

Cash Recycling, Waste Disposal Costs and the Incomes of the Working Poor: Evidence from California

Abstract

This paper finds that bottle laws reduce the costs of waste streams by diverting new material into recycling programs, in addition to increasing the income of the working poor. New survey data from California indicates that between 36 percent and 51 percent of the material generated by the redemption centers in Santa Barbara, CA would not have been captured by existing curbside recycling programs. California's bottle law has an unusual structure, with redemption centers that pay by counting containers or by weighing the material recycled. The evidence suggests policy makers should consider structuring new bottle laws to encourage broader recycling.

Keywords: recycling, deposit-refund, Pigouvian tax

1. Introduction

Many articles describe the people who recycle for cash, such as the story in the Los Angeles Times about Rogelia and Yolanda Garcia putting two children through college by collecting bottles and cans in Venice, CA. These articles are case studies about homeless and low-income people who are recycling¹. This paper is the first to examine empirically people who recycle for cash. The paper uses new survey data to describe people who are participating in the California deposit-refund program and it calculates the total amount of material brought in under the state bottle law in the metropolitan area of Santa Barbara, CA. The material recycled are aluminum, glass and plastic and they are brought in from households, workplaces or scavenged. The paper estimates how much new material (recyclable material that would not be captured by existing curbside recycling programs) is generated by the bottle law. The paper also describes who is recycling and estimates a recycling wage and annual income for people who are recycling material they did not purchase. These people are “professional recyclers”. The goal is to understand to what extent the bottle law may be increasing the efficiency of the recycling program and what impact the professional recyclers have on the efficiency of the recycling program while they simultaneously generate income for themselves.

A bottle law is a deposit-refund program for the return of beverage containers. Eleven states currently have bottle laws: California, Connecticut, Delaware, Hawaii, Iowa, Maine, Massachusetts, Michigan, New York, Oregon, and Vermont. A deposit-refund program is essentially a consumption tax combined with a disposal rebate that is the equivalent of a Pigouvian tax. A Pigouvian tax charges the consumer a disposal fee equal to the marginal damage caused by disposal. The tax covers the cost of disposal, but encourages illegal disposal by individuals trying to avoid the fee. Because of the possibility for illegal disposal the deposit-

refund program is the most efficient way of internalizing the external costs of waste disposal. The economic incentives of a deposit-refund program are described in Fullerton and Wolverton (2000)².

Bottle laws differ from state to state, and the way that the program is implemented shapes the way people recycle. The California Cash Redemption Act is unique in three important ways. First, California allows the rebate to be paid either by count or by weight, so that if you have a large quantity of recyclable material you can crush, store, and redeem it all at once, regardless of where it was purchased. Second, it requires recycling centers to be available within a half a mile of larger stores. Third, unclaimed deposits are put into a government-held fund that covers the program's administrative costs and also subsidizes curbside recycling and other recycling programs in the state. Bottle Laws in other states require that private beverage distributors handle the redemption process, and let them keep the unclaimed funds.³

What are the attributes of people recycling for cash? Starting with the most simple case, assume that there is a fixed amount of material available, and the wage is simply the value of the recyclable material divided by the number of people who choose to recycle. Because the wage is very low, only the lowest income people will recycle, perhaps only the homeless. In this theoretical case the only people recycling for cash would be those whose recycling wage is higher than their labor market wage. In practice, however, we observe higher-income people cash recycling. People come to the redemption center even though their market wage is higher than their recycling wage. In some cases this may be because they have a constraint on the number of hours that they work at their market wage. Alternatively, they may work in a place where they have access to large amounts of recyclable material, such as a restaurant or hotel. In these cases the decision to recycle for cash is based entirely on a person's market and recycling

wages. It may also be that people do not value their time recycling in the same way that they value their time spent in the labor market. People may actually like recycling for cash. People who receive some utility from their recycling might choose to recycle even if their recycling wage were less than their market wage. The estimates in this paper are based entirely on the value of the transfer. We assume that if a person is recycling then the value to them of recycling for cash is higher than the value of not recycling for cash. No attempt is made to empirically estimate the value of the time spent recycling, which is a topic for future research.

Deposit-refund programs create an incentive to recycle, but not all consumers consider it worthwhile. Because people do not respond identically, it is important to design programs that capitalize on people's varied responses. This paper provides estimates of the incremental material recycled by professional, workplace and household recyclers and also examines the income that they earn. In structuring new bottle laws policy makers should be sure that they are encouraging an increase in total recycled material. If professional recyclers return a significant amount of recyclable material, or if they receive a significant amount of income from recycling, then it is important for policy makers to structure new bottle laws in ways that encourage recycling by all groups, especially the people who scavenge recyclable material.

The rest of the paper is laid out in three sections. Section two includes a complete description of the survey instrument and how the survey was completed. Section three divides the data and results into two parts: Part A describes the material recycled in detail while Part B describes the people recycling. The final section of the paper provides a summary and conclusions.

2. The Survey Instrument

The key to studying cash recycling is to collect data on the people who bring material to the recycling centers. The unique dataset used for this analysis was created specifically to capture recycling by all groups—professional, workplace and household recyclers. The dataset includes the amount of material collected through the redemption centers, the amount of cash people earned in the process, and how much of the total material recycled comes from each of the different groups recycling? In addition we are interested in where the material came from and what would have happened to the material if it was not brought to the redemption center. In other words, would it have ended up as litter, garbage or curbside recycling? The survey instrument grew from these questions. The dataset is the result of a one month survey of all people returning bottles and cans for cash at several recycling centers.

