz. returnable bottle	1	$ .29*	.90¢	$ .23*	.70¢
10 oz. non-returnable bottle	6	$ .96	1.59¢	$ .51	.84¢
32 oz. non-returnable bottle	1	$ .40	1.26¢	$ .32	1.00¢
48 oz. non-returnable bottle	1	$ .67	1.40¢	--	--
12 oz. steel cans	6	$1.02	1.42¢	$ .76	1.06¢
BEER, 6-PACK RETURNABLE PRICE ASSUMING 11% VOLUME MARKDOWN:[2]					
12 oz. (strong beer) returnable bottle	6	$1.39*	1.93¢	$ .86*	1.19¢
12 oz. (3.2% beer) returnable bottle	6	$1.20*	1.67¢	$ .82*	1.14¢

[1] From a sample of 46 retail outlets in Minnesota (see Appendix B).
[2] Computed from a sample of eight stores, comparing prices of the same containers purchased in different volumes.

* Plus deposit.

TABLE 2.7

RELATIVE PRICES PER OUNCE OF BEVERAGES
IN RETURNABLE AND NON-RETURNABLE CONTAINERS

Entries are percentage markup (or markdown)
of vertical entry over horizontal entry

PREMIUM STRONG BEER Cents Per Ounce — Number of bottles	12 oz. Ret. 24	12 oz. Ret. 6	32 oz. Ret. 1	12 oz. Can	16 oz. Can	32 oz. Non-Ret.
1.74 — 12 oz. Ret. — 24	--	10.9	(9.4)	15.5	4.6	2.3
1.93 — 12 oz. Ret. — 6	--	--	(21.3)	4.1	(6.0)	(8.4)
1.59 — 32 oz. Ret. — 1	--	--	--	26.4	14.5	11.9
2.01 — 12 oz. Can — 6	--	--	--	--	(10.4)	(12.9)
1.82 — 16 oz. Can — 6	--	--	--	--	--	(2.2)
1.78 — 32 oz. Non-Ret. — 1	--	--	--	--	--	--

DISCOUNT STRONG BEER Cents Per Ounce — Number of bottles	12 oz. Ret.	12 oz. Ret.	12 oz. Can	16 oz. Can		
1.08 — 12 oz. Ret. — 24	--	10.2	47.2	41.6	--	--
1.19 — 12 oz. Ret. — 6	--	--	33.6	28.6	--	--
1.59 — 12 oz. Can — 6	--	--	--	(3.9)	--	--
1.53 — 16 oz. Can — 6	--	--	--	--	--	--

TABLE 2.7 (cont'd.)

PREMIUM 3.2 BEER Cents Per Ounce	Number of Bottles	12 oz. Ret. 24	12 oz. Ret. 6	32 oz. Ret. 1	12 oz. Can 6	16 oz. Can 6	32 oz. Non-Ret. 1
1.50	12 oz. Ret. 24	--	11.3	27.3	30.6	16.0	21.3
1.67	12 oz. Ret. 6	--	--	14.4	17.4	4.2	9.0
1.91	32 oz. Ret. 1	--	--	--	2.6	(9.8)	(4.9)
1.96	12 oz. Can 6	--	--	--	--	(12.6)	(7.7)
1.74	16 oz. Can 6	--	--	--	--	--	4.6
1.82	32 oz. Non-Ret. 1	--	--	--	--	--	--

DISCOUNT 3.2 BEER Cents Per Ounce	Number of Bottles	12 oz. Ret. 24	12 oz. Ret. 6	12 oz. Can 6	16 oz. Can 6		
1.03	12 oz. Ret. 24	--	10.7	56.3	40.8		
1.14	12 oz. Ret. 6	--	--	41.2	27.2		
1.61	12 oz Can 6	--	--	--	(11.0)		
1.45	16 oz. Can 6	--	--	--	--		

TABLE 2.7 (cont'd.)

PREMIUM SOFT DRINK Cents Per Ounce	16 oz. Ret.	32 oz. Ret.	10 oz. Non-Ret.	32 oz. Non-Ret.	48 oz. Non-Ret.	12 oz. Can
.94 16 oz. Ret.	--	(4.4)	69.1	34.0	48.9	51.1
.90 32 oz. Ret.	--	--	76.7	40.0	55.6	57.8
1.59 10 oz. Non-Ret.	--	--	--	(26.2)	(13.6)	(12.0)
1.26 32 oz. Non-Ret.	--	--	--	--	11.1	12.7
1.40 48 oz. Non-Ret.	--	--	--	--	--	1.4
1.42 12 oz. Can						

DISCOUNT SOFT DRINK Cents Per Ounce	16 oz. Ret.	32 oz. Ret.	10 oz. Non-Ret.	32 oz. Non-Ret.	12 oz. Can	
.74 16 oz. Ret.	--	(5.7)	13.5	35.1	43.2	
.70 32 oz. Ret.	--	--	20.0	42.9	51.4	
.84 10 oz. Ret.	--	--	--	19.0	26.2	
1.00 32 oz. Non-Ret.	--	--	--	--	6.0	
1.06 12 oz. Can						

We make the reasonable assumption that the costs of producing the beverage are unaffected by the different modes of final containerization. Thus, for our purposes, relevant costs can be limited to what may be called "delivery costs". These costs include labor and mineral resource costs of the containers and packaging process, the time and effort costs to the consumer in procuring the beverage package, and the disposal costs of the remains of the package after the beverage is consumed. We do not believe that these costs are automatically minimized by the market because of the possible existence of the non-market social costs involved and due to the fact that the organization of the beverage and beverage container industry is not such as to justify a prima facie case for market optimization.

Unit cost minimization for the chosen consumption level is the universal requirement for economic optimization and it is one which a market economy helps to achieve. However, while economic markets tend toward cost minimization and optimal resource allocation, they will achieve these goals unaided only under certain strict conditions. The two most important requirements are: (1) that all costs and benefits be internalized. This means that all the beverage procurement costs would have to be correctly priced and paid for directly by the consumer and that all the benefits of alternative procurement systems would accrue directly to him; (2) in addition, the product must be sold in a market characterized by perfect competition. This is a term that is widely misunderstood. Competition in economic theory is not a direct confrontation between firms vying against each other for markets. Economic competition is

analogous to a stroke play tournament in golf, where each individual is matched against the course, playing to minimize his score, regardless of the behavior of his competitor, rather than competing, as in a tennis tournament, where each competitor is directly matched against an opponent. Golf-like competition requires a market in which there are many small firms, each of which is too small to have a market influence and must continuously strive to break even (i.e., cover all costs including an acceptable rate of profit). These firms take prices as given and have no reason or extra funds to devote to advertising or lobbying or to non-price competition. They are able to sell all of their feasible output at the going price, and their virtue is that they equate prices to costs on the margin, providing consumers with accurate information on the true costs of the products. Excess profits are eliminated and costs are forced down to a minimum. Price changes are initiated by changes in consumer demand or supply conditions and presently competitive industries are forced to meet this demand in order to continue to break even. It is clear that most American industries and, in particular, the beverage and beverage container industries, do not fit this description. An industry assigned a product with relatively high transportation costs and with relatively uniform production costs for a wide geographical area is likely to become imperfectly competitive. The high transport cost acts as territory-defining barriers. The size of a firm's territory depends upon the price it charges; thus, firms in this type of industry are not characterized as price takers. This, in addition to the presence of a few dominant firms in the industry and the high incidence of advertising and

lobbying in the industry, results in the conclusion that the industry is imperfectly competitive.

The theory of imperfect competition is not a definitive area of economics and non-competitive industries must be analyzed case by case. The beverage container industry is a special case in that containers are demanded only indirectly and are purchased jointly with the product from which they derive their demand. The beverage container is also involved in media advertising and direct advertising. Brand name advertising can provide barriers to entry of competing firms, providing the possible profit cushion which removes the overriding concern to break even and allows management to pursue other goals than day to day profit maximization. Some of these goals, such as managerial ease and security and prestige, are often closely associated with growth and market penetration. Thus, the decision on beverage containerization becomes involved in market penetration activities in several industries, both the beverage industry and the container industry. Non-price competition, which can take the form of direct media advertising or advertising via special packaging specifications or government lobbying efforts for exclusive licensing or protective legislation or any number of other tactics designed to increase market share and/or market size, leads to a difference between market prices and costs.

If the beverage and the beverage container industries were perfectly competitive, as in the golf analogy, and if there were no non-market costs to consider, then we could assume that the present array of beverage containers is there in response to consumer demand

and that this array of beverage containers minimizes total procurement costs, when all things are considered. However, since there are social costs which are external to the markets and since the beverage and beverage container industries are not perfectly competitive, we are unable to judge the present beverage procurement system without further evaluation.

Cost-benefit analysis is most often used where market prices are either unknown or not correct indicators of value. This is the case with the beverage container problem. Here we deal with many resources: mineral resources, labor (including the consumer's labor), solid waste disposal facilities, the waiting embodied in industrial capital equipment and the resources that are involved with litter. Since we are not dealing with a final product directly, the beverage itself being the final product, we are mainly involved with the problem of procurement cost minimization. However, when dealing with competing procurement systems - the returnable vs. the non-returnable system - we deal in trade-offs, such as the trade-off between the consumer's time and effort in procurement and the use of other resources in the procurement process. Thus, each procurement system can be viewed as having costs and benefits in comparison with the other. The economic problem is to find the correct balance between these various resource inputs in order to minimize procurement costs. If the consumer were presented with all of the relevant costs and benefits of the competing procurement systems at the time he makes his beverage purchase decision, as in the case of perfect competition with no externalities, then we could expect cost minimization to be achieved automatically, with costs being accuratel

represented by the prices. When there are possible divergences between price and costs, we must analyze these divergences.

We can identify several areas where the possibility arises that there is a divergence between social costs and private evaluation of these costs. First, there is the problem of resource use in container production. Various methods of containerization vary significantly in their resource demands. The question arises as to whether these resources are correctly priced and included in the consumer's costs. The possibility that they are not arises from externalities (non-internalized costs) in the use of the resources (e.g., air, water and land pollution) and the possibility that the time rate of discount on them is too low. This last possibility is difficult to analyze. There is no analytic way of determining the sociallycorrect rate of discount - it involves ethical choice and the weighing of individual preferences. The dissatisfaction with the rate of discount used privately may show up in political agitation against such things as energy use and environmental decay by a vocal informed minority, while the majority is acquiescent because of choice or lack of information. It is beyond the means of this study to resolve the issue; however, it must be considered a factor motivating the average consumer's willingness or desire for government intervention in the containerization market. If there is any divergence between a private discount rate of the resource-using entrepreneur and the social rate, it is the lower private rate that will show up in the product price and this is the rate the ordinary consumer uses in making his decision as to use of the product. However, the consumer might be desirous of

restricting everyone's use of the product - that is, he is willing to give up his use of the resources at that too low price if it means that everyone else would have to do so. The only way to achieve this is through government intervention.

A second divergence can occur when a rational consumer applies a discount rate to future occurrences. This means that costs will be discounted at the time of purchase. However, as far as society is concerned, disposal is part of the ongoing process and should not be discounted. Whether this divergence is great or small is an empirical matter to be considered in the beverage container problem. If consumers attach an especially high (and perhaps irrational, even from an individual's viewpoint) discount rate, this may be a significant problem in evaluating solid waste costs.

A third area of divergence between the costs the individual consumer uses in his procurement decision and the social costs that he would prefer everyone face occurs in the disposal process. Not only does the consumer have incentive to discount disposal costs, but he may also avoid some or all of them, choosing an expensive disposal method, littering, wherein he pays an insignificant cost and imposes the major share of the cost on society, instead of socially cheaper disposal methods which require him to bear the full cost. Littering imposes costs on society whether or not the litter is picked up. The fact that litter is picked up indicates that the social costs of litter are higher than the costs of periodic pick-ups. The problem of beverage procurement cost minimization involves, among other things, choosing the optimal combination of litter costs,

anti-litter costs (law enforcement or container regulation), and litter pick-up costs. The costs of completely eliminating litter through law enforcement or litter pick-ups are probably prohibitively high. The high social cost of litter requires that something be done to reduce it. Presently minimal law enforcement and litter pick-ups are used. It has been proposed that various forms of government beverage container regulation would be a socially cheaper way of handling this disposal problem - that is, social costs of beverage procurement would be lower if disposal costs imposed by littering were eliminated or reduced by, for example, mandatory deposits on beverage containers. However litter is handled, government will have to be involved because of the divergence of private costs and benefits from social costs and benefits. There is no incentive for private entrepreneurs to engage in litter reduction on the required scale unless government provides it. A clean environment is a public good and requires public decision making.

A fourth concern with the beverage container as a market good arises with its legitimate (i.e., non-littered) disposal as solid waste. There is cause to suspect that all of the costs of beverage containers as solid waste are not internalized. First, there are externalities in the handling of solid waste in general - visual pollution, air pollution and water pollution. They are the largest non-organic component of solid waste. Since solid waste collection charges are based on either volume or weight, the costs of the various components (e.g., organic and non-organic) are averaged together in the charges. The charge on a specific component is not the cost of disposing of that component but an average of all

components. Also, part of the treatment costs of solid waste result from its being a mixture. The majority of the mixture is organic; the addition of beverage containers increases the heterogeneity of the mixture. This imposes a cost which is not internalized. Third, while there is certainly a cost involved in having beverage containers mixed in with municipal solid waste, it often costs the individual little or nothing to throw the containers in with the rest of his trash as his billing is not as closely related to the amount of trash he has as to the frequency of pick-ups and the average amount of trash in his area.

A fifth area of concern involves jobs in the labor market. It is felt that private industry and the consumer will undervalue the effect of the provision of jobs on the distribution of income. This problem, as well as the propriety of including a small increment toward its solution as a benefit of one procurement system over the other is considered in Chapter 7 below.

Two other possible forms of divergence occur not in the present market structure but could occur under government intervention. These divergences must of necessity be considered in evaluating the alternative procurement system. The first of these possible other divergences occurs because of significant consumer effects that may not be reflected in any market. There is not, nor will there be, a market price on consumer time and effort involved in procuring the beverage. This problem is often addressed by the title of "consumer convenience". Nor is the amount of variety and selection in the market assigned a price. These considerations are not external to the consumer when making his market decision; however, they may be

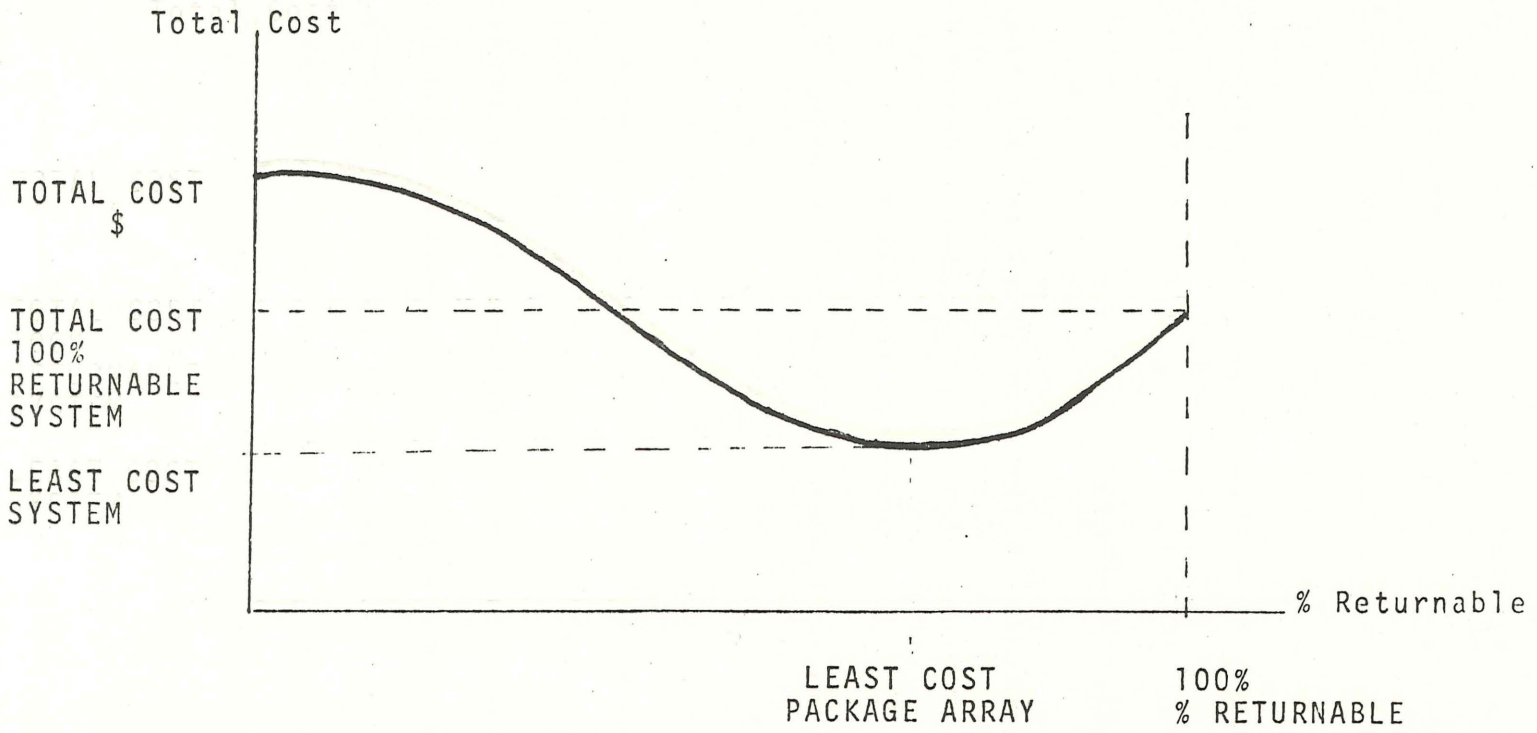
external to the government when it is making a social decision. Parallel to this concern is the possibility that some industry changeover, management or capital costs, may be neglected or undervalued in a public decision. This is another area which must be considered.

The incremental approach to the divergences which we take allows us to break down the problem into convenient areas which are considered in the following chapters. Chapter 3 considers the divergences which may be involved in the use of mineral resources. Chapter 4 evaluates the externalities involved in litter. Chapter 5 considers problems of disposal and solid waste. Chapter 6 evaluates the problems of industry changeover and possible divergences. Chapter 7 covers the labor aspects of the problem. Chapter 8 evaluates non-market consumer effects.

Thus far, we have considered only the comparison of the polar cases of doing nothing and shifting to an all-returnable system. This is a necessary starting point; however, it is not sufficient for the purposes of this study. As illustrated in Figure 2.1, it is possible that the lowest cost procurement system may lie somewhere between these cases. It is particularly likely that legislative proposals will fall somewhere between the two polar cases.

Chapter 9 considers the compromise proposal of mandatory deposits rather than legislatively mandating a particular container system (e.g., banning cans).

FIGURE 2.1


Total Cost
TOTAL COST $
TOTAL COST 100% RETURNABLE SYSTEM
LEAST COST SYSTEM
% Returnable
LEAST COST PACKAGE ARRAY
100% % RETURNABLE

CHAPTER 3: MINERAL RESOURCES

Conservation of mineral resources is a primary motive of proponents of limiting throwaway beverage containers. Our research finds that one-trip beverage containers do use relatively more mineral resources than do returnable containers in the State of Minnesota. This result, and especially the quantitative estimates which follow, is not as obvious as it might appear, especially when dealing with energy resources.

Even more difficult is the problem of valuing these differences. In a well-functioning market economy, prices represent values so that if resources are used in a product, the value of those resources is reflected in the price of that product. If consumers choose products that embody a large amount of resources, the price of those products includes the value of those resources. Consumers, by their act of purchase, express the fact that they perceive greater value from the use of the resources in those products than in alternative uses, including later use. Mineral resource-intensive production can be less costly and produce greater net value than alternatives using other resources. A clear example of this is in farming. Tractors are far more intensive users of mineral resources than are more primitive farming methods. The use of tractors which embody many metal and energy resources allows the use of far less human labor resources and land resources for a given amount of farm production. Banning tractors would save energy and metal (and create jobs) but would obviously be unproductive and very costly.

The price system can be very effective in allocating resources

to their best use in terms of consumer value. However, as pointed out in Chapter 2, this is absolutely true only under fairly strict conditions. Arguments for limiting one-trip beverage containers for reasons of mineral resource conservation must be based on a deficiency in the pricing system. One-trip beverage containers represent a balance of mineral resources, production, distribution and disposal capital costs, labor costs and consumer convenience costs that has been determined by prevailing market conditions. It is alleged that if this balance were changed to reduce mineral resource use, the value of the saving of mineral resources, when all social and other non-market costs are included, would be great enough to justify some increases in other costs (and, coupled with other alleged savings in litter and solid waste costs, would be great enough to justify eliminating one-trip containers). We find that strong arguments can be made that mineral resources are not correctly priced and that the system of allocation is deficient. Thus, it is necessary to estimate the effect on mineral resource consumption of changing from one-trip to refillable beverage containers and to attempt to place values on any potential savings that more closely reflect consumer values than do existing prices. In Section 3.1 below, our quantitative estimates are reported and in Section 3.2 below, we attempt to place realistic values on the potential savings.