The survey instrument was designed and then tested during a weeklong preliminary survey at one of the main Santa Barbara area recycling centers. The data collected from this survey were used to understand how the recycling center operated. Analysis of the preliminary data allowed for refining the original questions and adding new ones. Since many recyclers were Hispanic, the survey was administered in both Spanish and English. The survey was translated into Spanish by one translator and then translated back into English by a second translator. The two English versions were then compared to test for inconsistencies. The translations were done by people familiar with the Mexican idioms of Spanish.

The data was collected using face-to-face surveys at the recycling centers, located in Santa Barbara and Goleta, California. In July 2002 this area had three main recycling centers and five small buyback centers in supermarket parking lots. The final survey included results from one week spent at each of the high volume recycling centers as well as one week at one of the grocery store buyback centers. All people recycling for cash at a redemption center were

approached while they were waiting to check out and asked to participate in the survey. The final question of the survey was a card on which the surveyor recorded the actual cash payment or the weight of each load brought to recycling center by the survey participant. This was reported individually for each material: aluminum, glass, and plastic. In addition, because the surveys were face-to-face interviews, the surveyors were able to visually verify the answers to some of the survey questions. For example, household recyclers are quite easy to distinguish from professional recyclers both because of the volume and types of material that they bring. Many of the professional recyclers come to the recycling center several times a week. People who visited the redemption center multiple times during the survey period only completed the survey once.

The first part of the survey asks about the recycled material and recycling activities of the respondent, including where the recycled material are from, how much time it takes to recycle, and how far he or she travels to come to the redemption center. The second part asks the individual about his age, where he was born, his educational attainment, his household income, etc. The question about household income was asked using a separate card. This card categorized income levels as A: less than \$10,000, B: \$10,000 to \$25,000, C: \$25,000 to \$50,000, D: \$50,000 to \$75,000 and E: more than \$75,000. The respondent was asked to name the letter which corresponded most closely to his household income. The third part of the survey was a card filled out by the surveyor. The card recorded either the weight, by material, brought into the center, or in some cases, the amount paid by the recycling center for each material recycled.

Six hundred and sixty participants completed the survey and about one third of them took the survey in Spanish. The refusal rate for the survey was 10 percent. The survey asked the

respondent to identify the origins of their material. The choices were home, workplace, and all over. Then each person was asked what percentage of each material came from his home. There were many people who brought material from more than one of these places. In these cases, the individual's recycling type was determined by the location from which the majority of their bottle and cans came. So, for example, if more than 50 percent of the recyclable material was scavenged from all over, he was coded as a professional recycler. If more than 50 percent of her items came from her workplace, then she was coded as a workplace recycler. The sample includes 102 professional recyclers, 65 workplace recyclers, and 527 household recyclers.

3. The Data and Results

A. Material Recycled

The survey data gives the raw amount of each material - aluminum, glass or plastic – brought by each recycler group – household, workplace and professional. Each redemption center was surveyed for one week. This data was then combined with data from the California Department of Conservation, Division of Recycling that gave the total amount of material collected by each recycling center during the week of the survey. The survey and redemption data were used to calculate the percentages of each material – aluminum, glass or plastic – brought by each recycler group – household, workplace and professional – to the redemption center. The percentage of each material brought by each recycler group to the redemption centers was assumed to be constant throughout the month of July. While the survey included all three of the high volume redemption centers in the region, it only included one of the supermarket buyback centers⁴. In order to overcome this we assumed that the recycling percentages were the same at each of the supermarket buyback centers. These percentages were applied to the total amount of material collected by each recycling center during the month of

July. Table 1 reports estimates of the total weight of California Cash Redemption Value material (CRV) recycled in the Santa Barbara South Coast region⁵ for the month of July 2002 and this includes the County estimate of CRV material collected through the curbside recycling program. The weights are reported both by the type of recycler returning the material and by the type of material.

It is clear that the different recycler groups – household, workplace and professional – return different material. Households bring in about 50 percent of the aluminum being recycled, they are responsible for only 15 percent of glass recycled. Workplace recyclers are responsible for glass for 22 percent of the total glass recycled. Professional recyclers bring all materials and account for about 29 percent of the total weight of material being recycled. Curbside recycling accounts for about one third of all the CRV material recycled on the Santa Barbara South Coast. In 2002 the California beverage container recycling rate for aluminum was 74 percent, 59 percent for glass and 36 percent for plastic. These are CRV material returned through curbside and recycling centers⁶.

While the aluminum recycling rate is very high, there is a lot of plastic and glass that is not being captured by the state's recycling programs. Scavenging for recyclable material creates a commons problem. As with fish in a fishery, the higher the price of the cans, the more people are "harvesting" them. However, at the 2002 recycling rates close to half of all beverage containers were not being recycled. Since the survey, California has twice increase the redemption size, in order to increase the redemption rates. In 2004 the redemption size was increased from 2.5 cents to 4 cents for cans and small bottles and from 4 cents to 8 cents for larger bottles. In 2007 the redemption size was increased from 4 cents to 5 cents for can and small bottles and from 8 to 10 cents for larger bottles. The trend in the expansion of bottle laws

nationwide has included increasing the types of beverage containers that fall juices, milk and water, which increases the stock of glass and plastic beverage containers. In addition a strong economy increases the demand for beverage containers, which are normal goods, decreases the amount of scavenging that takes place, and leads to a decrease in both recycling and redemption rates.