3.1 Estimates of Mineral Resource Use.

Table 3.1 contains our estimates of the amounts of some mineral resources used to deliver one gallon of beverage in the various containers. The derivation of these estimates is explained

TABLE 3.1 RESOURCE USE PER GALLON OF BEVERAGE

	ENERGY (BTU's)	GLASS (Lbs.)	STEEL (Lbs.)	ALUMINUM (Lbs.)
BEER				
32 oz. returnable bottle	49,432	4.91	0.02	
" with 4 trips	20,405	1.23	0.02	
" with 8 trips	15,515	0.61	0.02	
" with 12 trips	13,937	0.41	0.02	
12 oz. returnable bottle	68,277	7.09	0.05	
" with 8 trips	19,372	0.89	0.05	
" with 12 trips	17,006	0.59	0.05	
" with 15 trips	16,060	0.47	0.05	
" with 25 trips	14,560	0.28	0.05	
11 oz. returnable "stubby" bottle	58,262	5.79	0.07	
" with 12 trips	16,379	0.48	0.07	
32 oz. non-returnable bottle	37,199	4.12		0.02
12 oz. non-returnable bottle	39,541	4.23	0.05	
12 oz. steel can	48,042		1.03	0.13
16 oz. steel can	46,476		1.01	0.12
12 oz. aluminum can	53,633			0.50
SOFT DRINK				
16 oz. returnable bottle	77,101	8.47	0.04	
" with 6 trips	21,413	1.41	0.04	
" with 9 trips	17,706	0.94	0.04	
" with 15 trips	14,787	0.57	0.04	
" with 25 trips	12,973	0.34	0.04	
12 oz. returnable bottle	89,277	9.93	0.06	
" with 6 trips	24,045	1.66	0.06	
" with 9 trips	19,628	1.10	0.06	
" with 15 trips	16,157	0.66	0.06	
" with 25 trips	14,107	0.40	0.06	
32 oz. returnable bottle	71,142	7.84	0.02	
" with 6 trips	19,636	1.31	0.02	
" with 9 trips	16,165	0.87	0.02	
" with 15 trips	13,404	0.52	0.02	
" with 25 trips	11,748	0.31	0.02	
10 oz. non-returnable bottle	61,795	6.20	0.05	
32 oz. non-returnable bottle	52,569	5.26		0.02
48 oz. non-returnable bottle	51,575	5.17		0.01
48 oz. Plastishield	30,760	3.80		0.01
12 oz. cans	50,452		1.10	0.12

in Appendix C. Energy use is reported in BTU's per gallon of beverage delivered; glass, steel and aluminum use is reported in pounds per gallon of beverage delivered. For example, the delivery of one gallon of beer in 12 oz. returnable bottles with 12 trips requires the use of 17,006 BTU's of energy, 0.59 lbs. of glass, and 0.05 lbs. of steel. This compares to 48,042 BTU's, 1.03 lbs. of steel and 0.13 lbs. of aluminum for the same amount of beer in 12 oz. cans. (It should be noted that a BTU is a very small amount of energy. A 100 watt electric light bulb uses up approximately 115 BTU's per hour.)

Table 3.2 combines the estimates of Table 3.1 with our estimates of Minnesota beverage consumption of Tables 2.1-2.3 to predict potential mineral resource savings of an all-refillable system in Minnesota. For the present delivery system, the estimates assume 12 trips on returnable 12 oz. beer bottles, 4 trips on the very small number of returnable quart beer bottles, and 9 trips on soft drink bottles. (A discussion of trippage rates is contained in Appendix C.) For an all-refillable system, calculations are made for three different trippage estimates. Hypothesis #1 is that trippage would be the same as we estimate for the present. Hypothesis #2 is that beer bottles would get 25 trips per 12 oz. and 8 trips for 32 oz. and that soft drink bottles would get 25 trips. Hypothesis #3 is that beer bottles would get 8 trips for 12 oz. and 4 trips for 32 oz. and that soft drinks would get 6 trips. Under Hypothesis #1, energy saving is 2.15×10^{12} BTU's, glass saving is 31,440 tons, steel saving is 21,270 tons, and aluminum saving is 2,514 tons. Under Hypothesis #2, the savings are 2.69×10^{12} BTU's, 1,763 tons of glass, 21,502 tons of steel and 2,507 tons of aluminum.

TABLE 3.2

POTENTIAL RESOURCE SAVING OF ALL-REFILLABLE SYSTEM

	ENERGY (10^6 BTU's)	GLASS (In 2,000's of Lbs.)	STEEL (In 2,000's of Lbs.)	ALUMINUM (In 2,000's of Lbs.)
BEER:				
Present*	1,696,866.3	28,981.3	8,670.0	1,393.2
All Refillable #1	953,603.9	16,203.3	1,569.6	14.1
All Refillable #2	823,759.8	8,360.1	1,367.5	21.2
All Refillable #3	1,095,336.5	25,573.7	1,367.5	21.2
SOFT DRINK:				
Present*	2,932,298.3	59,243.9	15,874.6	1,740.6
All Refillable #1	1,527,463.1	40,581.9	1,705.2	605.4
All Refillable #2	1,118,573.3	14,664.4	1,705.2	605.4
All Refillable #3	1,847,785.3	60,888.1	1,705.2	605.4
SAVINGS:				
Hypothesis #1	2,148,097.6	31,440.4	21,270.2	2,514.3
Hypothesis #2	2,686,831.5	65,200.7	21,471.9	2,507.2
Hypothesis #3	1,686,042.8	1,763.4	21,471.9	2,507.2

ASSUMPTIONS:

* Assumes 12 trips for all 12 oz. beer in returnable bottles; 4 trips for beer in returnable quarts; 9 trips for all soft drinks in returnable bottles.

#1 assumes that one-third of the beer total is comprised of "stubby" bottles at 12 trips, 5% quart bottles at 4 trips, and the remainder is assumed to be composed of 12 oz. standard bottles at 12 trips; 9 trips for all soft drinks.

#2 assumes 12 oz. beer bottles at 25 trips; quart bottles at 8 trips; and soft drinks at 25 trips.

#3 assumes 12 oz beer bottles at 8 trips; quarts at 4 trips; and soft drinks at 6 trips.

Table 3.3 converts the energy saving of Hypothesis #1 into quantities of mineral resources using Bruce Hannon's estimates that the energy source of the returnable system is 20% fuel oil, 20% gasoline, 40% gas and 20% coal, and the energy source of the non-returnable system is 10% fuel oil, 10% gasoline, 60% gas and 20% coal. We have not been able to verify these percentages, and suspect that the gasoline savings may not occur. (This saving certainly won't occur in Minnesota, where the delivery system will require a 20% or greater increase.) However, we were not able to evaluate the requirements for shipping raw materials, etc., and present Hannon's estimates as the best available.

The roughness of these estimates should be emphasized, but not overly so. The exact magnitudes of the savings are not feasible to measure and our estimates include (and exclude) many variables. But they are the best estimates available at the present time and we are quite certain of their signs. The energy estimate, which is the area of the greatest controversy, is based both on the well-known article by Bruce Hannon of the Center for Advanced Computation, University of Illinois at Champaign-Urbana, and on industry input. We have adjusted Hannon's estimates for differences between Illinois (his data base) and Minnesota and have made changes to reflect industry criticism of the Hannon results. (We find that some of the industry criticism is specious and that the quantitative adjustments they propose do not change the qualitative results.) Glass, steel and aluminum savings were estimated from container weights, capital equipment differences were estimated to be too small on an annual basis to affect qualitative results.

TABLE 3.3 DISTRIBUTION OF RESOURCE ENERGY SAVING[1]

	Fuel Oil (Barrels)	Gasoline & Diesel (Gallons)	Gas (10^6 ff^3)	Coal (Tons)	Total (10^6 BTU's)
Present System:					
10^6 BTU's	706,873.4	706,873.4	2,289,584.8	925,832.9	4,629,164.6
Amount	121,875.0	5,437,488.0	2,218.0	46,292.0	
All Refillable[1]					
10^6 BTU's	496,213.4	496,213.4	992,426.8	496,213.4	2,481,067.0
Amount	85,554.0	3,817,026.0	962.0	24,811.0	
Savings					
10^6 BTU's	210,660.0	210,660.0	1,297,158.0	429,619.5	2,148,097.6
Amount	36,321.0	1,620,462.0	1,256.0	21,481.0	
% of Minnesota Total Use (1970)	0.004%	0.080%	0.370%	0.240%	0.21%

[1] Calculated from our Energy Saving Estimate, using Assumption #1 of Table 3.2 and using Bruce Hannon's estimates of the distribution of resource saving (Hannon, Table 7.)

The results reported above are based on sales volume equal to current consumption levels. Since a change to an all-refillable system must be viewed as a long-term investment, mineral resource savings will adjust to changes in beverage sales volume. Future growth of beverage sales would increase potential savings at the rate of growth if containerization remained the same in percentage terms. If the trend toward more one-trip containers would continue, barring legislative action, then the potential mineral resource savings increase at that trend rate in addition to the growth rate. Since we do not foresee significant reductions in dollar expenditures on beverages, the problem of using more resources in the consumption of substitute goods does not occur. An additional complication is the possibility of recycling which would change the resource usage of both systems, but especially for the one-trip containers. Gerard W. Coleman of Midland Glass Company estimates that 26% to 36% of the glass bottles used in Minnesota could eventually be recycled. If this is also true of cans (which are easier to recover but have greater loss in processing), then resources in each system would be reduced. This would also mean a reduction in the net potential savings with recycling, of perhaps 30% for glass, steel and aluminum. Energy savings from recycling would come from the reused metal cans and depends upon the energy cost of separating and returning the cans and on the energy saved in making containers from the recycled metal. Hannon places the cost of separation and return to the processor at 1,225 BTU's/lbs. Combustion Power Company, a California based recyclin research project, estimates that making steel from recycled materials saves 8,907 BTU's/lbs. Thus, recycling 30% of Minnesota's can consumption would save 0.70×10^{12} BTU's, or 33% of the saving under

Hypothesis #1.

If beverage prices for non-returnables rise less than 15%, there will be less money spent for the same amount of beer and soft drink consumption. These "consumer savings" would be available for spending on other products, which would consequently result in additional resource use. (Appendix B discusses the effect on prices of an all-refillable system.) If prices rise only 8% for soft drinks and 12% for beer, there would be $15,500,000 available to consumers for additional expenditures. Input-output data reveals that the energy component of consumer expenditures on food is 4.07%, and on gasoline is 27.0% (the rest being labor and capital costs, etc.). Converting this into BTU's, we find that if the consumer savings were spent entirely on gasoline (as is very unlikely, but would be the most energy-intensive case), an additional 1.08×10^{12} BTU's would be consumed, a 50% reduction in the energy saving under Assumption #1. If, as is more likely, the consumer saving were spent on other food items, an additional 0.17×10^{12} BTU's would be consumed, or 7.9% of the energy saving under Assumption #1. We consider this last number fairly representative of the energy use differential from consumer savings and it is not significant given the roughness of our estimations.

3.2 Valuing the Mineral Resource Saving.

If the amount of mineral resources used to deliver one gallon of beverages is reduced, the amount of other resources must be increased. Barring market interference, the market value of these other resources must be at least as great as the market price of the mineral resources. Otherwise, competitive pressure would have caused them to be used originally. It would require very great distortion in the market to negate this on the production side. Problems on the consumer side will be considered separately in Chapter 8. Here we assume that the market value of the mineral resources saved is offset by the market value of the other resources used in their place. This allows us to concentrate on the external costs not included in the market price calculations.

Energy supplies are a problem at the present moment in time and this is reflected in lobbying efforts by proponents of beverage container regulation. In some cases, it has been the only resource considered. An example of this are statements which imply an infinite price of energy - statements which imply that an activity should not be undertaken simply because it uses energy without considering that it may conserve other resources. The present energy crisis must be put into perspective, especially when making decisions that have long-term effects. The present energy crisis is not the result of our running out of energy sources. There exist vast supplies of, as yet, untapped energy - solar energy, geothermal energy, agricultural wastes*, the kinetic energy of the moon (tides), atomic reaction, as well as mineral energy reserves - which are available when we are

* Reportedly, Minnesota's agricultural wastes contain enough energy to supply 40% of the State's needs.

willing to pay the price for them in terms of labor and capital. The present low (but rising) levels of energy prices, fostered by federal government policies and economic conditions, preclude the use of highly capital-intensive energy generation at the present time. The capacity to convert our energy into useful power requires the use of land (including mineral resources such as steel), labor, and capital - the truly scarce resources. The present energy crisis is caused by several factors: government-industry miscalculation or mismanagement resulting in a shortage of refining and generating capacity, increasing world-wide demand for cheap energy sources, Mideast politics and oil policies, and capitalized demand for certain kinds of energy (e.g., oil) built into our way of living (e.g., automobile and truck transport). Rather than take the socially unpleasant economic medicine of using temporarily higher energy prices to allocate available energy and stimulate greater production capacity, we have chosen to go the crisis route of voluntary and involuntary rationing. These immediate problems are not a good basis on which to make long-range plans. While, at present, we might wish to trade a good deal of other resources to make up a 10% shortfall of energy, we may not want to make this exchange over the long run.

The problems of resource allocation we are interested in are those which arise from underpricing mineral resources due to not including all of the costs to society in the market calculation. One of these costs could arise from the depletion problem. If our present mineral resource use policies are projected into the future, we get a picture which may look something like this: continue using cheap sources of energy, metals, glass, etc., until depletion causes prices

to rise high enough to cause private capital investment in more labor and capital=intensive forms of power and structure; tolerate the consequent "crisis" caused by construction lags; have our resource needs met after the "crisis" at higher prices, reflecting the increased capital-labor inputs. This, or similar, profiles can be seriously critized on three grounds: (1) the use of mineral resources at the present time may not be their highest and best use over time. For example, future technology may give greater value to petroleum in the production of plastics, or even protein, than in combustion; (2) the cost of the "crisis" caused by the above profile may not be great enough to require gradual conversion to the new, capital-labor intensive system before the depletion-caused price rise; (3) the risk factor: we are dealing with future uncertainties. We don't know how major the "crises" in the projected profits will be or how long or at what cost it will be to develop the new technologies. Perhaps, too, the future price will be so high as to cause regret at present levels of consumption. Since we are uncertain about the future profile, we must weigh possible gains versus possible losses from changing the resource use profile. The loss from changing the profile when, in fact, it turns out to be unnecessary may be small compared to the loss from not changing the profile when it turns out that it should have been changed.

For persons who would prefer an alternative mineral resource profile, these natural resources are underpriced and overused. However, resource markets do not assign weight to these preferences. Nor is it effective for individuals to reduce their own resource consumption because the effect on total consumption would be so small. Thus, a lobby for reduced resource use is produced. However, a more effective

way of altering the expected use profile would be to institute higher relative prices for mineral resources. Higher prices would curtail present consumption (generally in areas where it is least valued) and promote development of other technologies. Correct pricing is more likely to lead to correct allocation than is mandatory rationing or other restrictions on particular uses of resources.

Another important pricing problem arises from the existence of environmental externalities not included in the market price of the mineral resources. These externalities include the degradation of air, water and land in the extraction, refining and use of the mineral resources. These are costs to society, and when left out of the market calculation, lead to overuse and misallocation. The solution is to make prices include these costs. It would then often turn out that pollution control costs were lower than the pollution costs and the environment would benefit. Also, some marginal uses of resources would be abandoned due to the higher prices, thus reducing the load on the environment.

A "second best" solution to the problem of underpriced resources is to regulate their use by mandating their elimination from marginal uses. The problem here is in determining which are the marginal uses. A person who lives in the suburbs and uses a car for transportation may feel that automobiles are an important use of energy and light-weight one-trip beverage containers are a marginal use, while someone who lives in the city and uses buses and walking for transportation may feel the reverse.

Table 3.4 gives some possible valuations of the resource saving. In Column 3 is the market cost of the resource saved, with glass, steel and aluminum costs net of energy inputs. This column is not the value of the saving because these resources would have to be replaced by other resources - additional labor and capital equipment in delivery, for example - which are likely to be as expensive as the resources saved. It is the hidden savings that arise from the externalities that are important to note. Columns 4 through 6 estimate the value of these externalities for different judgments about the amount of externality. Column 4 assumes that the externalities are the kinds of pollution that the 1976 Pollution Control Act is directed against. Various estimates of the cost of meeting these standards range from less than 1% to 6% of costs for various industries. We use 5% as a fair estimate of the cost of eliminating most of the concentrated pollution effects. The value of this externality saved by an all-refillable system is estimated to be $598,962. Columns 5 and 6 are constructed to accommodate different judgments about the problems of depletion, etc., discussed above. Column 5 assumes the resource use should be 10% less than it is at present, and Column 6 assumes that it should be 25% less than at present. The necessary price increases of 12.5% and 32% are calculated from a Rand estimate of the price elasticity of total energy consumption of -0.8. We have applied this elasticity indiscriminately over all resources and over a wide range of price variation. The estimated value of the saving in external costs is $778,108 in Column 5 and $1,243,889 in Column 6. Comparing the all-refillable system to a system with 30% recycling (the maximum likely to occur) lowers these values by about 30%.

TABLE 3.4

RESOURCE VALUES AND NATIONAL SAVINGS
RESULTING FROM AN ALL-REFILLABLE SYSTEM IN MINNESOTA

		Column 1 Amount Saved	Column 2 Approximate Price (Industrial)	Column 3 Market Cost	
Fuel Oil (barrels)	Energy	36,321	$ 13.02	$ 472,899	2,400,000
Gasoline & Diesel (gallons)	Energy	1,620,162	0.45	779,208	
Gas (MCF)	Energy	1,256,000	0.50	628,000	
Coal (tons)	Energy	21,481	26.00	558,506	
Glass (tons)		31,440	160.00[1]	5,030,400[1]	
Steel (tons)		21,270	154.03[1]	3,275,580[1]	
Aluminum (tons)		2,514	511.00[1]	1,284,654[1]	
				$12,027,238	

VALUE OF SAVINGS FOR DIFFERENT VALUES OF EXTERNALITIES[2]

	Column 4 5% of Cost to Accommodate 1976 Air Pollution Standards		Column 5 12.5% of Cost to Decrease Consumption by 10%		Column 6 32% of Cost to Decrease Consumption by 25%	
Fuel Oil	$ 23,645	119,430	$ 59,112	298,576	$ 151,328	764,353
Gasoline & Diesel	36,460		91,151		233,347	
Gas	31,400		78,500		200,960	
Coal	27,925		69,813		178,722	
Glass	251,520		251,520[3]		251,520[3]	
Steel	163,779		409,448		1,048,186	
Aluminum	64,233		64,233[3]		64,233[3]	
	$598,962		$1,023,777		$2,128,296	

[1] Net of energy cost which is separately accounted for in the fuel entries.
[2] Using a price elasticity of -0.8 as estimated by Doctor, Anderson, Berman, Dale, Hannon McClure, and Smith, California's Electric Quandary, Rand Corp., R1116-NSF/CSA.
[3] Assumes that only the energy component of glass and aluminum is in danger of depletion.

If trippage rates are as in Hypotheses #2 or #3, then the savings would be correspondingly different, approximately 25% greater for Assumption #2 and 25% less for Assumption #3.

To put some perspective on the size of these savings, if all of the BTU's saved were used to generate electricity, it would be enough to light a 100 watt light bulb in every household in Minnesota for 4 hours and 23 minutes per day. If the saving were all gasoline, it would be enough to provide each household in Minnesota with 14.3 gallons, or enough to drive 170 miles annually or 3.3 miles per week at 12 miles to the gallon. Note, too, how quickly the saving is diminished if people are induced to drive more as a result of the refillable container system.

Finally, it is important to realize that these savings will not occur in Minnesota, but in the national and world resource pool. For instance, it is likely to increase the demand for gasoline in Minnesota (where the gasoline using delivery system is located), rather than reduce it. In resource saving, Minnesota would profit much more from a national bill than a state bill. Realistically, only about one-fiftieth of the value of the savings would accrue to Minnesota.

CHAPTER 4: LITTER

Litter imposes costs on society which are not accounted for in market prices. An individual engages in free disposal by the act of littering. This act imposes subjective costs on members of society who dislike either encountering the littered item or the idea of the disfiguration of their environment. The sum total of these individual costs is the cost to society of the act of littering. These subjective costs can be reduced by litter pick-ups, but this entails objective costs of the collection process. Society imposes legal sanctions against the act of littering because of the social costs involved. Now a further deterrent to littering behavior is sought. Mandatory deposit legislation is an attempt to reduce litter by increasing the costs of littering to potential litterers through giving refund values to specific items - in this case, soft drink and beer containers.