One of the difficulties in estimating the amount of new material generated by the bottle bill is that some bottles and cans would have been captured under existing recycling programs. Using data from the California Departments of Conservation and Finance, Berck et al (2003) estimate that in 1999 curbside recycling programs in Santa Barbara County covered an estimated 25-50 percent of the population. For the purpose of this paper new material is defined as material brought to the redemption center by a household, workplace or professional recycler that would not have otherwise wound up in curbside recycling. We asked household and workplace recyclers if there is curbside recycling at their home or workplace. If they responded yes we assumed that their material would be placed in a curbside collection bin and we do not attribute any material that they collected to the CRV program.

For the professional recyclers the curbside question is more complicated. They may not be honest with the surveyor because in some cases it is illegal to remove material from curbside containers. In fact, the legality of scavenging is not transparent. In the city of Santa Barbara it is illegal to remove material from a curbside recycling container “without the express consent of the property owner of the property (or the owner's tenant) upon which the recyclable material or container is located.”⁷ The Santa Barbara County Code allows only the owner or business or the “authorized recycling contractor”⁸ who generated the material to remove material from a recycling bin. In 2002, the penalty for a first offense of material theft from a recycling bin was a

fine of no more than \$100 in both the city and the County.⁹ According to the Santa Barbara Police and the University of California Police Departments, complaints are extremely infrequent and generally not prosecuted. There is not much support for arresting recyclers in Santa Barbara County. In fact officers of the Isla Vista CPD, next to the University of California Santa Barbara campus, generally feel that professional recyclers are doing an extremely valuable community service by cleaning up after the students.¹⁰

When recyclers at a large redemption center in Goleta were asked about removing material from curbside recycling bins, they did not seem to find the question incriminating. Forty-eight percent of the professional recyclers reported that they took some material from curbside recycling bins. But for the entire only twenty-one percent of the recyclers admitted taking material from the curbside bins. The Goleta recycling center was surveyed a second time during the final survey. It is possible that, having been asked this question previously, the recyclers were more aware that the removal of material from curbside containers was not legal, and less likely to respond honestly. In addition there were very few homeless recyclers in the pre-test because most of the homeless collect bottles and cans in the denser downtown Santa Barbara area. The homeless recyclers were very aware of the illegality of taking material from the curbside bins and they generally denied ever doing that.

Table 2 reports two estimates of the amount of new material generated by the California Cash Redemption Program. If a workplace or household recycler reported that he had curbside recycling at his workplace or at home, the material he brought to the recycling center was not counted as new material attributed to the bottle law. The assumption is that in the absence of the law they would use curbside recycling. The two estimates have to do with how to treat the recycling that is brought into the centers by the professional recyclers. The first estimate, that 51

percent of the total weight of the material collected through redemption centers is new material, assumes that all of the material collected by professional recyclers is newly recycled. This is an upper bound for the amount of new material generated by the program. In fact, in this survey recyclers reported taking about 21 percent of their material from curbside bins. In order to create a lower bound estimate of the amount of new material generated the paper assumes that 50 percent of the material collected by the professional recyclers is taken from curbside recycling.

A study in the San Francisco area estimated that scavengers were diverting 25 percent of glass, 30 percent of PET plastic, and 50 percent of aluminum from curbside recycling programs.¹¹ At the time of this study San Francisco was estimated to have curbside recycling programs that covered 75-100 percent of the population, much higher than the 25-50 percent of the population with curbside recycling in Santa Barbara County. The second estimate, which creates a lower bound, assumes that half of the material collected by professional recyclers is taken from curbside recycling. In this case the amount of new material generated by the redemption centers is still 36 percent.

Curbside recycling programs in California receive payments from the fund of deposits. The payments are based on the amount of beverage container material, estimated by the Department of Conservation, to be in the bins. A report to the California legislature on Beverage Container Recycling found that the value of the increased amount of beverage container material in curbside bins that would result from ending the California Cash Redemption program would be less than the loss of income from the supplemental payments that the curbside programs receive through the program. The report examines several scenarios, but all the cases result in an estimate of financial losses between \$35 and \$40 million for the curbside programs.¹²

B: People Recycling

Table 3 gives the breakdown of the reported household income levels by the recycler groups – household, workplace and professional. Professional recyclers come from the lowest income brackets in the community. While fifty-six percent of professional recyclers live in households with an annual income less than \$10,000, in the Santa Barbara South Coast region only nine percent of households fell in that income bracket. The income distribution for the for the Santa Barbara South Coast is based on 2000 Census information. The household income question is included on the census long form and the distribution is estimated from the sample of households who answer this form. This information is therefore only an estimate and should be treated as such.

Among the household and workplace recyclers the lower income brackets are disproportionately represented at the recycling centers. Fifty-eight percent of the household recyclers and sixty-seven percent of the workplace recyclers fall into the \$10,000 to \$49,999 income brackets. The representation of recyclers in the higher income brackets is sparse. This may be because higher income recyclers were less likely to answer the question about household income in the survey, but it is also consistent with the recycling model in the paper. The income distribution of the sample is consistent with the idea that there is a transaction cost associated with returning material to the centers even for households returning bottles and cans that they purchased. High income recyclers spend very little time collecting and organizing their material, the largest cost of recycling, is the time spent at, and travelling to, the redemption center. Higher income households earn a higher market wage, which makes the opportunity cost of their time high. For lower income households the value of the bottles and cans is more likely to outweigh the time cost of cashing it in.

Table 4 reports the means of the community characteristics, from the 2000 Census fact sheets for Santa Barbara South Coast community. For each of the community characteristics the information is either from the short form, which is a census, or from the long form, which is a sample. The community variables which are taken from the Census short form are: whether there is a child under the age of 18 in the household (kid<18 in house), the household size and whether the recycler is female. The community variables taken from the Census long form are: was the survey given in Spanish, whether the recycler born in the US, whether the recycler born in Mexico, whether he was married, educational attainment levels and household income.

Survey Spanish is a dummy variable for whether the survey was given in Spanish. The community variable is the proportion of Spanish speakers who report speaking English less than “very well”. Born-US and born-Mexico are dummy variables for the country of the respondent’s birth. For born-Mexico the community data is the number of people born in Latin America, which is an upper-bound for people born in Mexico. Married is a dummy variable for marital status. The educational attainment variables are restricted to respondents over the age of 25. No high school is for respondents without any high school education. High school includes students who attended any high school, graduated from high school, or earned a GED. College is a dummy variable which includes some college as well as college graduates. Income is household income aggregated into the same income brackets as the survey results and it is coded at midpoints, the minimum (\$10,000) and the maximum (\$75,000). For the community variable the Census income brackets are recoded to be consistent with the survey income brackets.

Table 4 also reports the results of t-tests comparing the means for the sample as a whole and the means for each recycler type to the means of the community characteristics. Only the means and the t-statistics for the variables that are statistically significantly different are

reported. For the variables taken from the census long form, which are estimated from the census sample, the standard deviations are unavailable for the Santa Barbara South Coast. In these cases the estimated census mean is assumed to be the true population mean.

People returning material to the redemption center are not a cross-section of the surrounding community. People who recycle are more likely to be primarily Spanish speaking, less likely to be born in the United States and more likely to have been born in Mexico. People in the sample have larger households, are more likely to have a child under the age of 18 in the household, and more likely to be married. The recyclers are more likely to have no formal high school education, less likely to have attended college, and their mean income is lower. They are also more likely to be men. These differences are statistically significant across the board, no matter whether the respondent is a household, workplace, or professional recycler. The only exception is that only household and workplace recyclers are, compared to the rest of the community, more likely to be married and to have a child under the age of 18 in the household. Professional recyclers are actually less likely than the community to have a child in the household.

Table 5 compares the recycling groups – household, workplace and professional. This table reports the means and t-statistics for the variables for which the mean value is statistically significantly different across recycler groups. The first column compares the household recyclers to the workplace recyclers, the second column compares the workplace recyclers to the professional recyclers and the third column compares the household recyclers to the professional recyclers. The clearest differentiation here is between the professional and household recyclers. The professional recycler is more likely to have been born in Mexico and more likely to take the survey in Spanish. Professional recyclers are older and more likely to be retired. They are less

likely to be married or to have children under the age of 18 and they are more likely to be men. They have less education and lower incomes than the household recyclers.

Professional and workplace recyclers are also significantly different. The workplace recyclers are younger, by almost 10 years, and are more likely to be married. In addition they have higher levels of education. Household and workplace recyclers are for the most part indistinguishable. Workplace recyclers are less likely than household recyclers to be retired; this is essentially true by definition. Workplace recyclers are also more likely to be male. The fact that the workplace recyclers resemble household recyclers is consistent with the idea that recycling is an informal part of their wage. They see the recycling payment as a weekly or monthly bonus.

How much do people earn per hour or per year recycling? The information from the survey about the frequency and length of time that recyclers devote to collection is used to estimate an hourly wage for professional recyclers. The hourly recycling wage is simply the exact value of the material returned to the recycling center divided by the time that the individual reported it took him to collect that load. The summary statistics for the hourly wage are reported in Table 6 for professional recyclers and workplace recyclers. Also included in Table 5 is the average wage estimated by the professional recyclers. The average wage for professional recyclers was \$6.33 per hour. This was just a bit below the California minimum wage, which was raised from \$6.25 to \$6.75 on January 1, 2002. The median recycling wage is \$2.31. There are four observations at the right-side tail of the wage distribution that are pulling this mean up, but there is no reason to believe that they do not belong in the sample. The estimated wage is the wage that the recyclers themselves believe they are earning. The mean value of the estimated

wage is \$3.74 and the median is \$3.00. The recyclers themselves are clearly aware that the wage they earn is likely below the minimum wage.

Workplace recyclers are defined as people bringing material primarily from their place of work and who keep the money they earn. It turns out that about half of the workplace recyclers are on the clock while they are recycling, reinforcing the notion that this income is really just a bonus from their employer. Table 6 reports both the calculated mean wage for this kind of recycling and also the mean value of the material cashed in. The mean workplace recyclers wage is \$65.85 per hour and the median is \$31.49 per hour. As with the professional recycling wage there are four observations at the right-side of the distribution pulling this mean up. The work wage is calculated using the cash amount paid to the recycler for the material from his workplace divided by the time that he reported it took him to collect and bring in the material.