Beverage containers are a major component of litter. Research Triangle Institute, which has studied this problem for the U.S. Environmental Protection Agency and for Keep America Beautiful, Inc., reports estimates of the beverage container component of litter ranging from about 20% by piece count in a 20 state survey to 40% in public perception as reported in a public opinion survey to 62% by volume in an Oregon highway study. It is believed that an all refillable system would lead to a reduction in beverage container litter and perhaps in litter in general. There are three reasons to expect this result: (1) The refillable bottle is associated with a refund value which should serve to reduce the incidence of littering;

(2) The refund value could promote scavenging of littered containers; (3) The publicity and increased awareness associated with government intervention in the mode of containerization might serve to reduce not just beverage container litter but all littering. Working against these factors is the nature of the refillable container which, being heavier than one-trip containers, increases the motive for summary disposal and being glass is breakable and non-degrading. It is quite certain that there exists a level of mandatory deposits for which the factors motivating a litter reduction outweigh the offsetting factors. It is likely that this deposit level is low, perhaps even 1¢ per bottle. It is also true that the higher the deposit, the greater the incentive against litter. However, deposits greater than the value of the bottle are not feasible due to counterfeiting, border crossing and problems with the incentive to accept returns. Attention is thus directed toward deposits of 3¢ to 5¢ for beer in standard bottles, 5¢ to 10¢ for soft drinks in standard bottles, and deposits of up to 25¢ for larger bottles, as is the case in Oregon and which is consistent with proposals for Minnesota.

Oregon has so far been successful with an anti-litter program based on mandatory deposits on all carbonated beverage containers. (See Appendix G for a report on the Oregon Bottle Bill.) While various studies being done in Oregon are not yet completed or released (e.g., the Legislative Fiscal Committee study and the E.P.A. contracted study), the Oregon anti-litter campaign appears to be extremely successful at this time. The state is remarkably clear of litter. The Oregon "bottle bill" has played a major role in this campaign, both in increasing the incentive not to litter and in generating a statewide anti-litter consciousness. In addition, it

appears that Oregon has increased both the funding and the cost-effectiveness of its litter pick-ups and made highway and park litter barrels more available. It is also possible that a reduction in tourism over the past summer (attributed to the gasoline shortage scare) has helped reduce the incidence of littering. The observation of the Governor's Highway Litter Survey that total litter initially decreased by an amount greater than the reduction in beverage container litter indicates that an important part of the anti-litter program and the "bottle bill" has been in its consciousness-creating aspects.

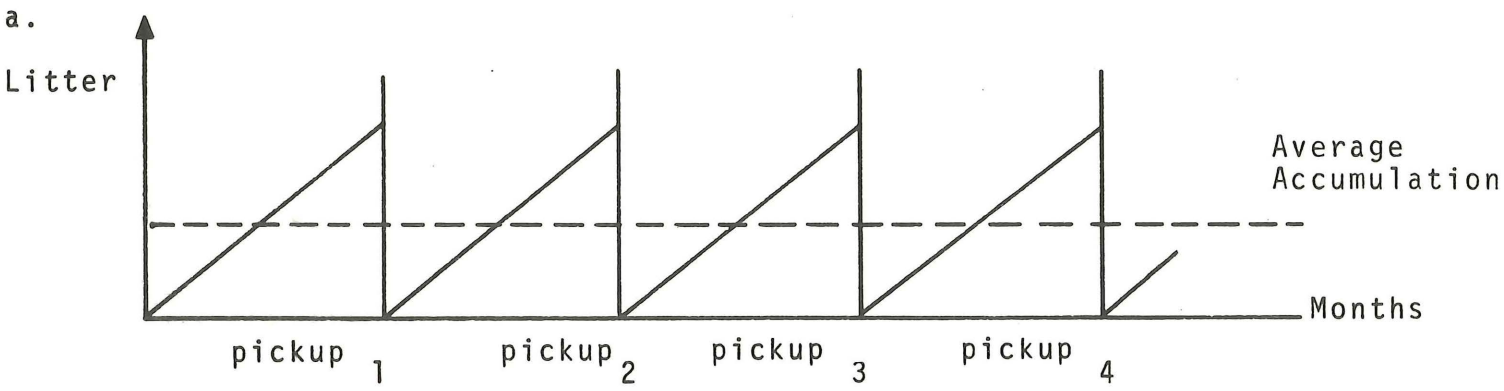
It is difficult to quantify the reduction in litter to be expected from an all refillable system or a system of mandatory deposits. Even more difficult is the problem of valuing the reduction. The true social costs of litter is the sum of the amounts that each consumer-citizen would be willing to pay to have it eliminated. This is obviously a different thing than the amount spent on litter pick-ups. Spending money on litter pick-ups should actually reduce the social cost of littering (otherwise the money is being poorly spent). The cost of eliminating litter through pick-ups approaches infinity as periodic pick-ups don't eliminate litter but allow it to accumulate between pick-ups. Ideally, for a given incidence of littering, the amount spent on litter collection should be determined by the point at which the costs of increasing the frequency of pick-ups exceeds the benefits of reducing the average accumulation of litter. The average amount of accumulated litter determined by this calculation is the best that can be done without reducing the incidence of litter. For a lower incidence of litter, that is a lower rate of littering, perhaps caused

by a system of mandatory beverage deposits, this ideal calculation would result in a greater or smaller expenditure on litter pick-ups, depending upon the costs and benefits at the new level of accumulation. It is not likely that there would be a reduction in collection costs proportional to the reduction in littering. Nor is it probable that the value of the reduction in littering, that is the aggregate benefit of all the consumer-citizens, would be equal to either any reduction in collection costs or the proportional share of the reduction in the original collection costs.

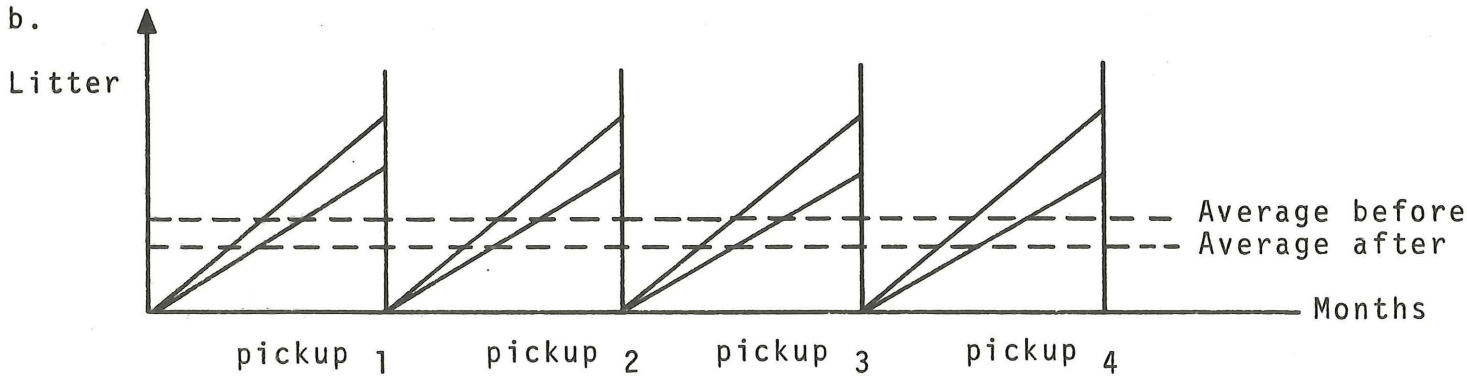
The actual situation is more complex than this due to the unlikelihood of the actual decisions on litter collection being ideal. Litter collection is a small and low priority budget item that is postponable. As a result, collection patterns are more likely to be set by tradition and availability of facilities and funding than by a welfare-maximizing calculation. There is subjective evidence that greater expenditures on litter collection would occur in an ideal calculation. There is obvious dissatisfaction among some people with the present accumulation of litter and more litter collection would have clear benefits. Since litter collection expenditures are not set equal to an ideal social calculation, it is even more difficult to predict either the effect on collection costs or the value of the reduction in litter of an all refillable or mandatory deposit system. However, it is unlikely that the savings would be used only to reduce collection costs. Thus, collection cost reductions will generally underestimate the true value of litter savings.

Figure 4.1 illustrates some of the possible effects on litter

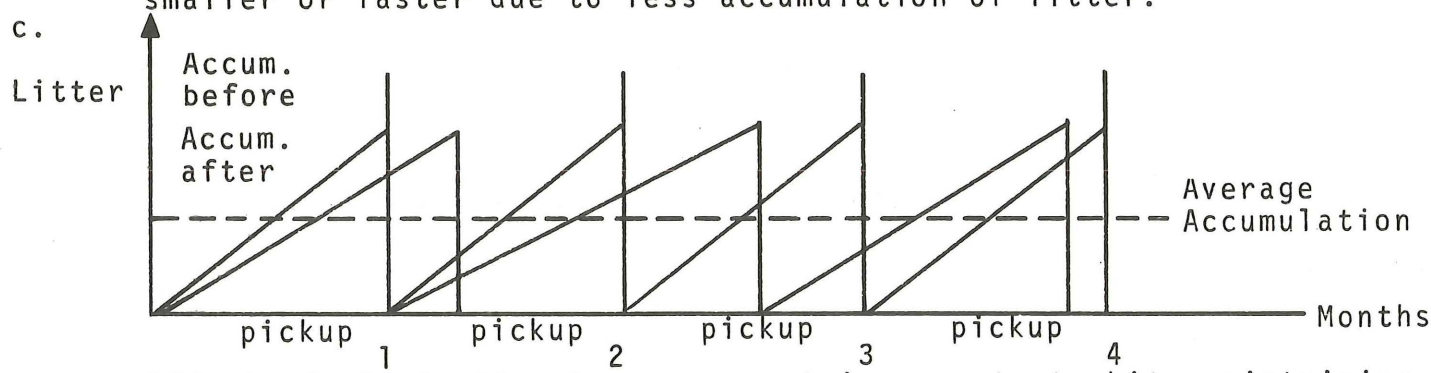
Figure 4.1



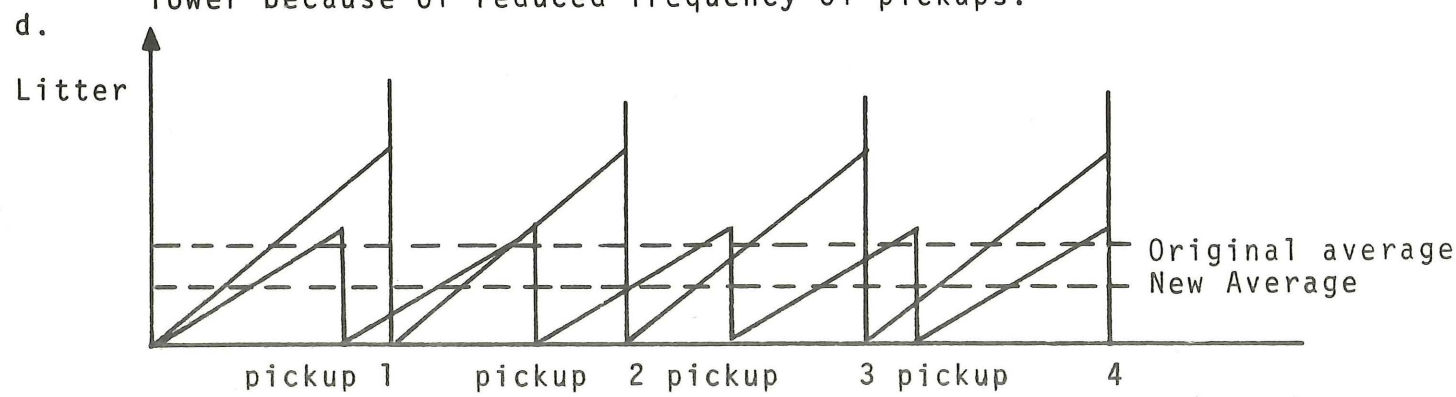
Accumulation of litter in an area with periodic pickups



Effect of eliminating beverage container content, but maintaining periodic pickups. Pickup costs are reduced if collection teams are smaller or faster due to less accumulation of litter.



Effect of eliminating beverage container content while maintaining average total accumulation with fewer pickups. Pickup costs are lower because of reduced frequency of pickups.



Effect of eliminating beverage container content while maintaining same expenditure on collection. Lower rate plus more frequent pickups reduces average accumulation.

collection. Figure 4.1a represents the accumulation of litter over time with periodic pick-ups. The littering rate is indicated by the steepness of the accumulation line. The horizontal dotted line is the average accumulation.

Figure 4.1b compares the original accumulation to a lower litter rate caused by the elimination of the littering of beverage containers, but with periodic collection continuing. As shown, the steepness of the new accumulation line, the dotted line, has decreased and the average accumulation of litter is less. Litter costs are reduced: (1) by lower collection expenditures if the periodic collection costs are less due to the small amount of litter to be picked up; and (2) because the lower average accumulation is probably associated with lower subjective costs to society. (We say "probably" because it isn't necessarily so that subjective costs are directly related to incremental changes in quantity. It could be that it is an all or nothing situation or that it is the idea of litter or littering that causes the subjective costs. It is, however, unlikely that this would be true of all persons and, thus, true in aggregate.)

Figure 4.1c represents a reduction in the littering rate coupled with a reduction in the frequency of pick-ups, which leaves the average accumulation of litter unchanged. Here the reduction in litter costs comes solely from the saving in collection costs. As we noted, this case is unlikely. However, a possibility is a combination of case b and case c with less frequent collections and less of a drop in average accumulation than is the case in Figure 4.1b.

Also possible is the case illustrated in Figure 4.1d, wherein the reduction in the rate of littering (note that in all cases, the before and after rates of littering are maintained at the same levels, as evidenced by the sameness of the steepnesses of the curves) is accompanied by more frequent collection. In this case, collection expenditures may be equal or greater than before and the average accumulation is reduced to the lowest level. This example best illustrates our evaluation of the situation in Oregon.

We conducted a brief study of the return to scavenging which is reported in Table 4.1. This study revealed that it is possible to earn between 50¢ and $1.26 per hour picking up beverage container litter with a 5¢ deposit value, which we feel would be sufficient to induce significant scavenging if the average accumulation were not significantly reduced.

Beyond this, we believe that the most significant costs of litter are not the collection costs, but the subjective costs, and that society concurs in this judgment so that colections will not decrease, as in Figure 4.1c. In Oregon, collections have actually increased and the obvious benefit and expectation of their "bottle bill", as well as the motive for one in Minnesota, is not a reduction in litter collection costs but a reduction in the average accumulation of litter. We expect the benefits of a situation like that illustrated in 4.1b or 4.1d to be far greater than that of 4.1c. As a result, the most important benefits in litter reduction would be the subjective ones of spending the potential savings in collection costs on litter reduction; i.e., maintaining the existing rate of spending on litter collection and reducing the average accumulation of litter.

TABLE 4.1 SCAVENGING STUDY

	Number Of Hours	Number Of Items	Value @ 5¢ Deposit	Wage Per Hour
Minnehaha Park	2.50	63	$3.15	$1.26
Mississippi River	3.00	65	$3.30	$1.10
Rural County Road near State Park	0.75	18	$0.90	$1.20
Como Park	2.00	20	$1.00	$0.50

As a result, estimates of the cost of collection of beverage container litter made by prorating total collection costs by the beverage container content of litter will tend to underestimate the true value to society of eliminating the beverage container content of litter. Such estimates are useful in setting a lower bound on the possible savings. However, further problems arise in estimating the beverage container content of litter and the actual costs of litter collection. (The law is not likely to eliminate all littering of beverage containers. Where heavier refillable containers have been hand-carried for significant distances, as into recreational areas, there will be an increased incentive to litter. The open bottle law will continue to motivate littering of beer containers from automobiles. The deposit simply reduces the motive to litter and realistic deposit levels simply eliminate littering where motive was not as strong as the small monetary reward to not littering.)

Table 4.2 presents our estimates of the range of potential savings in litter collection costs and possible reductions in litter accumulation. (Footnotes to the table explain the derivation of these estimates.) Estimates are presented for the three cases discussed above and illustrated by figures 4.1b, 4.1c and 4.1d.

Case 4.1b shows a possible reduction of around 18.5 percent or perhaps $500,000 to $800,000 in collection costs for state, county and municipal governments. This is a result of a litter reduction of perhaps 15% by piece count and 22% in volume.

Case 4.1c, allowing the same average accumulation of litter, shows a possible cost reduction of around 20 percent due to less frequent pick-ups.

TABLE 4.2 ESTIMATED LITTER AND COLLECTION COST SAVINGS[1]

DOLLARS COST REDUCTIONS

Estimated Expenditure on Litter Collection[1]	$2,700,000 - $4,300,000
Possible Savings at Same Pick-Up Frequency[2]	$500,000 - $800,000
Possible Savings if Same Average Accumulation Maintained[3]	$540,000 - $860,000

LITTER ACCUMULATION AND COLLECTION COST REDUCTION
Percentage Reduction Compared to Present System

	% Reduction In Costs	% Reduction in Average Accumulation
Case 4.1b Same Collection Frequency[2]	18.5%	15% - 22%
Case 4.1c Maintaining Same Average Accumulation[3]	20.0%	
Case 4.1d Maintaining Same Level of Expenditures of Collection[4]		30%

[1] Very little is known about actual litter collection costs. The state of Minnesota allocated $580,000 to litter collection along roadways in 1972. Some counties pick up roadside litter on an "as needed" basis; others have no pick-ups. These estimates were generated by: (1) attributing to Minnesota its per capita share of the $214 million annual estimate quoted by Research Triangle Institute, which yields $4.3 million; and (2) assuming that total public costs in Minnesota for roadside litter collection are in the same ratio to state costs as that implied by the figures quoted by Research Triangle Institute.

Very little is known about litter rates. Minnesota participated in the Research Triangle Institute study for Keep America Beautiful on litter accumulation and rates in 1968-69. The data in this study indicated that the Minnesota litter rate was between one-fourth and one-fifth of the litter rate for the 29 states participating. However, we feel that this rate is too low and that the sample data for Minnesota is misleading due to the smallness of the sample - 10 sections of roadway each two-tenths of a mile long, and the fact that the participating states did the surveys in different months. We do believe that the rate of littering is lower in Minnesota. The estimates presented in this table were done by estimating beverage container litter rates for Minnesota in items per mile per month from Research Triangle's estimates of percent of containers littered, reduced by 40% to assume that Minnesotans litter at less than the national rate, times our estimates of the number of fillings consumed in Minnesota. Total litter rates were then developed by using data from Research Triangle's study showing that beer and soft drink containers constitute about 20% of litter by piece count. Estimates were then made of the container litter under an all refillable system and total litter under an all refillable system.

TABLE 4.2 (cont'd.)

[2] Using the litter rates estimated, total litter would be reduced about 15 percent by piece count and about 22% by volume. Reduction in litter collection costs would not necessarily fall in proportion to the reduction in litter rates, so we assumed that the collection cost at the same frequency of pick-up would fall in proportion to the average of the piece count and volume percentage reduction.

[3] Under the calculated reduction in litter rates, 20% fewer pick-ups would be necessary to maintain the same average accumulation.

[4] The reduction in the cost per periodic pick-up due to the reduction in litter would permit an increase in the number of pick-ups at the same expenditure level. The increase in pick-ups in addition to the lower litter rate yields the 30 percent reduction in the average accumulation of litter.

Case 4.1d, maintaining the same expenditure on litter collection, shows a possible reduction in litter accumulation of 30 percent, resulting from the reduction in the litter rate and more frequent pick-ups at the same expenditure level due to lower costs per pick-up.

Two points should be kept in mind when evaluating these litter cost reduction figures. (1) These savings are "possible" savings. Litter pick-up may not be done on a regular basis on many roadways. Also, much of the litter collection is done on an "as needed" or on a "when available" basis; i.e., crews are sent out on litter collection when not needed for other duties. Therefore, the real cost of the litter collection may not be as high as the allocated cost and the real savings, therefore, would be smaller.

(2) The litter accumulation rates and, consequently, the litter reduction figures are closest to piece counts. However, as mentioned above, public perception of beverage container litter may be twice the actual percentage piece count. Therefore, the perceived improvement in litter accumulation may be greater than the estimates given in the table.

One further point should be raised concerning litter and littering. The individual who litters imposes the costs on society. It is estimated that only a small percentage of the population are litterers. The imposition of an all-refillable system or mandatory deposit system may impose costs on people who are not litterers, people who prefer disposable containers and dispose of them properly. Many of these people may be litter-haters who are made better off by absorbing the costs imposed by litterers, and would prefer the deposit system even

though they themselves purchase disposable containers at present. That is, they are willing to forego disposable containers if it means that everyone else must also. On the other hand, there may be people who feel otherwise and are made worse off by a deposit system. This is the so-called "equity problem" of making non-litterers pay part of the cost when litter-haters impose deposits on litterers.

CHAPTER 5: SOLID WASTE

Solid waste represents both a potential problem and a potential resource to our society. Uncontrolled disposal is a problem as are mounting collection and disposal costs. As yet, these costs have not risen enough to place constraints on individual consumption patterns, but some people fear that this may happen in some areas of the country in the relatively near future. Another problem is to find means of disposal that do not have higher social costs in the form of blight on our land and in our air and water. On the other hand, solid waste represents a stockpile of natural resources with the potential to be reused or to be conserved by reduction at the source.

Disposable beverage containers are an easily identified component of solid waste. An alternative beverage container system, the all-refillable system, is believed to reduce the beverage container contribution to solid waste. Thus, one of the proposed benefits of the all-refillable system is a reduction of solid waste costs.

5.1 Estimating the Effect on Solid Waste.

It is believed that an all-refillable system would reduce the amount of solid waste for these reasons: (1) Refilling the containers means that fewer containers would be used. For solid waste tonnage to be reduced, it is necessary for each container to make enough trips to make up for its heavier weight; (2) The reuse of paper and cardboard carriers associated with the refillable system would mean less secondary packaging material going into solid waste. For this to be true, the secondary packaging associated with the refillable system must both continue to be made and handled as it is for the

refillables now in use and make enough trips to make up for its greater weight. (3) Breakage and discard for wear of both the primary and secondary containers would occur to a greater degree than the bottles and thus tend more to be recycled or at least disposed of with greater economies of scale.

Estimation of the effect on secondary packaging is more difficult due to the greater uncertainty about the form it will take. For example, at the present time refillable beer bottles are sold in cases of 24 with a 13¢ deposit on the case (plus 72¢ on the bottles). These cases have a high rate of return with trippages of 24 being reported. It is unlikely, however, that if a refillable system were mandated, these would be the only carriers used. In Oregon, beer is sold in 12-pack non-reusable cases made of heavy cardboard. The return rate on these containers does not appear to be very high. It is likely that smaller cases would be used in Minnesota, especially in grocery stores, and a much lower rate of return would occur.

Table 5.1 contains data on solid waste generation per gallon of beverage for a variety of containers and trippage rates, including container waste, closures and secondary packaging. These figures do not include source recycling as explained in (3) above.

Table 5.2 gives the total solid waste generation of beer and soft drinks under the present system and under an all-refillable system for different trippage rates.

Table 5.3 compares the present system to the all-refillable system with 12 trips for beer and 9 trips for soft drinks. It

TABLE 5.1 SOLID WASTE GENERATED BY DIFFERENT CONTAINERS

CONTAINER	POUNDS PER GALLON BEVERAGE
BEER	
12 oz. "export" bottles	
8 trips	1.10
12 trips	0.75
15 trips	0.61
25 trips	0.39
12 oz. "no return" bottles	4.53
11 oz. "stubby" bottles	
8 trips	1.43
12 trips	1.18
15 trips	1.08
25 trips	0.92
12 oz. steel cans	1.18
16 oz. steel cans	1.15
12 oz. aluminum cans	0.77
SOFT DRINKS	
Returnables (under 20 oz.)	
6 trips	1.88
9 trips	1.38
15 trips	0.99
25 trips	0.75
Returnables (over 20 oz.)	
6 trips	1.33
9 trips	0.89
15 trips	0.54
25 trips	0.33
"No Return" bottles (under 20 oz.)	6.46
"No Return" quarts	5.28
48 oz. "No Return" bottles	5.19
48 oz. "Plastishield"	3.81
12 oz. steel cans	1.25

TABLE 5.2

COMPARISON OF SOLID WASTE GENERATION
UNDER ALTERNATIVE TRIPPAGE ASSUMPTIONS
FOR CURRENT CONSUMPTION LEVELS

(1,000's of lbs.)

BEER	
Present System	82,539
All Refillable System	
8 trips/container	70,506
12 trips/container	53,342
15 trips/container	46,479
25 trips/container	35,479
SOFT DRINKS	
Present System	172,303
All Refillable System	
6 trips/container	146,861
9 trips/container	105,733
15 trips/container	72,831
25 trips/container	53,090

TABLE 5.3

ESTIMATED SOLID WASTE GENERATED BY BEVERAGE CONTAINERS
(1,000's of lbs.)

	CONTAINERS	TOTAL[1]
Present System		
Beer	73,397	82,539
Soft Drinks	152,632	172,303
TOTAL	226,029	254,843
All Refillable System[2]		
Beer	31,023	53,342
Soft Drinks	82,255	105,733
TOTAL	113,278	159,075

[1]Includes containers, closures, secondary packaging.

[2]Assumes 12 trips per returnable beer container, 9 trips per soft drink container.

includes both container waste and closures and secondary packaging.

Trippage rates are discussed in Appendix C.

Our estimates of container use and our data on container and package weights were used to estimate the solid waste generated by the existing packaging array at present consumption levels. For comparison, we then estimated the solid waste which would be generated by an all-refillable system at the same consumption levels. Since the solid waste generation of an all-refillable system is sensitive to trippage assumptions, we did estimates for four different trippage rates. (Estimates of solid waste generation used trippage rates of 9 for soft drinks and 12 for beer.) We also needed assumptions on the type of packaging which would exist under an all-refillable system. We assumed for soft drinks the volume now in non-returnable containers would be purchased in refillable containers with the same array of sizes as the existing volume in returnable containers. For example, if refillable quarts now account for X percent of the volume sold in refillables, these containers would pick up X percent of the volume now in non-returnable containers if an all-refillable system were imposed. This is equivalent to assuming that various package sizes would maintain the same percentage of an all-refillable system as each has of the existing volume in returnables.

For beer, we assumed that about the same volume would be consumed in the familiar 12 oz. "export" bottle, and the remainder would be purchased in containers with packaging and solid waste characteristics similar to the "stubby" bottle which is the dominant container in Oregon and common elsewhere in the Pacific Northwest.

Our data on container and package weights was used to calculate the solid waste generation per gallon of beverage. In effect, we counted the number of containers, closures and secondary packaging needed to deliver a gallon of beverage, taking into account reuse of the container and package where appropriate.

5.2 Valuing the Effect on Solid Waste.

We estimate the beverage container content of solid waste at current consumption levels to be 254.8 million pounds (127.4 thousand tons) per year in Minnesota. The likely reduction in solid waste that we foresee is 95.8 million pounds (47.8 thousand tons)or 38% of the beverage container content and 1.5% of total municipal solid waste.

In estimating the value of this reduction in solid waste, there are two aspects to consider: collection and disposal. Consumers are charged a rate which combines these two costs. This rate is generally not based on individual waste generation, but on averages. This is a reasonable procedure due to collection costs being the dominant of the two costs (at least in terms of market prices to the collecting firm). The nature of the collection process is such that collection costs are determined mostly by the number and frequency of pick-ups and the distance traveled on the collection route and not so much by individual variations in the amounts to be collected at each stop. This is a result of the capital and labor requirements of using large efficient compactor trucks. This pricing procedure does not, however, give individual consumers the incentive to marginally reduce their output of solid waste since it would not lead to a reduction in their charges for collection so that this is a case

where a group decision; e.g., for everyone to make a marginal reduction in solid waste generation, is necessary to produce individual benefits. There are, however, two reasons for concentrating on disposal costs and not considering collection costs here. The first is that, as indicated above, the collection process is such that the percentage reduction in solid waste, which we estimate to be about 1.5 percent of municipal solid waste, would not have much effect on collection costs. The other is that there are no obvious or significant externalities in the pricing of collection costs. This does not mean there is not a market problem with collection costs; there is, as noted above, the problem of lack of individual incentives for group rewards, but this problem will be considered below in Chapter 8. The lack of market externalities in collection costs means that the consumer at least gets what he pays for and pays for what he gets, regardless of whether he would have made the choice in a group decision. This may not be true of disposal costs.

The market price of solid waste disposal, including transportation to the site, is estimated to be $4.20/ton in the Twin Cities metropolitan area (according to a 1967 study done for the Metropolitan Council by Black and Veach of Kansas City). Disposal is predominantly land fill. Some people feel that disposal by land fill is underpriced for several reasons, among them that land fill procedures are not yet adequate to meet the standards of "sanitary land fill", that the visual and olfactory effects are not included in the cost, and that land values for other uses, such as wildlife habitat are underpriced. At current costs, the solid waste reduction may save $207,000 per year in disposal costs. It seems reasonable to assume that the

external costs would no more than double this figure. Predicting future trends in solid waste disposal costs proves to be a very tenuous undertaking. On one hand are increasing land prices and greater handling distances and on the other are the possibilities of cost-reducing technologies, including various schemes to "mine" solid waste for its resource values, at least for areas such as the Twin Cities, where there are great concentrations of solid waste. It is likely that disposal costs will gradually rise in non-metropolitan areas, but may eventually decline, and even become negative in metropolitan areas. A neutral stance on this issue seems appropriate at this time. Thus, our estimates lead us to conclude that reduction in solid waste generation is not a significant factor in the beverage container decision and that the reduction is worth about $200,000 in costs not accounted for in beverage prices (but nonetheless in market prices) and less than $200,000 in external costs, or less than 10¢ per capita per year.

CHAPTER 6: IMPACTS ON INDUSTRY

We consider the impacts of mandating an all-refillable beverage container system on the beer, soft drink and container industries and on the retail outlets for these products. Effects on industries, such as the paper and mining industries which are further removed will not be considered because of their small scale and unpredictable nature. Input-output analysis as used in the MRI and Folk studies can be useful for predicting large scale economy-wide effects at the national level, but are generally not accurate in dealing with local effects where frictional inertia in the economy and the wide dispersion of the effects override the mechanical precision of input-output models. Thus, our concentration is focused on those industries most immediately affected and with the greatest impact on the economy of the State of Minnesota.

Interest in industry effects is based on consideration of equity and consumer self-interest. Questions of equity arise over the process of allowing firms to invest in the pattern of operation associated with the present mixture of beverage containers with no real opposition, and then suddenly reversing and decreeing that method of operation must end, thus subjecting the firms to capital losses. On the consumer side, there is a danger of forcing firms out of business, possibly decreasing market choice and reducing competitive pressure and of creating greater uncertainty in the industry, both of which would tend to raise prices. The extent to which these problems arise is determined by the effect of mandating the all-refillable on prices, volume and capital usage. The degree to which the all-refillable system affects these factors determines

the amount of difficulty industry will encounter and, thus, how significant are the equity problems. The importance of the equity problems are a political question, as opposed to efficiency questions, and thus a problem for the political system to weigh in the beverage container decision or to consider mitigating alternatives such as implementation of a refillable system gradually over a period of time to reduce capital costs.

(1) A switch to an all-refillable beverage container system would increase prices of beverage in refillable containers above those reported in Table 2.3.

(2) Beer and soft drink prices in refillables are expected to rise by 8% to cover the diseconomies of scale of increasing the returnable portion of total consumption to 100%. The average price of beer in returnables is expected to rise an additional 4% to accommodate a far greater proportion of returnable sales in six-packs and twelve-packs. This will result in an average price decrease of 13% for soft drink and an increase of 0.3% for beer. The derivation of these estimates is found in Appendix B. However, these estimates do not tell the whole story.

(3) When a consumer buys a product, part of the price of that product is the difficulty he encounters in getting it. When a consumer with the choice of buying beverages in one-trip or refillable containers chooses the disposable despite its greater market price, he is indicating that the convenience of the disposable container makes it preferred over the refillable and that, in fact, the effective price (market price plus effort) is lower for the one-trip container. If, for this class of consumers, the price of the

refillable is, at present, higher than the effective price they now pay for beverages in disposable containers, then they would certainly have to pay a price which to them is higher if an all-refillable system is implemented. On the other hand, there are consumers who may now buy the higher priced disposable containers only because refillable containers are not available where they shop. Some of these consumers would get a price reduction from the implementation of an all-refillable system. (The number of consumers benefiting would, of course, depend upon how great a rise in the price of refillables took place as some numbers of them would prefer disposables to refillables for higher prices of the latter.)

Presently, 42.3% of Minnesota's beer consumption is in returnable bottles. The price of this portion of sales is expected to rise 8% (not 12%, because the package size of this portion must be assumed to remain the same). Applying the price elasticity of -0.27 calculated by Research Triangle for all alcoholic beverages (Estimates were made for soft drink of -0.16 and for beer of -0.17 which were not statistically significant. The estimate for all alcoholic beverages was significant and it does not seem reasonable to use a lower figure for an item which would seem intuitively to have more close substitutes.) results in an estimated decrease in these sales of 2.16%.

Presently, 33.6% of Minnesota beer sales is in non-returnable containers. Consumers purchasing this beer would have to switch to returnable bottles under an all-refillable system. The money price of this beer would be less than in non-returnables, but the consumer would lose the convenience. For some consumers, this would not be a great consideration, but at other times it might. However,

we do not feel that it would be great enough in aggregate to pull the net decrease in beer sales down to less than 3%. Since this figure corresponds closely to estimates of annual growth in beer sales nationally of 3.9% and in Minnesota of 3% (disregarding the bad year of 1972), we do not foresee a decline in beer sales in the year following implementation of an all-refillable system. This estimate also corresponds to the Oregon situation where beer sales held up at the same level as the year before. Thus, the expected effect on beer sales is a one-year setback in the growth rate.

Applying the same analysis to soft drink sales, we estimate a decline of 2.16% in soft drink sales presently in returnables, which are 40% of total sales. There are further problems for soft drink sales, however. In Oregon, it was indicated to us that soft drink sales could be off as much as 10% in total, with practically all of this loss occurring in warehouse brands. These are sales which are made directly to supermarket warehouses to take advantage of economies of scale in delivery. This system has been built around the one-trip container. Cans were eliminated temporarily in Oregon by the ban on pull tabs and the warehouse sellers were severely impacted. They seem to be recovering at present, however. Soft drink sales may also be more susceptible to convenience changes with substitutes like ice tea and non-carbonated fruit punch appearing in the Oregon market. The annual rate of growth of soft drink sales was estimated to be 7.2% from 1965-1970. It would take a very large decrease in sales to wipe out this rate of growth. Thus, we do not foresee a large drop in soft drink sales. However, most of our calculations are done for both no decrease in soft drink sales and a 10% decrease, which we feel is

an unlikely maximum decrease.

Capital costs, which we consider next, are not involved in the evaluation of which container system is best, but in whether it is worthwhile to make the switch when, in fact, there are existing facilities devoted to the present system which cannot be converted to the all-refillable system. These costs are one-time costs of changing systems and, thus, are unlike the annually occurring costs and benefits discussed so far. Changeover costs can be considered to be like an investment; changing beverage container systems has costs - we expect to get a return on these costs if we make the change. Presently, there is existing capital equipment for the production, filling and distribution of disposable beverage containers. Going to a system of all-refillable containers, or even a change toward more refillables and fewer disposables, would require new capital investment in the refillable technology and possibly the abandonment of some of the capital equipment for disposable containers. The discounted present value of the abandoned capital represents a loss to society (because it could have been continued in use without tapping capital markets or raising prices, etc.) which is a cost of changing container systems.

We estimate that an all-refillable system would require capital investment of $1.9 million for new bottle float, $3 million for two new returnable filling lines to run at 860 fillings per minute and possibly new warehouse space costing $2 million for Minnesota brewers. This total of about $7 million is not expected to put an insurmountable burden on any of the Minnesota brewers (see Appendix E). Only the new bottle filling lines represent a replacement of old, but functional,

capital. The value of the replaced capital is unlikely to be as high as the replacing capital. Estimating the value of the old capital at $2 million and applying a real rate of discount of 10% yields an annually occurring changeover charge of $200,000 for the beer industry.

New capital required in the soft drink industry is estimated to be $7 million for bottle float, $6 million for new bottle lines capable of filling a total of 3,400 fillings per minute, and possibly $6 million for more warehouse space. Some intra-industry changes may result from these requirements. It will probably lead to greater concentration as small bottlers do not have the volume to justify new high speed bottle filling lines which are available. As with beer, the capital write-offs which represent social costs that do not show up in the price system are for the filling lines. Again estimating the value of the replaced capital at two-thirds of the new gives a cost of $4 million and an annual charge of $400,000. Thus, the total annual cost to be charged against the all-refillable system is $600,000.

Beer wholesalers would also be impacted to the degree that they would have to make additional investments in trucks and warehouse. Here, again, these costs will show up in prices and should not be counted twice. We doubt that this investment would cause financial crisis for Minnesota beer wholesalers.

Both proponents and opponents of the refillable system have seized the issue of the decline in the number of breweries. One argument is that the all-refillable system will benefit local brewers at the expense of out-of-state brewers because of the costs of shipping the empties back. The other argument is that the greater financial

power of the large national brewers will allow them to make the adjustment to all-refillables with greater ease than the locals, some of which would be unable to meet the capital requirements of the changeover. Our evaluation of the situation leads us to conclude that the impacts would tend to adversely affect the relative positions of the local firms over the nationals. A ban on the production and/or filling of disposable containers would be disastrous to local firms as it would put them in an untenable position in out-of-state markets. However, we don't believe that the effects of either a statewide ban on disposable containers or a mandatory deposit system would do more than reinforce existing trends toward concentration - that is, it may serve to speed up concentration which would have occurred anyway, but would probably not force out of business any firm which would have had good long-term prospects otherwise.

The greatest adverse effects of an all-refillable system would occur in the beverage container industry. There are presently four companies producing beverage cans and two companies producing beverage bottles in Minnesota.

Table 6.1 estimates the final destination of metal cans fabricated in Minnesota. As shown, we estimate that 476 million cans are filled in Minnesota for export and another 7 million are sold directly out of state, a total of 57% sold out of state. Similar calculation for the bottle industry yields an estimate of between 74 % - 86% of Minnesota's bottle production sold out of state.

TABLE 6.1

MINNESOTA CAN PRODUCTION[1]

(In Millions)

Number of Cans Produced in Minnesota and Filled for Minnesota Consumption:		
	Beer 93	
	Soft Drinks 290	
	Total ----------	383
Number of Cans Produced in Minnesota and Filled for Export:		
	Beer 372	
	Soft Drinks 104	
	Total ----------	476
Total Minnesota Can Fillings:		859
Allowance for Loss, Breakage, Inventory Build-Up and Error[2]:		26
Minnesota Can Sales to Out-of-State Fillers:		7
Total Minnesota Can Output:		892
Percent of Minnesota Can Output Consumed in Minnesota:		43%

[1] Source: Survey data

[2] This figure is the difference between can industry sales data and fillings industry data. Unreported imports and exports may also be included.

An all-refillable system would require replacement of the one-trip production with refillable production. Because refillable bottles made an estimated 4 to 12 trips rather than one, enough excess capacity would be generated in the bottle industry to supply returnables with minimal capital investment. We expect that at least one can plant and a satellite facility would close down as a result of an all-refillable system. Other facilities probably have enough non-beverage and out-of-state sales to remain in operation. The impact on the Minnesota container industry would be much greater for a national ban than for state action due to the out-of-state sales.

Retailers would be expected to experience a certain amount of inconvenience and higher operating costs due to an all-refillable system. The returns would entail handling and storage costs as well as separating problems. Most retail stores, specifically grocery and liquor stores, have not been designed to accommodate the number of returns that an all-refillable system would entail. Some investment in additional warehouse space may be required. All of this would mean higher costs which would be passed on, at least in part, to consumers. Soft drinks in returnable bottles are presently being carried by most major outlets and only a quantitative increase would be expected to occur. Beer in refillable bottles is carried predominantly by liquor stores. The refillable bottle in use in Minnesota is the tall, thin "export" 12-ounce bottle. This is the traditional bottle in this part of the country and is easily cleaned and handled by the brewer, stacks well in coolers and is convenient for on-sale consumption, but is a bulky container for retail handling. The more nearly round "stubby" bottle is likely to be preferred by the retailer and the "convenience" consumer. Pressure will probably arise for the

introduction of a more convenient refillable bottle in Minnesota if such regulatory legislation is adopted. This may lead to some unforeseen sorting problems at the retail level, as it is also likely that all-refillable beer will no longer be sold strictly in the heavy-duty reusable case.

If a mandatory deposit system is legislated rather than a ban on disposable containers, cans would also be permitted. (It is unlikely that one-trip bottles would be used in either case except for a very small volume of foreign beer.) In this case, we feel that retail outlets will be able to accommodate can returns and perhaps even prefer them to bottles. Vending machines would continue to vend cans under the mandatory deposit system, as has happened in Oregon. Under either system, sanitation will have to be controlled but would not appear to be a great problem, despite retailer and distributor complaints about cockroaches. The stores have to handle returns now; more returns may bring a quantitative increase in sanitation problems, but not a qualitative change.