The error in the mean wages calculated comes entirely from the estimate of the time it took to collect the load of bottles and cans. It is important to keep in mind that a high recycling wage can reflect a small amount of time worked, which skews the data for workplace recyclers. The workplace recyclers came to the redemption center less frequently and appeared to be less sure about the amount of time that they spent recycling. In many cases when asked how long it took them to collect the material they would answer “Oh, no time at all”. They were then prompted to give an exact time. The amount of time spent daily was so small that they may have underestimated the total time it took them to recycle. The consistent underestimation of the time spent recycling would result in an overestimated wage for these workers. For this reason Table 6 includes the actual value of the load of material brought to the center. The mean value of the material brought by the workplace recyclers was \$27.90. If it takes workplace recyclers half an hour, on average, to bring material to the recycling center, unload them and return to work then

the mean wage estimated is \$55.80. The average distance that the recyclers travel to the recycling center was 5 miles, and the average wage is \$65.85.

How much income does recycling amount to annually? Table 7 gives the annual mean recycling income for both workplace and professional recyclers. The standard deviation and median recycling income are also reported. To find this the value of the material returned during the survey was aggregated based on how often the person reported that he recycled. The only assumptions made for this estimate were; that each person recycling in the sample brought roughly his normal load to the recycling center, and that he was accurately able to report how frequently he recycled. The payment that each person received was then inflated based on the frequency of their visits to the recycling center. This was done for household, workplace and professional recyclers. For the household recyclers this is not an income transfer, it is a refund of money that they paid in deposit when they purchased the bottles and cans. It may be useful to think of this as a tax on disposal that the households are choosing not to pay.

The mean annual recycling income is \$2,789 for the professional recyclers, \$1,185 for the workplace recyclers, and \$161 for household recyclers. In addition a new variable is created, the mean percentage of household income represented by the recycling income. This variable is the ratio of the annual recycling income to reported household income for each recycler. The mean of this variable is reported for household, workplace and professional recyclers. What is remarkable is that for the professional recyclers \$2,789 represents about twenty two percent of their annual household income. In order to calculate this percentage each individual's estimated yearly total was divided by the midpoint of the household income range except of the case of the lowest range. For households that report under \$10,000 of household income the income is assumed to be \$10,000.

The annual income variable depends on the assumption that the recycler is bringing his normal load to the recycling center. If a person recycling had a particularly good day or a bad day on the day that we observe the value of their materials, this increases the variation. Dropping the four highest professional recycler observations lowers the mean percentage of total household income to about fifteen percent. Another reason that the actual percentage must be treated cautiously is that very low reported income in the Census is thought to sometimes be the result of measurement error. However, it remains the case that \$2,789 of income is of great significance to these households. Workplace recyclers' recycling income represents, on average, just over three percent of their household income. For both professional and workplace recyclers this does not include any material that comes from their own household. For the household recycler the \$161 mean annual refund amounts to less than one percent of household income.

4. Conclusions

This paper provides evidence that Bottle Laws do in fact increase the amount of beverage container recycling beyond what is captured by municipal curbside recycling programs. States may find that curbside recycling programs are efficient in densely populated areas while deposit-refund programs can be useful in more rural areas. Further research is necessary, but states trying to maximize their recycling rates should imagine that a mixed recycling program, including both deposit-refunds and curbside recycling, may well be the most efficient strategy. If a deposit-refund program is structured similarly to the California Cash redemption program, where the curbside recycling programs receive payments based on an estimate of the amount of

beverage containers captured by the curbside recycling program, then these policies are not in competition with one another.

Cash recycling is also an important part of the income of some of the working poor. A significant percent of the income of professional scavengers comes from recycling. A deposit-refund program subsidizes recycling wages and targets a population that can be difficult to reach. There is no empirical evidence that professional scavengers increase crime rates, but they do increase recycling rates. In fact there is a substantial literature showing that increasing the legal labor market opportunities of low income workers may in fact lower property crime rates.¹³ The evidence presented here should compel policy makers to consider structuring new bottle laws in ways that encourage professional recycling for its positive environmental and labor market consequences.

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Table 1: July 2002 Total CRV¹ Recycling for the Santa Barbara South Coast from Redemption Centers² and Curbside Recycling Collection

Source of Recyclable Materials	Aluminum (lbs)	Total (%)	Glass (lbs)	Total (%)	Plastic (lbs)	Total (%)	All Materials (lbs)	Total (%)
Household Recyclers (Redemption Center)	43,433	49.5%	106,756	15.2%	13,021	18.6%	163,210	18.9%
Workplace Recyclers (Redemption Center)	6,420	7.3%	154,614	22.0%	3,320	4.7%	164,354	19.1%
Professional Recyclers (Redemption Center)	21,247	24.2%	214,360	30.4%	12,584	17.9%	248,191	28.8%
Curbside Aggregate for South Coast ³	16,711	19.0%	228,333*	32.4%	41,228	58.8%	286,272	33.2%
Total CRV Recycling for South Coast	87,811		704,063		70,153		862,027	

Notes: In order to report these estimates I assume that the proportion of the recycling brought to each of the recycling centers is the same for the month of July as it was for the week the center was surveyed. In addition I assume that all of the grocery store parking lot recycling centers have the same proportions as the one that was in the survey. ¹ CRV are bottles and cans that are included in the California Cash Redemption program. ² Redemption centers are recycling centers which buy CRV materials and then receive payments from the State for these materials. ³ This information was supplied by the Santa Barbara County Department of Public Works, Solid Waste and Utilities Division. * The number for glass reported in this chart is the estimated amount of CRV glass captured by the curbside recycling program for all of Santa Barbara County and was supplied by the California Department of Conservation, Division of Recycling. This number is an upper bound because it was not possible to secure the amount of CRV glass in the South Coast recycling region.