CHAPTER 7: LABOR

According to generally accepted economic theory, the number of jobs in an economy is determined by the amount of aggregate demand in the total economy, the average wage rate is determined by the capital-labor ratio, and the industry-by-industry location of jobs is constantly changing to accommodate changes in the composition of aggregate demand. Aggregate demand is the total demand for goods and services by the consumption, investments and government sectors of the economy. It is susceptible to changes in consumers' taste between spending and saving, changes in the interest rate and money supply, and changes in government taxation and expenditure policy, but it is generally not susceptible to changes in the composition of output. This means that a full employment economy, or any given level of underemployment, is consistent with either disposable beverage containers or an all-refillable beverage container system. A change in taste away from one good toward another, or a legislated change in the beverage delivery system, would cause jobs to be lost in some sectors of the economy and gained in others but with little, if any, effect on the total number of jobs in the economy in the long run. It is possible that there would be some temporary effect on aggregate demand, but whether this effect would be a decrease caused by the lay-offs and shut-downs involved in the changeover or an increase due to new hirings and new opportunities is impossible to predict. In summary, the total number of jobs in the economy is determined by aggregate demand and not by the demand for a single given product. Changes in demand occur naturally and it is economically beneficial for industry and employment to adjust to them.

There are, however, impacts on individual workers which can cause them to bear an inequitable share of the cost of changing product composition. This would be the case in a changeover from disposable beverage containers to an all-refillable system. If throwaway beverage containers are eliminated, the number of jobs in the beverage containerization industries will decrease. A large and sudden decrease in these jobs will force people out of jobs they would otherwise have continued to hold into the job market with associated unemployment and job search costs. Also involved is the possible loss of such fringe benefits as non-vested pension rights. The costs to individual workers are a changeover cost relevant to the beverage container system. It has been argued that while jobs are being eliminated by the beverage container regulation, offsetting new jobs in handling and retailing are being created. While it is true that there may be new jobs directly connected to the beverage regulations, it is specious to argue that they are offsetting. They would be offsetting only if they eliminate the unemployment, job search and fringe benefit losses of the displaced beverage container workers. This seems unlikely, as the beverage container workers' locations, skills and wage levels are not likely to be congruent with the newly created jobs. It is also noted again that if the beverage container regulation requires many new workers in beverage distribution, it will result in higher prices of beverages, which, if extreme, will result in lower demand and fewer jobs somewhere in the economy, the total number of jobs being determined by total aggregate demand. It is important to note also that the economic costs involved are not directly related to the number of jobs lost, but to the number of workers who are forced out of jobs they would otherwise have

continued to hold. Also of possible interest would be the effect of beverage container legislation on average wage rates, the location of jobs and the total number of jobs within Minnesota and the number of unionized jobs. However, for a change of the magnitude proposed, the effects in these areas are probably insignificantly small. As far as wage rates are concerned, the movement away from resource intensive delivery to more labor intensive delivery system would tend to lower the capital-labor ratio and thus reduce average wages, but by an insignificantly small and unpredictable amount. Minnesota has a large beverage container industry where most of the job losses would occur, but also most of the jobs created in the delivery system would be local jobs in the State of Minnesota. Losses in such unions as the Steelworkers would probably be offset by gains in unions such as the Teamsters. Thus, the focus of this analysis is the evaluation of the costs of the proposed beverage container system changeover imposed on displaced workers.

Table 7.1 lists the employment in impacted industries, along with our estimates of the possible job losses and the number of employees displaced from jobs. In the brewing and soft drink bottling industries, we foresee no net reduction in the number of jobs; however, intra-industry changes are expected to cause 87 employees to be dislocated, mainly in the soft drink industry where some can filling plants may be forced to shut down.

In the metal can fabricating industry, we estimate an expected 209 job losses and 190 displaced employees. A crucial part of this estimate is the result of Table 6.1 that only 43% of the cans produced in Minnesota are consumed in Minnesota due largely to the

TABLE 7.1

EXPECTED JOB LOSSES
RESULTING FROM AN ALL REFILLABLE BEVERAGE CONTAINER SYSTEM IN MINNESOTA[1]

	Estimated Number of Full-Time Jobs Low	High	Average Wage[2]	Expected Reduction in Jobs[3]	Range of Possible Job Loss[4]	Expected Number of Employee Dislocation[5]
Beer Brewing & Distributing	2,586	3,100	5.52	0	--	15
Soft Drink Bottling & Distributing	2,200	2,494	4.53	0	0-71	72
Metal Can Fabricating	1,062	1,322	5.71	209	142-670	190
Glass Container Manufacture	669	765	4.71	97	46-381	76
Other	--	--		Adjusted Input-Output Data:		35
			TOTALS:	341	c.(188-1,157)	388

[1] See Appendix E for derivation.

[2] Includes all personnel

[3] Expected value of the reduction in full-time jobs;estimated by summing the possible jobs lost times the probabilities of the losses occurring.

[4] Range approximates a 95% confidence interval, except for total which approximates 99% confidence.

[5] Expected jobs lost adjusted for normal quits and layoffs that would have occurred within one year, and for intra-industry relocations.

number of soft drink and beer fillings that are exported. We are assuming that the exports would continue. (A national or regional ban on cans would have a much more severe effect on the Minnesota can industry.)

The glass container manufacturing industry is expected to lose 97 jobs, with 76 workers displaced. A crucial part of this estimate is the same sort of calculation as for cans. We estimate that only 14-25% of the beverage bottles produced in Minnesota are consumed here.

Other miscellaneous jobs losses are expected to total 35. Thus, the total loss of jobs is estimated to be 341 with 388 workers being displaced. Ranges of the estimates are also included in the table.

These expected job losses represent an investment cost in the changeover to an all-refillable system. Just as with the capital cost discussed in Chapter 6, they are not a part of the comparison of the present system with an all-refillable system, but are an investment in the change from which it would be required that a compensating rate of return be generated. This investment cost can be estimated using our expected number of 388 displaced workers. Maximum unemployment compensation per worker would be $85/week times 26 weeks, or $2,210. The amount paid out of the unemployment compensation fund is a cost to society regardless of the incidence of the unemployment tax and is, in effect, paying the worker for being impacted by the changeover to all refillables. A worker unemployed for this amount of time would have other costs as well - loss of income (unemployment compensation is, at most, half his

weekly wage), job search costs, loss of fringe benefits, and possible relocation costs. An additional $1,000 in costs for full term unemployment is not unreasonable. Using an expected term of unemployment benefits of 16.6 weeks (see Appendix E), we find the cost per worker to be $2,054, or $797,000 for 388 workers, of which $1,414 per worker, or $549,000, would be paid by unemployment compensation.

Since the workers themselves are not responsible for their job displacement, and since they are being asked to bear part of the cost of the changeover which benefits all of society, an equitable adjustment of their costs would not be out of order. Such an adjustment could be made through a State program, perhaps by giving supplemental unemployment compensation or a lump-sum grant.

As we stated before, itemizing job gains does not allow us to calculate the effect on the number of jobs in the economy, nor are these job gains offsetting to the job losses we have just discussed. However, there is legitimate interest in the number of identifiable jobs that would be created in the refillable distribution system in order to estimate the effect on prices and labor-capital intensities of the distribution system and possibly as an aid to locating new job opportunities. Thus, we have made estimates of possible job gains in the returnable beverage container system. These estimates are contained in Table 7.2 The first column are the estimates done by Hugh Folk. Folk's estimates are based on national averages for beer and soft drink containerization and contain other discrepancies from the Minnesota situation as explained in the footnotes. We have redone the calculations using the best data available to us. Our results

TABLE 7.2 IDENTIFIABLE JOB OPPORTUNITIES CREATED BY AN ALL REFILLABLE SYSTEM

Industry	Folk[1]	Our Unadjusted Figures	Figures Adjusted for 10% Decline in Soft Drink Sales
Retail			
Beer	476	161	161
Soft Drink	195	192	103
Subtotal:	671 [2]	353 [2]	264
Beer			
Bottling	498 [3]	0 [3]	0
Distributing	483 [4]	216 [4,5]	216 [5]
Subtotal:	981	216	216
Soft Drink			
Bottling	327 [3]	222 [3]	117
Distributing	348 [4]	264 [4]	90
Subtotal:	675	486	207
TOTALS:	2,327	1,055	687

[1] Folk uses estimates of Minnesota beer and soft drink consumption based on national averages which are different and probably less accurate than the ones developed here.

[2] Uses same estimate of 2.8335 man hours/1,000 bottles (from a California supermarket study) that Research Triangle uses, but neglects to multiply by their estimate of sales in outlets having enough sales volume to require extra help. We use Research Triangle estimates of 47% for soft drink and 42% for beer.

[3] Folk uses estimates made by Robert H. Koch for Brewers Digest, January, 1970, of the cost of packaging the various containers to estimate labor requirements. He converts labor costs to man hours by dividing by $4.00/hr. We find this to be too low an estimate of payroll cost (wages + benefits + expenses) and use $6.05/hr. as estimated from our survey data and inputed back to 1970 using a 10% growth rate. He also assumes that all can lines in Minnesota fill at 1,500/min., while there are none this fast in the state. Beer lines average less than 800/min. Also, non-returnable bottles are assumed to be filled at 680/min., rather than an average of 425/min. for beer and about half this for soft drinks and returnable bottles at 360/min., rather than the Minnesota average of 500/min. for beer and probably about 200/min. for soft drinks. Thus, our estimates of labor requirements are (in man hours/case): beer - .0366 in returnables; .0509 in non-returnables; and .0224 in cans; soft drinks - .0915 in bottles and .0273 in cans. The soft drink estimates are for existing equipment. Filling of all soft drinks in returnable containers would require new equipment, at least half of which would run as fast as the beer lines. Thus, new fillings of soft drinks in returnables were calculated using .0641 man hours/case.

[4] Our estimates are done in the same manner as Folk's, using his Table 4 (see Appendix E) to calculate distribution labor requirements. Differences reflect differences in data on Minnesota fillings (which are less reliant on non-returnable bottles and cans than national data) and, possibly, the fact that soft drink fillings are converted from 12 oz. cans to 16 oz. bottles.

[5] Adjusted for information from Oregon and Minnesota beer wholesaling.

are presented in the second and third columns. The unadjusted figures give a total of 1,055 new jobs in the beverage delivery system for the same volume of beverage sales. For a 10% decline in soft drink sales, the total is 687 new jobs. We expect the actual total to be somewhere between these two figures. The jobs in the retail industry will be low paying and mostly part-time and should provide job opportunities mainly to teenagers. The distributing jobs will be desirable, well paying Teamsters Union employment, and the bottling jobs will generally be desirable full time jobs. The total of these jobs is 702 for the present volume of sales, 423 for a 10% decline in soft drink sales.

In comparing beverage container systems, the relevant annual charge is the required return on the changeover cost of $797,000 for the all-refillable system. At 10%, this amounts to about $80,000 annually.

For a mandatory deposit system with cans at 40% of their present volume, we estimate that displaced workers would be expected to be 36 fewer in soft drink, 76 fewer in can fabricating and 4 greater in bottle manufacture, for a total of 280. The changeover cost in this case would be $575,120, of which $395,920 would be paid by unemployment compensation, or an annual charge of $57,500 at 10%. Identifiable job opportunities (and we stress again that this is not an estimate of the gross change in jobs) would also be reduced. There would be 30% less changeover to refillable bottles. We believe that cans would be handled as they are in Oregon, with little retail handling, thus reducing the increase in retail handling by 25% to between 198 and 265, depending upon what happens to sales. Beer

distributing requirements would be reduced to 140 new jobs. New jobs in bottling soft drink are caused solely by the changeover of cans and would thus be reduced to 133 for no change in volume to 28 for a 10% decrease. Increases in soft drink distributing would decline to 177 for no decrease to 3 for a 10% decrease in sales. Thus, under a mandatory deposit system with 40% of the cans remaining, identifiable new job opportunities would range between 369 and 715, with the range of permanent full time jobs between 171 and 450.

CHAPTER 8: CONSUMER EFFECTS

The arguments both for and against the refillable system ultimately rest on their effect on consumers ("citizens" in the terminology of the days before the rise of the "New Industrial State"). The importance of mineral resource savings, litter reduction, solid waste effects, price increases, convenience losses and all other differences between the two systems depend on the values placed on them by the people of the State of Minnesota. Our estimates of these values are only that - estimates. In a hypothetical economy with a perfectly functioning market structure, this kind of analysis would be unnecessary because the answers to the problems of what to produce and how to produce it are solved automatically. In preceding chapters, we have discussed areas where the market process breaks down due to factors which are external to the existing market structure. In this chapter, we discuss some additional aspects of the alternative beverage container systems relating to effects they may have on consumers which do not show up or are not solved by the automatic computations of the market.

Market complications can arise even where there exist no externalities of the "pollution" type we have discussed earlier, especially in a highly specialized, capital intensive economy like that of the United States. This is the case in solid waste collection, where a group decision is necessary to reduce individual rates. Since collection costs are determined more by the number of stops and the distance between them and the frequency of collections than by the weight of solid waste at each collection point, and since the cost of measuring the weight or volume of each individual's solid waste would be more costly than any probable reduction in collection fees to

individuals, individual collection costs are determined by the total disposal practices of the community, and no reasonable alternative exists to change this practice. An individual wishing to reduce his collection costs has few options, one being self disposal, which would generally entail higher personal costs. He cannot simply reduce his solid waste output to reduce his collection costs. This is especially true of renters.

A group decision is necessary to reduce solid waste collection costs. An individual preferring reduced solid waste for reduced collection costs would have to band together with many people along his collection route in order to get total collections reduced enough to produce a cost reduction for himself. This is likely to be true even in a perfectly competitive collection market where market pressure forces costs down to the minimum level of profitability for the given level of collections and solid waste. Thus, consumers may prefer an all-refillable system as a group decision to reduce solid waste, even though individually they continue to purchase disposable containers.

There are, in fact, several reasons why a person who currently purchases disposable containers may support legislating an all-refillable system. One, as just explained, is to get a reduction in his solid waste collection costs by forcing people on his collection route to reduce their solid waste generation. (Referring to Chapter 5, it is evident that the reduction in collection costs would not be great, but could amount to more than the solid waste disposal costs.) A person buying disposables may be willing to give them up in order to get a reduction in litter or mineral resource use. A person may wish that soft drinks were less available, especially to his children, for

dental or health reasons. The fact that a person chooses on an individual basis to buy beverages in disposable containers when refillables are available indicates that he values the convenience of those containers but, due to the fact that his not buying those containers will not reduce his solid waste costs, will not reduce the litter costs he bears, and will not reduce his costs of mineral resource usage and the associated external costs, his purchase does not indicate that he "demands" disposable containers, especially when the possibility of group action exists. To get the convenience requires only private action, but to not pay the associated costs requires group action the individual pays the group costs whether or not he buys the disposable containers. Thus, faced with only the private costs and benefits, the purchase of disposable containers is frequently the result.

The loss of convenience is an obvious cost of the refillable system. Often people don't choose this convenience, preferring the money saving of refillable containers or out of personal conviction or social pressure not to contribute to group costs. For other people or other situations (obviously, the value of the convenience changes according to the situation and the person who buys refillables at one time may choose disposables at another), the value of convenience outweighs the monetary savings offered by refillables and he purchases the disposable container despite group costs which, together with the money saving, are to him greater than the value of the convenience. For some people, the value of the convenience is greater than the total of private and group costs, and disposables will be purchased and an all-refillable system opposed. All of these persons will lose

something from the legislation of an all-refillable system, as well as gain something. Whether the gain or the loss has greater value to the individual depends on his values. All will share to some degree in the group benefits, but different individuals will place different values on those benefits. Persons buying a specific refillable package at present will suffer a loss as the price of that beverage rises due to the additional costs of having all refillables. Persons presently purchasing disposables under circumstances related above will suffer the loss of the convenience of those packages.

There is, also, another group of circumstances to consider in the convenience problem and that is persons in circumstances where the market situation dictates their purchase of the disposable containers (i.e., the circumstances and motivations discussed thus far are not complete). These circumstances arise from three possibilities: (1) only disposable containers are available at the store where the consumer makes the purchase; (2) only disposable containers are available in the size which the consumer prefers; and (3) only disposable containers are available in the number the consumer desires. These are all aberrations of the perfect competition model of an economy and are caused by the realities of locational monopoly and inventorying-marketing costs. What these realities mean is basically that some retailers don't care to handle returns (of either beer bottles, soft drink bottles or both) or don't care to market and inventory a wide variety of container sizes and packages, for whatever reason, and are in a market position such that they don't have to. This is especially likely to be true of specialty stores that stay open after regular hours, liquor stores carrying only a small

selection of mix as a convenience to their customers, stores isolated because of location, and vending machine sales. In case (1), where the consumer finds refillables unavailable, he has the choice of looking elsewhere, foregoing the purchase or purchasing the disposables. (Some persons in this situation would have bought the disposables anyway; they are included in the earlier discussion.) The persons who would not have purchased returnables anyway may benefit from an all-refillable system, depending upon the effect of the price rise on refillables and its potential effect on their decision between the containers. This same argument can be applied to point (2) where, for example, the consumer desires a twelve-ounce container and it is available only in the disposable. Point (3) introduces an additional problem. Refillable beer is generally sold only in 24 bottle carriers or else loose. Many times, persons lack the liquidity, transportation, or storage space to justify a purchase of 24 bottles. Rather than tolerate the extra inconvenience of handling the loose bottles and making a special and unusual request of the retailer, these persons generally end up with disposables. This situation applies to a lesser degeree to soft drink sales as well. An all-refillable (or even mandatory deposit) system could exacerbate this problem by eliminating the smaller sized packages (by package size, we refer to the number of containers in the carrier), but this is unlikely to be the case. It is predictable that new packaging would appear for refillable bottles (notably, for beer). It is possible that were a refillable law passed, a more compact refillable bottle (e.g., a twelve-ounce stubby) would enter the market in response to consumer and retailer desire for a container more

easily stored and handled in smaller packages. The availability of beverages in smaller refillable packages would be a gain to persons desiring to purchase refillables but who are presently constrained by considerations of package size.

Consumer saving has been raised as an issue by some people, including Hugh Folk in his study of the beverage container problem. Expressed in terms of changes in dollar expenditures on beverages, "consumer saving" is not in itself a real issue. As shown in the preceding analysis, beverage prices are expected with a high degree of certainty to rise for people who have been making their purchases in refillable containers. For people making their purchases in disposable containers, the money price may or may not fall, but this is only part of the real price. As shown, there are many possible categories of individual cost and benefit in terms of size, convenience, social costs and tastes associated with the change of disposable to refillable beverage containers for people presently consuming the disposables. Whether or not the consumer saving in terms of money price times quantity occurs or what its level is gives us very little or no information as to which container system is preferred. It does not provide individuals with information they need to determine whether they wish to support a group decision requiring an all-refillable system or mandatory deposit system. Nor does it accurately portray a benefit or cost of either system. The dollar saving simply reflects a part of the change in effective price. Based on our estimates of beverage volumes and present array of containers, these "consumer savings" will be zero for a price increase on refillables of 15%, positive for a price change of less than 15%, and negative for a price change of more than 15%, for an equal volume of sales.

For our estimated price increase of 12% for beer and 8% for soft drinks, these "consumer savings" would be approximately $15.5 million for an equal volume of sales, $25.6 million for a 10% drop in soft drink sales, not subtracting the value of the convenience lost in either case.

The all-refillable system or mandatory deposits would require that consumers not only pay for the beverage, but put up cash deposits. For a system requiring deposits on all beverage containers, this would require consumers to have on deposit an estimated average of an additional $1,030,000, given the same volume of sales as at present and an average consumer turnover time of the bottles of one week for soft drinks and two weeks for beer. The value of this amount of liquidity at present rates of interest paid on savings accounts is $53,000. This is an additional cost of a deposit system.

Mandatory refilling would probably have the effect of reducing market selection by placing great difficulties on the marketing of foreign brands of beer. Mandatory deposits are not likely to have so great an effect on the variety of beverages. Soft drinks are nearly all bottled locally, so these would be little problem as far as transportation is concerned. Some retailers might carry fewer brands, but this is not seen as likely to occur widely. It evidently did not happen to a great degree in Oregon. The warehouse brands and house labels could become less available, but it appears that their selection is a matter of cost rather than taste. We do not believe that the reduction of market selections of soft drinks is an issue.

Even with mandatory deposits instead of a ban on disposables, the variety of beer available would probably not be as great in the future as otherwise and smaller volume beer that would be sold in the State would probably be somewhat less available. Oregon reports 24 brands of beer marketing in the state through September, 1973, as compared to 33 through September, 1972, and the same number (33) for all of 1972. The reduction came mostly in small volume foreign and out of state beer. It is unlikely that any major brands would not be present and available in the market. Large liquor stores would probably carry close to the same variety as at present. Smaller operations, grocery stores, etc., would be more likely to carry a reduced variety; however, the amount of variety carried in these outlets is not great now. Thus, we foresee a small reduction in variety that would be significant only to drinkers of specialty beers.

Presently, the beer industry pays a special excise tax to the State of Minnesota of $4.00/barrel for strong beer and $2.00/barrel for 3.2% beer. This tax amounted to $7.6 million in 1972. In addition, a federal tax of $9.00/barrel is paid. The loss of some of this tax revenue has been raised as a possible issue. The amount of this tax revenue depends only on the volume of beer, not on its containerization. If the refillable or mandatory deposit system causes less beer to be sold than would otherwise have been sold, then there would be a reduction in this tax. The worst effect on beer volume that we would expect from the all-refillable or mandatory deposit system would amount to no more than four percent of sales, or around $300,000 per year in taxes, and is more likely to do no more than reduce the rate of growth of consumption. Therefore, the effect on taxes is likely to be only a slowdown in the rate of growth in beer

tax revenues and not an actual reduction. Taxes per gallon on beer are 12.9 cents for strong beer and 6.45 cents for 3.2% beer, while taxes for other alcoholic beverages are $.27 per gallon for wine under 14% alcohol, $.79 per gallon for wine over 14% alcohol, and $4.39 per gallon of distilled spirits. If a reduction in beer consumption occurs due to a switch to other alcoholic beverages, the State is likely to receive more revenues due to the higher taxes per gallon on other alcoholic beverages. Thus, we are convinced that the tax issue should not be a consideration in the beverage container decision.

Another consideration which may be an important aspect of individual valuation of this problem is its relationship to the whole environmentalist movement. This movement has many facets and areas of concern and has had widespread support despite making slow and uncertain headway in achieving its goals. The beverage container project is not a major area of importance in itself to knowledgeable environmentalists, but it has been an easily understood rallying point for the movement. The ramifications for this movement of success or failure of the beverage container bill is something to consider.

Along this same tack is the possibility of more states and/or the federal government passing similar legislation. Since many of the problems addressed by the bill cross state lines, the possibility of promoting further legislation out of state is another effect to consider. The fact that any mineral resource saving will go into the national resource pool rather than the State's and the likelihood that litter and solid waste disposal externalities out of state cause

disutility to Minnesotans makes the benefits of regional or national legislation greater to Minnesota than would be a state law. Thus, for people on the margin of the decision about the bill in Minnesota, the effect of Minnesota passing the bill or other states and the federal government is a point to consider.

Also to be considered is the effect of the ban on the Occupational Training Center (OTC) located in St. Paul, which runs Metro Recycling as part of their job training program. OTC is one of the finest operations of its kind in the United States. It is run as a non-profit, largely self-financing corporation and teaches job skills and habits to its mentally or physically handicapped client-employees which allows them to establish non-institutional lives of their own. Metro Recycling has become a fruitful part of their organization, providing training jobs for handicapped individuals and generating income to subsidize other programs. Plans have been discussed to expand this recycling supported operation to other parts of the State. An all-refillable system would be a setback to the OTC program, since all-steel cans are their most profitable and easily marketed item. Since this program is picking up what is essentially a community responsibility, serious thought must be given to this effect. The evaluation of the magnitude and direction of these last three points we leave to the reader.

In summary, the beverage container decision is a group decision which is appropriately considered by the political process. In theory, it should be made by weighing each citizen's preference of beverage container systems and the intensity of that preference. This is the job of the political process. It is the job of industry to respond

to consumer preferences over possible alternatives. We have found both beverage container systems to be feasible and have investigated the difference between them. The decision should be made on the basis of the aggregate taste for these differences.

The most extreme proposal was one to ban all sales, manufacture, and filling of disposable beverage containers in the State of Minnesota. This proposal would have been unfair to Minnesota businesses competing out of state, disastrous to them, and probably unconstitutional on the grounds of the ends not following from the means. (Banning exports of disposable beverages would not have any identifiable benefits to Minnesota.) This proposal has been dropped from serious consideration.

A ban on the sale of disposable beverage containers has been given serious consideration. This bill would have established an all-refillable beverage system in Minnesota with the expected results we have evaluated thus far in this report. However, the legislative prospect of this bill is negligible due to a compromise position having been accepted by the proponents. The compromise bill is mandatory deposit legislation similar to that adopted in Oregon and Vermont.

The mandatory deposit system requires that a deposit be collected on the containers of all carbonated beverages sold. It does not specifically regulate the kinds of containers used, because cans would still be allowed as long as a deposit was charged on them and refunded upon their return. (See Appendix G for the Minnesota Proposal, S.F. 634.) This bill would have somewhat different effects than a ban on non-refillable containers. Some of the effects would depend upon the deposit level. The proposed legislation in the State of Minnesota prescribes a minimum 5¢ deposit, with higher deposits on larger containers. We will

consider this measure.

If mandatory deposits resulted in an all-refillable system, the analysis would be the same for each. The possible differences result from the possibility of the continued use of one-trip containers. We expect that a mandatory deposit system would practically eliminate one-trip bottles. The only exception would be for imported beer. With a mandatory deposit, the one-trip bottle would offer no significant advantage over the refillable bottle and would be more expensive. Cans, on the other hand, retain some of their advantages - e.g., they are considerably lighter and unbreakable. Professor Kaufman of the Economics Department of the University of Oregon in Eugene predicted that cans would be more desirable under a deposit system than before and on this basis expected that can sales would increase in Oregon due to the "bottle bill". That this prediction did not come true is, perhaps, an indication of consumer preference for the refillable system. However much of the basis of his analysis is still valid. The weight of the cans makes them easier to return. This is especially true where they must be carried by hand. Fred McRae, of Safeway Stores, District Manager in Portland, Oregon, expressed to us his feeling that cans would be easier to handle than bottles at the retail level if the sorting problem could be solved. Blitz-Weinhard Brewery reports that at present cans represent 6 - 6-1/2% of their package sales in Oregon and that this figure may rise in the future. Other reports indicate that cans now have about 5% of the Oregon market, approximately one-fifth of their former level. One source

reported can sales for the year at about 45 percent of his previous volume. In Minnesota, we expect cans would retain some share of the market. The absence of a ban on pull tabs from the Minnesota proposal will make the immediate impact on cans less severe than it was in Oregon. Costly replacements and changeover of vending machines should not take place in Minnesota as they did in some parts of Oregon. The warehouse marketing of house brand soft drinks would be expected to continue. If a procedure to simplify or eliminate sorting of returned cans is developed, cans could be expected to maintain a substantial share of the market.

Table 9.1 summarizes one set of estimates for the all-refillable system from the previous chapters and compares these values to a mandatory deposit system which eliminates all of the non-refillable bottles and 60% of the cans. It might be considered a maximum likelihood estimate of the effects of an all-refillable system or a mandatory deposit system. However, the values are only suggested values and some of the most important effects are non-quantifiable. We estimate that under a mandatory deposit system, the value of the resource saving would be about 8% less, the value of litter reduction slightly greater, and the value of solid waste saving about the same as compared to an all-refillable system. Net quantifiable public costs would be reduced by 32% under a mandatory deposit system, and the loss of convenience would be reduced. Jobs lost would be reduced from 388 for the all-refillable system to 280 for the mandatory deposit system. A mandatory deposit system with fewer cans would have costs and benefit estimates between those values given in Table 9.1. With more cans, the changes between systems would be greater.

TABLE 9.1 COMPARISON OF ALL-REFILLABLE SYSTEM WITH MANDATORY DEPOSIT SYSTEM

	QUANTIFIABLE PUBLIC BENEFITS	
	ALL-REFILLABLE SYSTEM	MANDATORY DEPOSITS
Resource Saving	$2.4 million worth of energy, with 12.5% external cost of $298,000. Other resources saved total $9.6 million, with $480 thousand in externalities at 5% of cost. Range of estimates: +25% -66% Estimated value to Minnesota: $15,560 at 2% of national saving of $778,000 externalities. (NOTE: Only externalities should be added here, since other resource savings are included in prices.)	$2.2 million worth of energy, with 12.5% external cost of $274,000. Other resources saved total $8.8 million, with $440thousand in externalities. Extimated value to Minnesota: $14,280 at 2% of national saving of $716,000 in externalities.
Litter	30% reduction worth more than $540-860,000.	30% reduction worth more than $540-860,000. (Perhaps greater benefits because littered cans are easier to pick up.)
Solid Waste	Disposal: save $200,000 in costs plus less than $200,000 externalities - estimate $100,000 for total of $300,000.	Unchanged - estimated saving of $300,000.
Prices and Consumer Expenditures	Average prices higher for beer; lower for soft drinks; possibly lower expenditures of $15.5 million.	Average prices higher than all-refillables; possibly lower expenditures of $14.3 million.

TABLE 9.1 (cont'd.)

	QUANTIFIABLE PUBLIC BENEFITS (cont'd.)	
	ALL-REFILLABLE SYSTEM	MANDATORY DEPOSITS
TOTAL ANNUAL QUANTIFIED BENEFITS:	More than $854,560 - $1,157,560 for Minnesota plus $762,000 additional national share of resource use externality.	More than $858,000 - $1,117,000 for Minnesota plus $701,000 additional national saving in resource use externality.

	QUANTIFIABLE PUBLIC COSTS	
	ALL-REFILLABLE SYSTEM	MANDATORY DEPOSITS
Capital	Annual loss of $600,000 (investment charge).	Capital loss reduced 40% to $360,000 annually.
Labor	388 displaced workers; cost valued $800,000, or annual charge of $80,000.	280 displacements; cost valued at $575,120, or annual charge of $57,500.
Liquidity	Consumers liquidity cost worth $53,000 annually.	Liquidity costs slightly higher; $55,000.
Consumer Convenience	Value of loss of consumer convenience not quantified.[1]	Loss of consumer convenience not as great.
TOTAL ANNUAL QUANTIFIED CHARGES:	$733,000	$472,500

[1] For example, at a loss of convenience charge of only 1/4¢ per non-returnable filling, this total would be $1,578,000.

It is felt that the impact on the consumer of the deposit system is superior to that of mandated all-refillable system since the can option is retained, but at lower social cost than at present.

Since the passage of beverage container regulation would impose severe costs on a few people to get widespread benefits, some compensation of those who bear the costs might be considered. Possibilities are loan guarantees for some of the affected bottling and brewing industries to finance changeover costs and severance pay and/or increased unemployment benefits for employees who lose jobs and/or special assistance in job search for these people. A reasonable program of this sort could be run for the estimated 280 employees displaced by the mandatory deposit system - we estimate for $179,200 in addition to the $395,920 from normal unemployment compensation. Such funding could be used to locate new jobs, defray moving expenses and compensate for lost benefits. Normal unemployment benefits would amount to $2,210 per person for full term benefits, $1,105 per person for the average length of unemployment benefits. Loan guarantee costs would be small as long as the businesses were successful, but costly if otherwise.

Other proposals that have been given consideration are a ban on aluminum cans, a container tax, and increased litter collection. The proposal to ban aluminum cans is based on the virtual indestructability of aluminum in the environment and on the large electrical input of aluminum. The ban on aluminum alone would have little, almost no, effect on litter. Most beverage container litter is picked up before it decomposes, and is left only at environmental

cost. Under a deposit system, aluminum cans are easier to scavenge than any other container due to their weight and compactability. As an energy conservation measure, the ban on aluminum would reduce electrical consumption very slightly in the Northwest where the aluminum industry is located to take advantage of cheap hydroelectric power. This effect on energy usage would be trivial, due to the small amount of aluminum involved. Minnesota does not use many aluminum cans for beverage containers. Thus, we do not consider a state ban on aluminum cans to be a significant measure.

A 1/4¢ tax on all beverage containers has been recommended as an alternative to mandatory deposit legislation. Such an approach was recommended by Research Triangle Institute. The justification of the tax is that it raises the price of the containers closer to their true social cost. The revenue from such a tax could be used to pay for some of the social damage done by the container. The tax would increase the price of disposable containers relative to refillable containers as the tax on refillables would be spread over many fillings. It is unlikely that a tax of this level would have more than a marginal effect on beverage containerization and its chief aim would be to raise funds for increased litter collection. These would amount to $1.8 million if applied only to Minnesota consumption for the present array of containers. This proposal has merit whether or not a deposit system is adopted, but it is not to be considered as an equivalent bill. It does not allow for possible consumer effects and tastes discussed in Chapter 8 which call for a group decision about beverage containerization. We recommend that the question of container systems be resolved before this kind of legislation is considered.

Increased litter collection would mitigate one (and only one) of the problems associated with beverage containers. It is our view that Minnesota does a good job of collection at the present time, but that additional work could be done in this area. Highway collection costs are presently estimated at $48 per mile for 12,000 miles of state highway. There are an additional 115,000 miles of roadway in the state and significant problems of off the road litter. The $1.8 million raised by a 1/4¢ container tax with the existing container array would cover the cost of picking up litter on 38,000 miles of roadway. An all-refillable system would provide around $285,000 per year from a 1/4¢ tax per container. Oregon has been quite successful with its litter program of combining mandatory deposits with increased litter collection.

A compromise could be made in the deposit bill to include only containers of less than 32 ounces under its jurisdiction. There is little evidence that the quart containers are a major litter problem (although their share could be expected to increase somewhat under this proposal). The use of larger bottles is a resource-conserving measure, since the amount of glass per gallon of beverage in quart soft drink containers is 7.84 lbs. for beer and 4.91 lbs. compared to 8.47 lbs. in 16-ounce soft drink and 7.09 lbs. in 12-ounce beer bottles. Less glass per gallon coupled with fewer closures reduces energy consumption.

BIBLIOGRAPHICAL NOTE

The chief predecessors of this report are The National Economic Impact of a Ban on Non-Refillable Beverage Containers, Jeff Maillie, Midwest Research Institute, June 30, 1971, The Beverage Container Problem, Taylor H. Bingham and Paul F. Mulligan, Research Triangle Institute, prepared for the U.S.E.P.A., September, 1972, "The Employment Effects of a Ban on Non-Returnable Beverage Containers in Minnesota," and "Employment Effects of the Mandatory Deposit Regulation," January, 1972, Hugh Folk, and "System Energy and Recycling: A Study of the Beverage Industry", Bruce Hannon, Center for Advanced Computation, January 5, 1972, revised March 17, 1973.

Of these, the Research Triangle study is the most comprehensive and has been very helpful in preparing this report. The Folk and Hannon reports were also used as a basis for some of this research. The Midwest Research report predates the others and is useful background. Extensive bibliography is provided in each of these reports and is not reproduced here unless used directly, in which case it is noted in the text.

We have also analyzed The Effect of Convenience Packaging on the Malt Beverage Industry, prepared for the United States Brewers Association by Robert S. Weinberg, December, 1971, using the techniques of multiple regression analysis. We are unable to confirm his results, and feel that the statistical problems involved in this kind of analysis overwhelm its usefulness in this situation.

Much of our data has been generated from surveys of the Minnesota beer, soft drink, can and glass container manufacturing and beverage retailing industries which we conducted, and from private discussions and correspondence with a wide range of interested parties representing all sides of the beverage container controversy. We have also visited representative manufacturing and distributing facilities of the industries involved and traveled to the West Coast to investigate the effects of the Oregon mandatory deposit legislation.

The theoretical and subjective evaluation in this report is our own. The employment estimates in Chapter 7 are based on techniques developed by Robert A. Dildine, one of the authors, while doing highway impact analysis reported in Highway Impact Study, Eureka, California, Summary Report, Daniel, Mann, Johnson and Mendenhall, Redwood City, California, January, 1971.

APPENDIX A
ESTIMATES OF BEER AND SOFT DRINK PRODUCTION, CONSUMPTION AND CONTAINERIZATION

These estimates were prepared using data from several sources. The five Minnesota brewers provided us with data on production, percentages of sales in Minnesota and sales out of state, and the container array of these sales. Similar data was provided for about 50 percent of the Minnesota soft drink plants. In addition, we used some national data and information obtained through interviews with distributors.

In calculating the estimates of beer containerization in Minnesota, we used the survey data obtained from the Minnesota brewers to prepare figures on total production and sales in Minnesota and exported. The containerization data provided in the surveys was then used to estimate the volume of these sales by package type- returnable bottles, non-returnable bottles and cans, both steel and aluminum. The volume of imported (i.e., produced outside Minnesota) was taken from data on file with the Minnesota Liquor Control Commission. The packaging array of imported beer was figured using our data on the package array of locally produced beers, interviews with distributors and some national data. The sum of Minnesota production consumed in-state plus the volume of imported beer yields Minnesota consumption by package type. This was then converted into fillings and, consequently, the number of containers used. (We assumed 12 trips per returnable 12 oz. bottle and 4 trips per quart returnable.)

A similar procedure was used to estimate the consumption of soft

drinks and soft drink containers. Survey data was used to estimate Minnesota production and exports of soft drinks. National, regional and local estimates were used to calculate Minnesota consumption of soft drinks. Sources included Carbonated Beverages in the United States American Can Co.; Glass Containers 1972, Glass Containers Manufacturers Institute, and Annual Report, Metal Can Shipments. Imports and exports were assumed to roughly balance in border areas where franchises may overlap state lines. All of this yielded estimates of total production, consumption in Minnesota and net exports. The survey data and national and regional data were then used to estimate the containerization of soft drinks.

As checks on our estimates, we were able to compare our beer production and consumption estimates with data from the Minnesota Liquor Control Commission. Since there is no tax on soft drinks similar to the barrelage tax on beer, no similar check was possible for soft drinks. Our totals for container use by both beer and soft drinks were also checked against container production and use figures provided us by the Minnesota bottle and can manufacturers.

APPENDIX B
PRICES OF BEER AND SOFT DRINKS

We would like to thank the individuals who volunteered their time to assist us in our survey of beverage prices. With their aid, we were able to survey prices of beer and soft drinks in a sample of 46 stores, of which 60 percent were in the metropolitan area and 40 percent outstate. In the metropolitan area, we surveyed stores in both central cities and in some suburbs. Outstate, we surveyed stores in cities and in small towns and a few rural stores. Beer and soft drink prices used in Chapter 2 and in our calculation of possible consumer savings came from this survey.

In our sample, prices of national premium beer ranged from an average of 1.78¢ per ounce for a case of returnable bottles to an average of 2.03¢ per ounce for a six-pack of 12 oz. cans. Local premium beers show about the same averages, 1.73¢ per ounce in a case of returnable bottles to 2.01¢ per ounce in a six-pack of 12 oz. cans. However, there is a considerable variation around these averages. National premium beers ranged from 1.60¢ per ounce to 2.00¢ per ounce (average 1.78¢ per oz.) in cases, and from 1.74¢ per ounce to 2.22¢ per ounce (average 2.03¢ per oz.) in six-packs of cans. Price per ounce may be as much a function of volume per pack as the type of container. Comparisons of prices per ounce in cans and returnable bottles are generally comparisons not only between container types but also between cases and six packs. The few six-packs of returnables we found averaged 11 percent higher per ounce than in cases, or 1.98¢ per ounce compared to 1.78¢ per ounce in cases of returnables and 2.03¢ per ounce in six-packs of cans. The one case of cans we priced cost 1.81¢ per ounce, just slightly above the

average price in cases of returnables. Best buys in terms of price per ounce are returnable quarts at 1.59¢ per ounce and non-returnable quarts at 1.78¢ per ounce.

Premium soft drinks averaged 1.42¢ per ounce in six-packs of 12 ounce cans, with a range of 0.79¢ per ounce to 1.65¢ per ounce. In eight-packs of 16 ounce returnable bottles, prices ranged from 0.77¢ per ounce to 1.52¢ per ounce with an average of 0.94¢ per ounce.

In making price comparisons, it is important to use comparable units. For example, Eileen Claussen*reported that Oregon legislation has resulted in "lower cost to the consumer, as beer in cans sold in March, 1973, at six for $1.58 (including a 30-cent deposit), while certified refillable bottles of beer sold at six for $1.17 (including a 12-cent deposit)." After regaining the deposit, this means that $1.28 was paid for 6-12 oz. cans, or 72 oz., and $1.05 was paid for 6-11 oz. bottles, or 66 oz. Thus, the price per ounce in cans was 1.78¢ or 21.3¢ for a 12 oz. equivalent and in bottles 1.59¢ per ounce or 19.1¢ for a twelve oz. equivalent, savings of only 2.2¢ per twelve ounces, or 13-1/4¢ per 72 oz. six-pack, rather than the 41¢ difference that appeared in the report. In terms of a 66 oz. six-pack, the saving would only be 12-1/3¢. This is not much compensation for the extra handling and it would appear that the effective price was actually higher for the bottles.

An important question is the effect on prices of a change to an all-refillable system. For beer, the average price per ounce for purchases in returnables should increase above the present average because returnables would be offered in six and 12 packs, rather than

* U.S.E.P.A. Office of Solid Waste Programs in "The Oregon Bottle Bill, the First Six Months."

almost always in cases as is true now.

Under an all-refillable system, sellers (either brewer, distributor or retailer) would have higher handling, space and transportation costs than at present for the same volume of sales. Whether there would be an incrase or decrease in the average price for all purchases from the present average depends on whether the average cost of all returnables, not including handling, etc., is enough less than the average for the existing container array to offset the higher handling, space and transportation costs.

We estimate that handling and other costs might increase the cost of delivery (i.e., not including taxes, brewing process, container and packaging) by around 8 percent. The effect of this, along with the increase of 4% per six-pack in average prices due to marketing beer in smaller packs, would mean an increase in the average price of returnables of 8% for soft drink and 12% for beer.

According to our estimates, consumers of beer would save $8.5 million on the same volume if there were no increase in the average price of returnables (except for the markup for smaller packages). If the higher handling costs add an additional 10%, consumers would pay $2.6 million more for the same volume of beer and $13.8 million more for the same volume at a 20% decrease in the price of returnables.