Table 2: New Recycling Generated by the Bottle Law

Assuming all Professional Recycling is from Trash	Weight (lbs)	Percent of Total CRV Recycling
Total materials that could be captured by existing curbside programs	425,523	49%
Total materials that could not be captured by existing curbside programs	436,503	51%
Assuming 50% of Professional Recycling is from Curbside Bins	Weight (lbs)	Percent of Total CRV Recycling
Total materials that could be captured by existing curbside programs	550,727	64%
Total materials that could not be captured by existing curbside programs	311,299	36%

Table 3: The Breakdown of Household Income Level by Recycler Type

Household Income Level	Sample		Household		Workplace		Professional		Community	
	Obs.	Percent	Obs.	Percent	Obs.	Percent	Obs.	Percent	Obs.	Percent
Less than \$10,000	108	19%	63	14%	3	5%	42	56%	5,414	9%
\$10,000 to \$24,999	165	29%	127	29%	16	28%	22	29%	9,702	16%
\$25,000 to \$49,999	156	27%	126	29%	22	39%	8	11%	16,036	26%
\$50,000 to \$75,000	74	13%	65	15%	7	12%	2	3%	11,521	19%
Over \$75,000	69	12%	59	13%	9	16%	1	1%	18,171	30%
Responses	572		440		57		75			
No Response	122		87		8		27			
Response Rate for Income Question	82%		83%		88%		74%			

Notes: The Community observations and percentages are based on the 2000 Census information for Santa Barbara city, Goleta CDP and Isla Vista CDP. The income question is on the Census long form and therefore is estimated from a sample (1 in 6 households).

Table 4: T-test Comparing the Sample and Recycler Types to the Community Characteristics

Variable	Community Mean	Sample vs. Community	Household vs. Community	Work vs. Community	Professional vs. Community
Spanish Survey ^B	0.1251	0.305 (10.029)	0.27 (7.334)	0.323 (3.301)	0.479 (6.829)
born-US ^B	0.767	0.593 (9.07)	0.634 (6.178)	0.516 (3.921)	0.426 (6.66)
born-Mexico ^B	0.1382	0.328 (10.370)	0.304 (8.093)	0.355 (3.540)	0.436 (5.798)
married ^{3B}	0.463	0.563 (5.044)	0.575 (4.955)	0.627 (2.585)	0.453 (0.176)
kid < 18 in house ^A	0.28	0.355 (3.967)	0.373 (4.244)	0.458 (2.715)	0.186 (2.226)
household size ^A	2.59	3.53 (11.892)	3.56 (11.168)	3.32 (3.133)	3.44 (3.180)
female ^A	0.506	0.277 (13.001)	0.315 (9.197)	0.167 (6.994)	0.144 (9.703)
no high school ^{4B}	0.079	0.240 (9.041)	0.202 (6.383)	0.218 (2.476)	0.458 (6.886)
college ^{4B}	0.675	0.498 (8.462)	0.544 (5.503)	0.455 (3.254)	0.289 (7.707)
income ^{5B}	\$47,790	\$34,598 (14.12)	\$36,801 (10.30)	\$39,298 (2.98)	\$18,100 (17.66)

Notes: The T-statistic for a two-sided test that the mean is equal to the community mean is in parentheses. Community means are based on the 2000 Census information for Santa Barbara city, Goleta CDP and Isla Vista CDP. Variables marked with an A are calculated from the Census short form (100% data). Variables marked with a B are calculated from the Census long form (1 in 6 households). ¹This mean is taken from Spanish speakers who report speaking English less than very well. ²This is reported in the Census as born in Latin America. ³This variable is for a population age of 15+. ⁴The educational attainment variables are for a population age of 25+. ⁵These incomes are reported in brackets. For the analysis the incomes are coded at midpoints except for the highest and lowest brackets which are coded as \$10,000 and \$75,000.

Table 5: 2-Sample T-test of the Means with Unequal Variances by Recycler Type

Variable	Household vs. Work		Work vs. Professional		Household vs. Professional	
Spanish Survey			0.323 (1.97)	0.479	0.27 (3.756)	0.479
born-US	0.634 (1.749)	0.516			0.634 (3.753)	0.426
born-Mexico					0.304 (2.384)	0.436
age			43.5 (4.092)	53.6	45 (4.465)	53.6
retired	0.203 (2.318)	0.102	0.102 (3.995)	0.365	0.203 (2.913)	0.365
female	0.315 (2.803)	0.167			0.315 (3.988)	0.144
married ¹			0.627 (2.083)	0.453	0.575 (2.071)	0.453
kid <18 in house			0.458 (3.488)	0.186	0.373 (3.928)	0.186
no high school ²			0.218 (3.047)	0.458	0.202 (4.392)	0.458
college ²			0.455 (1.963)	0.289	0.544 (4.587)	0.289
income ³			\$39,298 (6.412)	\$18,100	\$36,801 (9.393)	\$18,100

Notes: T-statistics are in parentheses. ¹This variable is for a population age of 15+. ²The educational attainment variables are for a population age of 25+. ³These incomes are reported in brackets. For the analysis the incomes are coded at midpoints except for the highest and lowest brackets which are coded as \$10,000 and \$75,000.