Soft drink purchasers would save $19.1 million at the same volume if there were no increase in the average price of returnables, $13.8 million with a 10 percent increase, and $4.1 million at a 20 percent increase. We expect an increase of around 8 percent.

Total savings on beer and soft drink would be $27.6 million at no increase in the average price of returnables, $11.2 million with a 10% increase, and a loss (i.e., higher total expenditures) of $9.7 million with a 20 percent increase.

Including our estimated increase of 12% for beer and 8% for soft drink results in an increase in the average price of beer of three-tenths of one percent under an all-refillable system, compared to the present average price and existing container array and a reduction of 13 percent in the average price of all soft drink purchases. Total consumer savings under an all-refillable system would then be $15.5 million at the same volumes and $25.6 million if soft drink consumption fell by 10 percent.

APPENDIX C
TRIPPAGE RATES

The trippage rate, or number of times a bottle is reused, is a factor in much of the discussion of the value of the all-returnable system. The more times a bottle is used, the less is the contribution to resource use and solid waste generation with each filling of soft drink or beer. Simple as the concept of trippage seems and as important to the analysis of the beverage delivery system, it is a surprisingly difficult aspect to evaluate. The first problem arises in trying to estimate present trippage rates.

There are actually two relevant aspects of trippage rates. The first is the percent of fillings on returnable bottle lines which have to be made in new bottles. This is the ratio of total fillings per period of time divided by the number of bottles purchased in that period of time. The second concept of trippage is the number of times each individual bottle is, on the average, refilled. In an equilibrium system, these two concepts would be equivalent. However, in a situation where the volume of fillings and the array of containers is constantly changing, they are not the same. For example, see Table C.1.

TABLE C.1

	Period 1	Period 2	Period 3	Period 4
Fillings	1,000	1,000	1,100	1,200
Returns	-	900	900	990
New Bottles	1,000	100	200	220
Fillings/ New Bottles	-	10	5.5	5.5

Imagine that in Period 1, a bottler decides to try a new size bottle,

a 16 oz. bottle, for example. He buys 1,000 new bottles, fills them and sells them. Counting breakage and losses, he gets a 90% rate of return on the bottles. Thus, in Period 2, he has 900 return bottles and has to buy an additional 100 for his 1,000 fillings. Trippage, as calculated by fillings divided by new bottles, is equal to 900 divided by 100, or 10 trips. In Period 3, the new bottles begin to catch on and sales increase to 1,100 fillings. The rate of return is still 90% and 900 bottles are returned from the previous period. 200 new bottles must be purchased, giving an apparent trippage rate of 1,100 divided by 200, or 5.5 trips with a continuing growth trend of 10% per period. Period 4 also yields 5.5 trips as calculated by the fillings ratio. What might be thought of as a true trippage rate as calculated by the rate of return remains at 10 trips throughout all four periods, as only 100 bottles must be purchased new for each individual 1,000 fillings. This data can be calculated from the above example because the periods are clearly defined. This is not the case in dealing with real world data, where the turnover periods themselves are variable. The bottles do not come back uniformly at the same rate of time. As the time rate of return varies, so does this stock of bottles in the system vary. In a study of the returnable bottle versus the throwaway bottle done for the filling industry by Weinberg, the formula presented in Table E.2 was used to estimate trippage rates. It still requies subjective estimate of the length of the turnover time. It is presented as an example of the complexity of the problem and was not used in our estimates. If, as we feel is the case, the length of the turnover time is increasing, then there will be a difference in the trippage rate applicable to resource use (i.e., the number of the bottles going into the system for each filling) and the

trippage rate applicable to resource use (i.e., the number of the bottles going into the system for each filling) and the trippage rate applicable to solid waste generation (i.e., the number of bottles coming out of the system. This is due to the fact that a longer turnover time means an increasingly large stock of bottles in a supporting system. This is more likely to be true for soft drinks, where there is presently more change being made in the returnable container array than in beer, which has been more stable.

TABLE C.2

$$\frac{\left(\frac{\text{Fillings/Year}}{\text{Turnover Periods/Year}}\right) \cdot \text{Length of Turnover Time}}{\left(\frac{\text{Fillings/Year}}{\text{Turnover Periods/Year}}\right) \cdot \text{Growth Rate of Fillings} + \text{New Bottles/Year}} = \text{Trippage Rate}$$

Some trippage figures have been estimated from national sales of returnable bottles versus national sales of crowns or national fillings of beer and soft drinks. We have attempted to estimate trippage levels from this data but have run into the aforementioned problems. Since national sales of fillings in returnable bottles has been sharply declining, the effect demonstrated in Table C.1 is reversed and simple calculations from national data overstate the actual trippage rates by a significant, but unknown, amount.

With all of these problems in mind and relying considerably on our industry contacts, we have estimated that at present, trippage as expressed in terms of the ratio of cost of fillings to new bottles purchased is about 12 trips for beer and about 9 trips for soft drinks. An even more difficult problem is predicting what the trippage rate would be under an all-refillable system. If, under an all-refillable system, people who presently purchase one-trip containers continue

to dispose of the bottles after one use, forfeiting their deposits, and if these bottles were not scavenged, then we would expect trippage rates to fall. On the other hand, the fact that all containers were returnable might lead to a greater rate of return due to the certainty of redemption value and the greater amount of investment in deposits. Thus, rather than attempt to predict the future trippage rate, we have presented a range of trippage rates in our analysis.

APPENDIX D
ENERGY AND RESOURCE CALCULATIONS

The figures for steel, glass and aluminum use per gallon of beverage in Table 3.1 were derived from our measurements of container and closure weights.

Energy calculations for Table 3.1 were calculated in the following manner:

(1) The energy used in fabricating containers was derived from our measurements of the pounds of the glass, steel, or aluminum used per gallon of beverage. Energy requirements per pound of these resources came from the United States Environmental Protection Agency for glass and aluminum. (The figure is 15.3×10^6 BTU's per pound. Hannon used 17.7×10^6 BTU's; a glass container manufacturer quoted us a figure of 11.3×10^6 BTU's.) We used Hannon's estimate for steel, corrected for an error in Table 5 (Hannon used the weight for soft drinks rather than for beer, which accounts for part of the difference between our totals and his).

(2) We used Hannon's figures for crowns and caps. The resource use in crowns per gallon of beverage varies with container size, since the number of crowns necessary per gallon varies with container size.

(3) Transportation costs are based on Hannon's data, adjusted to reflect the average distance in Minnesota for both intermediate shipping and final delivery.

(4) BTU's in bottling came from data supplied by the industry.

(5) Energy use for disposal came from Hannon.

We did not include paper carriers and secondary packaging because of the uncertainty as to the type of secondary packaging in an all-refillable system. Total use could increase or decrease, depending on the relative use of 6,12 or 24 packs and the type and weight of carriers for 6 and 12 packs.

Steps 1-5 yielded the energy use per gallon of beverage figures contained in Table 3.1.

Energy and resource use shown in Table 3.2 were developed from the data in 3.1 and our estimates of containerization under the present system and an all-refillable system.

Table 3.3 was derived from the energy use data in Table 3.2, Hannon's data on percentage fuels use in the present and an all-refillable system, and the following figures on BTU's per unit of fuel: Coal - 10,008 BTU/lb; natural gas - 1,032 BTU/cubic foot; gasoline and diesel - 130,000 BTU/gallon; fuel oil - 5.8 X 10^6 BTU's/barrel. Total energy use in Minnesota for 1970 came from "Energy Use in Minnesota," Environmental Quality Council, May, 1973.

Table 3.4 was derived from data in Tables 3.2 and 3.3 and price data from Business Week for steel and aluminum, industry data for glass, and fuel prices from a sample of recent prices by the Civil Defense Division of the Minnesota Department of Public Safety.

APPENDIX E
INDUSTRY AND EMPLOYMENT DATA

Industry and employment data was obtained from questionnaires sent to all breweries,can plants, glass container plants, and bottlers in Minnesota. A 100% rate of response was obtained from the first three industries and better than 50% responses were obtained from the soft drink industry. Information on employment, output and capital equipment was obtained in this way. These responses were checked for credibility against national averages and ratios from such sources as the Census Bureau, Research Triangle Institute estimates and national data compiled by the various national industry institutes. Personal contact with a cross-section of the firms involved was also established and additional follow-up and clarifying questions were answered. Much of the information received is of a confidential nature, as the firms wish to protect their markets and proprietary techniques, and could only be used in aggregates or subjective evaluations. Since the employment issue is such an important one and because our estimates are substantially different than some others, there follows an industry-by-industry background of the estimates found in Table 7.1.

BEER INDUSTRY

What happens to the two local Minnesota brewers is largely determined by whether ownership is committed to keeping them running. There is a possibility that the bother of an all-refillable system could dissuade present ownership from remaining in business. If the highest bidder for one of these breweries were a regional or national brewer, the locals would be closed down and their product made and

distributed out of the larger brewery. It is also possible that this would happen eventually, regardless of the possible effects of an all-refillable system. Nationally, the number of breweries declined 35% from 220 in 1962 to 147 in 1972. These possible occurrences were weighed in our employment analysis.

Another possibility is that a loss in volume of sales would occur as a result of container regulation that was great enough to cause a decline in employment. As shown in Table 2.4, beer sales nationally have been growing at an average annual rate of about 3.9%, which is a trend which protects against the price effects of an all-refillable system as discussed in Chapter 6, and as seems to have happened in Oregon. Job losses may occur from automation that would not have occurred had their beer grown in sales. On the other hand, there seems to be an equal chance that the all-refillable system might set back some of this automation. Thus, the expected value of the job loss from sales declines is zero.

A final possibility is that one of the large regional brewers might be forced out of business by an all-refillable system. However, the one regional brewer that has been having difficulties sells a large percentage of its sales out of state and appears able to adapt to all refillables in Minnesota without excessive difficulty.

We conclude that no change in the number of jobs in this industry can be expected but that some job dislocations may come from intra-industry adjustment.

GLASS INDUSTRY

Between 14%-26% of Minnesota's glass industry output would be

affected, either directly by loss of sales to Minnesota firms or indirectly by loss of sales to firms outside the state which depend on final consumption in Minnesota for their sales. At best, less than one-third of this loss of volume could be recouped through production of refillable bottles. However, at present, neither glass plant in the state produces significant numbers of refillables and there is doubt that they would capture the increase in this output. The expected loss of 97 jobs was obtained by weighing the possibilities of sales losses out of state, possible gains in refillable volume, and the possibility of one of the plants becoming unprofitable and shutting down. The minimum of the range, a loss of 46 jobs, was estimated by similar technique; the maximum loss would be the result of closing one of the plants. The adjustment for normal layoffs and quits takes account of the fact that while there is a large number of fairly good jobs which are held on a permanent basis, there are also less desirable jobs which have a high turnover rate. Some of both kinds of jobs would be eliminated, but the latter would have less impact on people desiring to retain their jobs in the long run. Also, the seasonal nature of some of the employment was considered. Job displacements were assumed to be randomly distributed over potential quits and layoffs and the resulting figure subtracted from job losses to calculate the expected number of displaced workers.

CAN INDUSTRY

The four Minnesota can producers at six locations were examined in much the same manner as the glass firms. One firm was found to have possible benefits from an all-refillable system, as they produce bottle caps. All other firms would be adversely affected by the loss of can

sales to Minnesota firms. Allowance was made for final product exports by these firms. Job losses were also weighted by the estimated probabilities of forced closures of some of the plants. These probabilities included only the effect on their location of the decrease in beverage container sales and thus are not estimates of the probabilities of the firms leaving the state for other reasons. Quit rates were also estimated from survey data and used to estimate involuntary job displacements. Our total expected loss of 209 jobs is lower than some other estimates due to our inclusion of exports of filled cans from the state. As Table 6.1 indicates, only 43% of Minnesota can production is finally consumed in Minnesota. The minimum job loss is calculated by taking 43% of the beverage can production jobs (= 142) and adjusting for 20% recovery through exports. The higher estimates include plant closings. Long range possibilities might include more can sales out of state, but it is not considered likely that this would happen.

BEER WHOLESALERS

Wholesalers would lose employment only for reduction in beer consumption. These losses would be offset by increased employment necessary to handle the heavier, bulkier returnable cases. We estimate these increased handling costs to be at least 20%, while beer sales are not expected to fall by as much as 10%. Thus, the job gains will more than offset any possible losses in this industry.

SOFT DRINK BOTTLING AND DISTRIBUTION

For the present volume of output, an all-refillable system would be expected to require 486 additional employees (see Table 7.2).

Present employment is estimated to be 2,300. The maximum decline in output which we consider is 20%. Employment under this hypothesis would be 2,786 times 80%, or 2,229, a maximum decline of 71. For a decline in output of 17.4%, there is no job loss and for a decline in output of 10%, the employment would be 2,786 times 90%, or 2,507, a gain of 207 jobs. Some workers could be displaced, nevertheless, due to intra-industry adjustments caused by the closing down of bottlers heavily relying on can sales. We estimate the expected value of this displacement to be 72 workers for an all-refillable system, 36 for a mandatory deposit system that allows cans.

OTHER

Using input-output data, Hugh Folk has estimated job losses in industries which supply inputs to the can and glass industries affected by the ban. Most of the jobs included in that estimate are not in Minnesota. Nor is it likely that they represent potential job displacements. The economy does not work as smoothly, especially for such a small scale change as considered here, as the input-output matrix implies when used in this way. Our evaluation is given below:

INDUSTRY	INPUT-OUTPUT	OUR ESTIMATE
Coal Mining, Petroleum and Other Energy	Loss of 63 Jobs	Would not occur due to dispersion and growth in overall energy demand. (Not located in Minnesota.)
Paper	Loss of 59 Jobs	Paper demand could increase as glass replaces cans, depending upon the final array of secondary packaging and reuse. Even if not, dispersion and demand growth would eliminate most of this loss.

INDUSTRY	INPUT-OUTPUT	OUR ESTIMATE
Transportation	127	Dispersion and demand growth would probably eliminate most of this. We estimate that the observed Minnesota component of this loss would be no greater than 10%.
Stone & Clay	7	Could be 7 in Minnesota because silica sand is supplied locally to the glass industry
Commercial Printing	61	Most of this is accounted for in Minnesota in our can industry estimates. Don't know of any being done otherwise in the state.
Wholesale Trade & Miscellaneous Business Services	148	Some may be lost in the state, but a lot of wholesale purchasing is done by corporate headquarters out of state. Estimate loss at 10%.
Basic Steel	379	No basic steel in state is supplying can manufacture. Dispersion eliminates possible loss in mining.
Other	82	Widely dispersed.
TOTAL	924	35.

We expect no employment effects directly from an all-refillable system on employment in litter collection or solid waste disposal, as we expect the effect of the reduced incidence of littering to be taken as a reduction in average accumulation rather than in reduced

costs, and because the reduction in solid waste will be too small to affect employment due to dispersion, increased solid waste generation and improved disposal.

Estimates of identifiable new job opportunities created by an all-refillable system are contained in Table 7.2. Hugh Folk's Table 4 from his "Employment Effects of a Ban on Non-Returnable Beverage Containers in Minnesota," M.P.C.A. 617, is used in our calculations and is presented here.

FOLK'S TABLE 4

CASES DISTRIBUTED PER MAN-YEAR

	Returnables	Non-Returnable Bottles	Cans
Beer Distributors	16,710	25,350	27,750
Brewers	16,740	25,390	27,770
Soft Drink Bottlers	16,300	24,720	27,040

Source: Research Triangle Institute

ESTIMATE OF JOB LOST COST

Minnesota Department of Manpower Services estimates that the average number of weeks of benefits was 14.4 weeks in 1972 for an estimated average period of eligibility of 22-23 weeks. Prorating the average weeks of benefits for full eligibility yields an estimated average of 16.6 weeks of benefits.

NATIONAL CORPORATIONS

There is additional uncertainty about our industry and labor estimates due to the fact that the firms we have been dealing with

are not independent decision-making units, but parts of large national corporations. Many of the important decisions affecting the State of Minnesota are made in corporate offices out of state and reflect the national objectives of these corporations. Thus, a can plant may be removed from Minnesota because the national corporation feels it has better opportunities elsewhere, or to fit better into the corporation's national policies. Where an independent local firm would probably have to stay put and drum up business where it can, the national corporation has the option of moving its output to existing facilities out of state. How much of this is likely to occur is difficult to estimate. We have attempted to do so by assigning probability to plant closures in our estimates, but this is a procedure with a large margin of error.

APPENDIX F

SUMMARY OF FINDINGS ON THE EFFECTS OF THE OREGON BOTTLE BILL

The State of Oregon was the first state to enact mandatory deposit legislation, with this legislation being effective October 1, 1972. Oregon has therefore been looked to by advocates on both sides of the issue and by legislators and other government officials for evidence, based on actual experience, of the results of this type of legislation.

Consequently, the authors of this study travelled to the West Coast for a week in August, 1973, to investigate the effects to date of the Oregon mandatory deposit legislation for beverage containers. First-hand observation was necessary to evaluate conflicting descriptions received from advocates on both sides of the beverage container issue and to evaluate sources of future information about the Oregon experience. Representatives from the beverage and related industries, environmental groups and "bottle bill" lobbyists, and government agencies were contacted and met with. What follows is based on the information gained from these meetings and observations and on subsequent contacts and data received from Oregon, such as litter and beer consumption data. While Oregon's experience with the "bottle bill" provides much useful information, a judgment as to the "success" or"failure" of the legislation in Oregon does not necessarily mean that similar legislation in another state will also be, in the balance, helpful or harmful.

The Oregon "bottle bill" requires that a deposit be collected on all carbonated-beverage containers sold in the state and that this deposit be refunded upon return of the container. It requires that the deposit be at least 5¢ on each container, except for "certified" containers that must have a minimum 2¢

deposit. Containers may be certified by the Oregon Liquor Control Commission if they are refilled by at least two users. Also, pull-tab easy-open cans were banned. The bill did not "ban the can", however, and did not apply to non-carbonated beverages.

The bill was considered and passed by the legislature virtually as an anti-litter measure alone. Major support came from owners of ocean-side real estate who wanted cleaner beaches. Not until the court test after passage was the bill advocated officially for conservation of resources. Many supporters of the bill credit a poor and uncoordinated lobbying effort by opponents with aiding the passage of the bill. The legislature was apparently prepared to be responsive to constructive proposals from industry but none were forthcoming. It was stated that a 2¢ deposit for cans would have been possible had industry actively sought it.

The Oregon anti-litter campaign is unarguably a success at this time. There is virtually no carbonated beverage container litter to be seen on highways, beaches or trails and very little litter of any kind. In order to evaluate the effect of the bill on litter, the Oregon Highway Department has conducted monthly litter courts on 25 or 30 randomly selected one-mile sections of highway. These studies show that beverage container litter has been reduced considerably (e.g., from an average of 122 containers per mile per month in the four month period of June through September, 1972, preceding the effective date of the bill, to an average of 12.5 items per mile per month in the same period a year later, June through September, 1973). Total litter also fell considerably in the first 10 months following the effective date of the law. However, results for August and September, 1973, showed a surprisingly large jump, so that total litter for these two months returned to levels very close to the levels of the same months prior to the effective date of the "bottle bill".

The following data on items per mile per month is reproduced from "Oregon's 'Bottle Bill' - One Year Later" by Don Waggoner, President, Oregon Environmental Council (2637 S.W. Water Avenue, Portland, Oregon, 97201). Appendix B of that report is attached.

	Beverage Container Litter Per Mile Per Month	Total Litter Per Mile Per Month
June 1, 1972	99	240
July 1, 1972	126	658
August 1, 1972	125	533
September 1, 1972	138	513
November 1, 1972	55	349
January 1, 1973	38	234
February 1, 1973	47	224
March 1, 1973	29	193
April 1, 1973	19	141
May 1, 1973	13	231
June 1, 1973	14	316
July 1, 1973	12	278
August 1, 1973	13	548
September 1, 1973	11	511

It is difficult to evaluate the importance of the mandatory deposit legislation to the overall anti-litter campaign. The reduction in litter seems to be the result of many factors, including more efficient litter pick-ups, greater availability of litter barrels, the "bottle bill", an increased state-wide consciousness about litter due, in part, to the publicity attending the passage and implementation of the bill, and possibly a reduction in tourism due to the gasoline shortage scare. Certainly the "bottle bill" has been effective in reducing the amount of beverage container litter and building the consciousness of Oregon as the anti-litter state. It is also clear that the mandatory deposit itself is not solely responsibile for the total reduction in litter. It is not known at this time how important mandatory deposits are to the formulation of an effective anti-litter program or how long the effects of the publicity which accompanies them will last.

The effects on solid waste and energy and other resource use will depend somewhat on the final configuration of beverage containers in the market. At the time the law went into effect, it was commonly, but erroneously, thought that the law would mean the end of the beverage can in Oregon. Cans were immediately taken out of the Oregon market, partly to comply with the ban on pull tabs and partly because of expectations of retailer and consumer resistance to returning cans. Now retailers are finding that can returns may actually be easier to handle than bottles, and cans are re-entering the market.