Table 6: Estimated Recycling Wages for Professional and Workplace Recyclers

	Mean	Median	Standard Deviation	Observations
Professional Wage	6.33	2.31	12.68	77
Wage Estimated by the Professional	3.74	3.00	3.62	60
Wage of Workplace Recyclers	65.85	31.49	102.54	48
The Total Value of Workplace Recyclers Materials	27.90	12.91	40.92	55

Notes: The Professional's estimated wage is the amount that the individual recycler believed that he was earning by recycling. The work total is the total amount of recycling the work recycler was paid for during this visit to the recycling center.

Table 7: Annual Mean Recycling Income for Professional and Workplace Recyclers

	Mean	Standard Deviation	Median	Mean Percentage of Total Income
Professional	\$2,789	\$5,244	\$667	22.10%
Workplace	\$1,185	\$3,353	\$211	3.30%
Households	\$161	\$392	\$65	0.67%

Notes: For households this is the amount of deposits paid on the bottles and cans that they purchased, which they then claimed from redemption centers.

Question 35 CARD

- A Less than \$10,000**
- B \$10,000-\$25,000**
- C \$25,000-\$50,000**
- D \$50,000-\$75,000**
- E More than \$75,000**

Question 36 CARD

Survey Number _____

Please write the weight or the cash refund you received for each material that you recycled. Thank you very much.

Glass

_____ lbs

OR

_____ \$

Aluminum

_____ lbs

OR

_____ \$

Plastic

_____ lbs

OR

_____ \$

Recycling Survey Number _____
Surveyor _____

Date _____

1. I am a student at UC Santa Barbara and I am doing an anonymous survey of people who are returning their recycling for refund for a school project. Are you willing to answer a few questions about your recycling and yourself? Y N (If no ask 3,14,17,19, 21)

First I am going to ask you some questions about your recycling.

2. How many miles out of your way did you travel to come to the Recycling center today? _____ miles

3. Where is your recycling from? *circle all that apply*
my own household my workplace all over

Ask only workplace recyclers questions 4,5, 6, and 7

4. Do you have curbside recycling pickup at your workplace? Y N
5. How much time, between trips to the recycling center, do you spend on recycling at your workplace?
_____ hours OR _____ minutes.
6. Are you recycling during work hours? Y N
7. What happens to the refund? Keep it Goes to Work Petty Cash Other _____

Ask only the people who bring recycling from all over questions 19-23

8. On average, how often do you go out to collect material for recycling?
_____ X a day _____ X a week _____ X a month _____ X a year Other _____
9. About how long do you spend collecting each time you go out? _____ hours OR _____ minutes
10. When do you collect recycling? All year long Summer Fall Winter Spring Other
11. About how much do you think you earn per hour recycling? _____
12. How do you travel when collecting recycling? On foot By bike In a car In a truck or van
13. Is recycling the principal use of your vehicle? Y N

14. Do you have curbside recycling pickup at your home? Y N
15. Did you bring something today that your curbside program doesn't accept? Y N
16. Did you bring recycling today for which you did not receive a refund? Y N
17. Did you bring aluminum for a refund today? Y N
18. If yes, how much of the aluminum comes from your own household? _____
19. Did you bring glass for a refund today? Y N
20. If yes, how much of the glass comes from your own household? _____
21. Did you bring plastic for a refund today? Y N
22. How much of the plastic comes from your own household? _____

23. How often do you bring material to the recycling center?
_____ X a day _____ X a week _____ X a month _____ X a year Other _____

24. How do you usually come to the recycling center?
On foot By bike In a car In a truck or van

Now I would like to ask you a few questions about yourself.

25. Where were you born? (Country) _____

26. How old are you? _____

27. Are you retired? Y N

28. Circle the interviewees gender M F

29. Are you married? Y N

30. Do you have any children? Y N

31. *If yes ask* How many of your children are under the age of eighteen and live with you? _____

32. How many people live in your house? _____

33. Are you a student? Y N

34. Did you go to high school? Y N
If yes ask Did you graduate from high school? Y N
If yes ask Did you go to college? Y N
If yes ask Did you graduate from college? Y N

Ask only the people who bring recycling from all over questions 30-37

35. In the past twelve months have you had another job other than recycling? Y N

36. How many hours a week do/did you work?

37. What is/was your hourly wage?

38. Have you been looking for a job, or to change jobs in the past twelve months? Y N

39. How much of the material that you recycle comes from curbside or neighborhood recycling containers?
None about a quarter about half about three quarters All Other _____

40. What types of material does that include? Aluminum Glass Plastic

41. What is your approximate annual family income?
A B C D E

42. We are trying to figure out what fraction of recycling comes from different types of people. Would you please fill out the weight of your recycling, or the amount you are refunded on this card and hand it back to us when you are finished. Or you can ask the cashier for a receipt. Thank you very much!