Statewide, it appears that cans may have regained around a fifth of their previous market share. In some markets, cans were stated to be up to about 60 percent of their previous volume, while other bottlers have not as yet re-entered the market in cans. The return rate on cans appears to be 70 or 80 percent.

The effects of the bill on solid waste is conjectural at this time. It appears that in the next 5-10 years solid waste recovery systems will be available and financially desirable. They will probably be the most cost-efficient way of reusing beverage cans. If the effect of the bill is to implement a less efficient pre-sorting method of reusing cans, then there is a loss in the area of solid waste handling that must be set against any gains from getting an early start on reuse or from reducing the number of containers in the solid waste stream.

Another problem in evaluating the solid waste situation is that refillable beer bottles are being sold in non-reusable cardboard cartons. These containers are heavier than the holders for non-returnable bottles and cans and, unless they are returned for paper recycling, add to the solid waste volume.

It is evident that the "bottle bill" has not had significant effects either way on the costs of solid waste handling and disposal in Oregon. Hopefully, it will not lead to a delay in implementing the new solid waste handling technology as it becomes available, although this is a possibility.

Energy and other resource use have probably decreased slightly, although not definitely. At the present time, fewer beverage containers are being used in Oregon than before the law due to increased use of refillable bottles. Here again, we don't know what the final equilibrium will be regarding the array of containerization. If cans continue to come back into the market, then energy and resource use will depend upon the extent to which the cans are reused. Savings 5-10 years hence will depend upon whether the mandatory deposit system is more efficient than reuse out of the solid waste stream. It is not likely that it would be unless it results in a significantly different beverage container array.

At the present time, the energy and other resource situation is a balance between savings from increased refilling versus expenditures for more transportation, more warehousing (heat and light), and possibly more paper and wood packing.

Another resource use to consider is labor. In an imperfectly functioning economy, it is often heard that producing jobs is a good thing even if they are inefficient or wasteful. While this may be true for the standpoint of distribution of income, it is not true per se when evaluating alternative ways of doing something. The number of jobs or the distribution of income is a separate problem from the one of which is the best way of doing something. Labor is an important and valuable resource. Its use is a cost that should be allocated like any other resource. Thus, one of the costs of the mandatory deposit system in Oregon, which must be balanced against the benefits, is that it

uses more labor resources for handling and distribution.

Costs of administering the law are negligible and compliance has been high. The Oregon Liquor Control Commission enforces the law as part of its regular duties and has required no new staff.

The breweries have been somewhat impacted by the bill, but it has caused no major problems. The local brewer, Blitz-Weinhart, has benefitted from buying up bottle returns at 2¢ rather than buying new glass at 4-1/2¢ (at the expense of out-of-state brewers). They have put in a new returnable bottle line, but do not seem to be suffering financial problems. Beer prices have risen at the retail level by about 70¢ per case, and a significant part of this increase is attributable to the extra handling costs of the new system. The growth rate of beer sales has probably been set back as a result, but sales declines, which would have had a greater impact on the industry, have not occurred.

Data furnished by the Oregon Liquor Control Commission shows an increase in beer sales of 2.9% through the end of September, 1973, and 0.7% through the end of October, compared to the same months in 1972. On a fiscal year basis, the apparent consumption of beer in Oregon had been growing at annual rates of around 5.2 percent for the several previous years. This may indicate that a drop in the growth rate of consumption has been caused by the bill. However, it appears that there has also been a decrease in the growth rate of wine consumption during the same period, and the "bottle bill" does not apply to wine.

The standardization of containers has probably been a benefit to the industry. Long term gains by local or regional brewers at the expense of the nationals are not apparent. Small volume out-of-state and foreign labels have become less available in the state, but this may be a temporary phenomenon as

retailers adjust to the new situation.

Soft drink sales in the state may be down o-10% with almost all of the decrease being absorbed by the warehouse brands. Name brand bottlers have generally seen an increase in sales. The warehouse brands are now making a comeback as cans are becoming accepted. The development of the legal easy-open button-down can should aid this trend. Distribution costs have increased for bottlers, as well as for brewers, with about a 20% increase in trucking costs and a 25% increase in labor costs for the same volumes. Some soft drink prices have been held down by the price freeze, but others rose before the freeze went into effect. Prices will probably stabilize with an average retail increase of about 70¢ per case in returnable bottles as in beer. Can prices will probably also be higher than before the law to account for handling returns. Presently, returned cans are being warehoused waiting for shredding equipment to be installed. It is not known how many of the cans will be recycled. Separation of steel from aluminum may be a problem for a while as there are no magnetic separaters operating. Soft drinks have not lost vending machine locations and almost all gasoline service stations have vending machines. Vending machines have not had to be changed over to handle bottles instead of cans, although some bottlers mistakenly did this initially. Some new capital investment has had to be made in glass inventory or warehouse space. It appears that the bill, when the situation finally stabilizes, will have no great effects on the soft drink industry in Oregon --- somewhat higher costs and probably fewer cans, but no dramatic changes. The one private soft drink canner who went out of business was probably more responsible for his own demise than was the "bottle bill".

Oregon had one beverage bottle manufacturer and no beverage can manufacturers in the state. Out-of-state can-makers have been impacted by the loss of can sales in Oregon, but these effects have been widely spread and appear

to be somewhat temporary as well. When can sales reach their equilibrium level in Oregon, they will probably be at a lower level than before the bill, but will be higher than at present. It is likely that the impact on the can industry will be negligible and easily absorbed.

The local glass plant has been impacted by the loss of beverage container sales in Oregon. They have been able to compensate somewhat by moving into a labor intensive pharmaceutical bottle line which produces glass for the East Coast. As a result, only 5-6 workers have been laid off. Without the pharmaceutical line, layoffs may have been as high as 75-100 workers.

Retailers have been experiencing higher handling and storage costs for beverages and a certain amount of inconvenience in dealing with container returns. Some of these problems are being handled by more efficient return policies and by passing the costs on to the consumers. Part of the retailer dissatisfaction is a matter of aesthetics --- their stores were not designed to handle large numbers of beverage returns and the result is unaesthetic clutter near the store entrances. Sanitation problems have not arisen in the stores, although there may be a temporary problem in inventorying unshredded cans in the warehouses. The sorting problem is being handled in the large supermarkets by having the customer sort his containers into different carts. Cans are handled in the large plastic lined cardboard containers. There is, at present, resistance to handling more than one variety of can due to sorting problems. These will probably soon be resolved. There has probably been a slight increase in shelf space devoted to beverages because of the more bulky containers. Consumers are buying more of their beverages in larger containers than before the "bottle bill". Non-carbonated beverages (beverages not covered by the "bottle bill") sold in pull-tab cans have significantly increased their market share. The variety of soft drinks and beer carried by each retailer may have declined slightly, but

mostly in specialty items such as foreign beer.

The people of Oregon have easily adapted to the requirements of the "bottle bill" and generally favor it. A feeling of well-being and pride seems to have developed over the idea that Oregon is fighting litter and waste. Whether or not this effect will be lasting or transferable to other states is not known and probably will depend more on the realities of the "bottle bill's" effects than it does at present.

LITTER SURVEY RESULTS - TOTAL ITEM COUNT

	OCT-NOV 1971	DEC 1 1971	FEB 1 1972	APR 1 1972	JUN 1 1972	JUL 1 1972	AUG 1 1972	SEP 1 1972	OCT 1 1972	NOV 1 1972	JAN 1 1973	FEB 1 1973	MAR 1 1973	APR 1 1973	MAY 1 1973	JUN 1 1973	JUL 1 1973	AUG 1 1973	SEP 1 1973
mber of One Mile ctions Sampled	28	30	30	30	30	30	30	30	25	25	25	25	25	25	25	25	25	25	25
tter Accumulation riod - Months	NA[1]	1.5	2	2	2	1	1	1	NA[1]	1	1[2]	1	1	1	1	1	1	1	1
turnable Beverage[3]																			
ntainers																			
Bottles																			
Over 5¢ Refund-Soft Drink	40	20	165	261	79	83	88	73	0	0[4]	2	1	0	1	0	1	1	3	2
5¢ Refund-Beer										0	0	0	0	0	0				0
5¢ Refund-Soft Drink	135	91	128	90	101	88	243	295	49	35	19	32	28	1	12	14	13	16	14
2¢ Refund-Beer[5]										273	239	293	198	119	89	108	91	83	82
1¢ Refund-Soft Drink	796	949	396	451	314	179	206	207	210[5]					0	0		0		
Cans																			
5¢ Refund-Beer[6]										8	6	5	3	0	13	2	4	9	5
5¢ Refund-Soft Drink[6]										0	6	4	2	3	4	6	0	7	5
Total Returnable	971	1060	689	802	494	350	537	575	259	316	272	335	231	124	118	131	109	118	108
nreturnable Beverage[7]																			
ntainers																			
Bottles																			
Beer									481	170	135	200	103	87	37	33	32	20	15
Soft Drink									86	48	66	45	21	18	7	8	5	7	3
Cans																			
Beer									2061	763	358	443	237	190	124	153	140	129	117
Soft Drink									719	408	118	143	93	55	39	38	30	64	34
Total Nonreturnables	7556	8520	4565	5620	5458	3381	3220	3557	3347	1389	677	833	490	350	207	232	207	220	169
ther Items[7]																			
Non Beverage Bottles									95	56	72	67	50	23	29	24	15	10	8
Non Beverage Cans									257	136	128	81	78	66	56	83	78	112	96
Other Containers									1231	656	895	934	397	1054	305	397	429	754	951
Beverage Related Paper									196	128	152	61	41	37	23	35	36	63	59
Other Paper & Miscellaneous									20390	6076	3649	3327	3532	1877	5028	7031	6069	12432	11366
Total Other Items	15860	11440	12357	13918	8486	15994	12257	11269	22169	7052	4896	4470	4098	3057	5441	7570	6627	13371	12480
Total All Items	24387	21020	17611	20340	14438	19725	16014	15401	25775	7857	5845	5638	4819	3531	5766	7933	6943	13709	12757

Source: Oregon State Highway Litter Survey

Notes: 1. Duration not available. 2. Results for December 1, 1972 pickup not available.
3. Beverage as defined in the "Bottle Bill" Act. 4. No 5¢ refund for beer until October 1, 1972.
5. Refund for beer changed to 2¢ October 1, 1972. 6. No refund on cans until October 1, 1972.
7. Additional detail categories established October 1, 1972.

LITTER SURVEY RESULTS - ITEMS LITTERED PER MILE PER MONTH

	DEC 1 1971	FEB 1 1972	APR 1 1972	JUN 1 1972	JUL 1 1972	AUG 1 1972	SEP 1 1972	NOV 1 1972	JAN 1 1973	FEB 1 1973	MAR 1 1973	APR 1 1973	MAY 1 1973	JUN 1 1973	JUL 1 1973	AUG 1 1973	SEP 1 1973
Returnable Beverage[1] Containers																	
Bottles																	
Over 5¢ Refund Soft Drink	1	3	4	1	3	3	2	0	0	0	0	0	0	0	0	0	0
5¢ Refund-Beer[2]								0	0	0	0	0	0	0	0	0	0
5¢ Refund-Soft Drink	2	2	2	2	3	8	10	1	1	1	1	0	0	1	1	1	1
2¢ Refund-Beer[3]								12	10	12	8	5	4	4	3	3	3
1¢ Refund-Beer[3]	21	7	8	5	6	7	7	-	-	-	-	0	0	-	0	0	
Cans																	
5¢ Refund-Beer[4]								0	0	0	0	0	1	0	0	0	0
5¢ Refund-Soft Drinks[4]								0	0	0	0	0	0	0	0	0	0
Total Returnable	24	12	14	8	12	18	19	13	11	13	9	5	5	5	4	4	4
Nonreturnable Beverage Containers[5]																	
Bottles																	
Beer								7	5	8	4	3	2	1	1	1	1
Soft Drink								2	3	2	1	1	0	0	0	0	0
Cans																	
Beer								30	14	18	11	8	4	6	6	5	5
Soft Drink								16	5	6	4	2	2	2	1	3	1
Total Nonreturnables	189	76	94	91	114	107	119	55	27	34	20	14	8	9	8	9	7
Other Items[5]																	
Non Beverage Bottles								2	2	2	2	1	1	1	1	0	0
Non Beverage Cans								5	5	3	3	3	2	3	3	5	4
Other Containers								26	36	37	16	42	12	16	17	30	38
Beverage Related Paper								5	6	2	2	1	1	1	2	2	2
Other Paper & Miscellaneous								243	146	133	141	75	202	281	243	498	456
Total Other Items	254	206	232	141	532	408	375	281	196	177	164	122	218	302	266	535	500
Total All Items	467	294	340	240	658	533	513	349	234	224	193	141	231	316	278	548	511

Source: Oregon State Highway Department Litter Survey

Notes:
1. Beverage as defined in the "Bottle Bill" Act.
2. No 5¢ refund on beer until October 1, 1972.
3. Refund for beer changed to 2¢ October 1, 1972
4. No refund on cans until October 1, 1972
5. Additional detail categories established October 1, 1972.

A bill for an act

APPENDIX G

relating to pollution; beverage containers and the reduction of solid wastes; requiring a deposit on beverage containers sold within this state; providing a penalty.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MINNESOTA:

Section 1. [STATEMENT OF POLICY.] The growth of packaging materials, like one-way beverage containers, significantly contributes to the exponential growth in per capita waste generation. And increased waste generation indicates an undesirable increase in the consumption of natural resources. By encouraging source reduction of solid waste, the legislature seeks to:

(1) Promote consumer savings and the rational use of mineral, energy and other resources;

(2) Reduce the environmental and economic impact of solid waste generation; and

(3) Encourage consideration of other methods of solid waste source reduction and energy waste reduction as may be required.

Sec. 2. [DEFINITIONS.] Subdivision 1. For purposes of sections 1 to 8, the terms defined in this section shall have the meanings given them.

Subd. 2. "Agency director" means the executive director of the Minnesota pollution control agency or designated members of the agency staff.

Subd. 3. "Agency board" means the nine member board of the Minnesota pollution control agency.

Subd. 4. "Beverage" means beer, ale or other malt

A bill for an act

relating to pollution; beverage containers and the reduction of solid wastes; requiring a deposit on beverage containers sold within this state; providing a penalty.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MINNESOTA:

Section 1. [STATEMENT OF POLICY.] The growth of packaging materials, like one-way beverage containers, significantly contributes to the exponential growth in per capita waste generation. And increased waste generation indicates an undesirable increase in the consumption of natural resources. By encouraging source reduction of solid waste, the legislature seeks to:

(1) Promote consumer savings and the rational use of mineral, energy and other resources;

(2) Reduce the environmental and economic impact of solid waste generation; and

(3) Encourage consideration of other methods of solid waste source reduction and energy waste reduction as may be required.

Sec. 2. [DEFINITIONS.] Subdivision 1. For purposes of sections 1 to 8, the terms defined in this section shall have the meanings given them.

Subd. 2. "Agency director" means the executive director of the Minnesota pollution control agency or designated members of the agency staff.

Subd. 3. "Agency board" means the nine member board of the Minnesota pollution control agency.

Subd. 4. "Beverage" means beer, ale or other malt

drink containing one half of one percentum or more of alcohol by volume; and mineral waters, soda waters or any other carbonated soft drink in liquid form and intended for human consumption.

Subd. 5. "Bottler" means every person bottling, canning or otherwise filling beverage containers for sale to distributors or dealers.

Subd. 6. "Consumer" means every person who purchases a beverage in a beverage container for use or consumption.

Subd. 7. "Container" means an individual, hermetically sealed glass, metal or plastic bottle, can, jar or carton used for the purpose of containing a beverage.

Subd. 8. "Dealer" means every person in this state who engages in the sale of beverages in beverage containers to a consumer.

Subd. 9. "Deposit" means a sum of money which is added to the price of each beverage container and refunded to the bearer when the empty container is returned.

Subd. 10. "Distributor" means every person who engages in the sale of beverages in beverage containers to a dealer in this state including any bottler who engages in such sales.

Subd. 11. "In the state" means within the exterior limits of the state of Minnesota and includes all territory within these limits owned by or ceded to the United States of America.

Subd. 12. "Nonrefillable, nonreturnable or disposable beverage container" means any container, containing or made

for the purpose of containing any beverage, which is not suitable for refilling.

Subd. 13. "Place of business of a dealer" means the location at which a dealer sells or offers for sale beverages in beverage containers to consumers.

Subd. 14. "Use or consumption" includes the exercise of any right or power over a beverage incident to the ownership thereof, other than the sale, the keeping or retention of a beverage for the purposes of sale, or for the purpose of transportation of a beverage container through the state.

Sec. 3. [REFUND.] Subdivision 1. [REFUND VALUE OF CONTAINERS.] Except as otherwise provided in this section, every beverage container sold or offered for sale in this state shall have a refund value of not more than

(a) five cents on a container holding 16 ounces or less;

(b) ten cents on a container holding less than 32 ounces, but more than 16 ounces;

(c) twenty five cents on a container holding 32 ounces or more.

Provided, however, that every beverage container certified as provided in section 6 sold or offered for sale in this state, shall have a refund value of not less than three cents.

Subd. 2. [REFUND PAYMENT REQUIRED.] Except as provided in subdivision 3,

(a) A dealer shall accept from a consumer any empty

beverage containers of the brand sold by the dealer, and shall pay to the consumer the refund value therefor as provided in subdivision 1.

(b) A distributor or bottler or a designee of a distributor or bottler shall accept from a dealer any empty beverage containers of the kind, size and brand sold by the distributor or bottler, and shall pay the dealer the refund value therefor as provided in subdivision 1.

Subd. 3. [EXCEPTIONS.] A dealer may refuse to accept from a consumer, and a distributor, bottler or designee may refuse to accept from a dealer, any empty beverage container which does not state thereon a refund value as required by section 5.

Sec. 4. [TRUTH IN PRICING.] Beverage dealers shall display an itemized listing on each container or group of containers sold to the consumer as a packaged unit showing the deposit charge separate from the actual cost of the beverage.

Sec. 5. [CONTAINER DESIGN.] Subdivision 1. Every beverage container sold or offered for sale in this state by a dealer shall clearly indicate by embossing, by a stamp, by a label or other method securely affixed to the beverage container, the refund value therefor as provided in section 3, subdivision 1.

Subd. 2. Subdivision 1 shall not apply to returnable beverage containers having a brand name permanently marked thereon which, on the effective date of this section, had a refund value of not less than five cents.

Sec. 6. [CONTAINER CERTIFICATION.] Subdivision 1. [PROMOTION OF UNIFORM CONTAINERS.] To promote the use in this state of reusable beverage containers of uniform design, and to facilitate the return of containers to bottlers for reuse as a beverage container, the agency director shall certify beverage containers which satisfy the requirements of this section.

Subd. 2. [REQUIREMENTS FOR CERTIFICATION AS UNIFORM CONTAINER.] A beverage container shall be certified if:

(a) It is reusable as a beverage container by bottlers representing more than one corporation's beverage product line in the ordinary course of business; and

(b) More than one bottler will, in the ordinary course of business, accept the beverage container for reuse as a beverage container and pay the refund value of the container.

Subd. 3. [NON-UNIFORM CONTAINERS.] A beverage container shall not be certified under this section:

(a) If by reason of its quality, weight, shape, color or design, or by reason of words or symbols permanently inscribed thereon, whether by engraving, embossing, painting or other permanent method, it is reusable as a beverage container in the ordinary course of business only by a bottler of a beverage sold under a specific brand name, or

(b) If the bottler's proposed system of identifying the contents of the beverage container causes an adverse environmental effect worse than that caused by the use of non-uniform beverage containers.

Subd. 4. [AUTOMATIC CERTIFICATION.] Unless an application for certification under this section is denied by the agency within 60 days after the filing of the application for certification, the beverage container shall be deemed certified.

Subd. 5. [CERTIFICATION REVIEW.] The agency board may at any time review the certification of any beverage container. If the agency board determines that certification was improperly withheld by the agency director and that the container is qualified for certification, the board shall grant certification.

Sec. 7. [PENALTY.] Violation of sections 3 through 5 shall be a misdemeanor. For each day on which a violation occurs, a separate offense may be charged.

Sec. 8. [STANDARDS AND REGULATIONS.] Pursuant to the provisions of chapter 15 and to the rules of procedure of the Minnesota pollution control agency, the agency board may adopt, amend and rescind regulations and standards having the force of law relating to any purpose within the provisions of sections 1 to 9. The regulations or standards may be of general application throughout the state, or may be limited as to times, places, circumstances or conditions in order to make due allowances for variations therein.

Sec. 9. [EFFECTIVE DATE.] Except as otherwise provided in this section, sections 1 to 8 shall take effect January 1, 1976. Applications and certifications referred to in section 6 may be made prior to January 1, 1976. Prior to March 31, 1974 the agency board shall adopt rules and regulations applying to this act.