TARJETA de la pregunta 35

- A Menos de \$10,000**
- B \$10,000-\$25,000**
- C \$25,000-\$50,000**
- D \$50,000-\$75,000**
- E Más de \$75,000**

TARJETA de la pregunta 36 CARD

Encuesta Número _____

Sea tan amable de anotar el peso o el reembolso en efectivo que recibió por cada material que recicló. Muchas gracias.

Vidrio

Aluminio

Plástico

_____ **libras**

_____ **libras**

_____ **libras**

Ó

Ó

Ó

_____ **\$**

_____ **\$**

_____ **\$**

Encuesta de Reciclaje Número _____
Encuestador(a) _____

Fecha _____

1. Soy un(a) estudiante de la Universidad de California en Santa Bárbara y estoy haciendo una encuesta anónima sobre las personas que reciclan materiales a cambio de un reembolso para un proyecto escolar. ¿Está dispuesto(a) a contestar unas cuantas preguntas sobre lo que recicla y sobre usted?
Sí No (Si su respuesta fue negativa, haga las preguntas 3,14, 17,19 y 21)

Primero voy a hacerle algunas preguntas sobre su reciclaje.

2. ¿Cuántas millas se desvió de su camino para venir hoy al centro de reciclaje? _____ millas
3. ¿De dónde proviene su material de reciclaje?: *indique con un círculo todo lo que corresponda*
de mi propia casa de mi trabajo de todas partes

Haga las preguntas 4,5, 6 y 7 sólo a las personas que reciclan materiales de su trabajo

4. Donde usted trabaja, ¿tienen servicio de recolección de reciclaje en la acera? Sí No
5. ¿Cuánto tiempo, entre los viajes al centro de reciclaje, se pasa reciclando en su trabajo?
_____ horas Ó _____ minutos.
6. ¿Está reciclando en horas de trabajo? Sí No
7. ¿Qué hace con el reembolso? Me quedo con él Lo entrego en mi trabajo Gastos menores Otro _____

Haga las preguntas 19-23 sólo a las personas que traen reciclaje de todas partes

8. En promedio, ¿con qué frecuencia sale a recolectar materiales para reciclarlos?
_____ veces al día _____ veces a la semana _____ veces al mes _____ veces al año otro _____
9. ¿Aproximadamente cuánto tiempo pasa recolectando cada vez que sale? _____ horas O _____ minutos
10. ¿Cuándo recolecta material de reciclaje? Todo el año Verano Otoño Invierno Primavera Otro
11. ¿Aproximadamente cuánto cree que gana por hora al reciclar? _____
12. ¿Cómo viaja cuando recolecta material de reciclaje? A pie Bicicleta Carro Camión o camioneta
13. ¿El uso principal de su vehículo es para reciclar? Sí No

14. Donde Ud. vive, ¿tiene servicio de recolección de reciclaje en la acera? Sí No

15. ¿Trajo algo hoy al centro de reciclaje que el programa de reciclaje en la acera no acepta? Sí No

16. ¿Trajo algo hoy al reciclaje que no le reembolsaron? Sí No

17. ¿Trajo aluminio hoy para un reembolso? Sí No

18. Si es así, ¿qué cantidad del aluminio proviene de su propia casa? _____

19. ¿Trajo vidrio hoy para un reembolso? Sí No

20. Si es así, ¿qué cantidad del vidrio proviene de su propia casa? _____

21. ¿Trajo plástico hoy para un reembolso? Sí No

22. Si es así, ¿qué cantidad del vidrio proviene de su propia casa? _____
23. ¿Con qué frecuencia trae materiales al centro de reciclaje?
 _____ veces al día _____ veces a la semana _____ veces al mes _____ veces al año Otro _____
24. Habitualmente, ¿cómo se transporta/llega al centro de reciclaje?
 A pie En bicicleta En carro En camión o camioneta

Ahora quisiera hacerle algunas preguntas sobre usted.

25. ¿En dónde nació? (País) _____
26. ¿Qué edad tiene? _____
27. ¿Está jubilado(a)? Sí No
28. Indique con un círculo el sexo del (la) entrevistado(da) M F
29. ¿Está casado? Sí No
30. ¿Tiene hijos? Sí No
31. *Si respondió afirmativamente* ¿Cuántos hijos menores de dieciocho años tiene y viven con usted? _____
32. ¿Cuántas personas viven en su casa? _____
33. ¿Es estudiante? Sí No
34. ¿Estudió preparatoria (bachillerato)? Sí No
Si dijo que sí, pregunte ¿Terminó la preparatoria? Sí No
Si dijo que sí, pregunte ¿Estudió en la universidad? Sí No
Si dijo que sí, pregunte ¿Terminó la universidad? Sí No

Haga las preguntas 30-37 sólo a las personas que traen sus materiales de reciclaje de todas partes

35. En los últimos doce meses, ¿ha tenido otro trabajo que no sea el de reciclar? Sí No
36. ¿Cuántas horas a la semana trabaja/trabajó?
37. ¿Cuánto gana/ganaba por hora?
38. ¿Ha estado buscando empleo o ha tratado de cambiar de empleo en los últimos doce meses? Sí No
39. ¿Qué cantidad del material que recicla proviene de los contenedores de reciclado de los vecindarios o de la calle?
 Ninguna una cuarta parte alrededor de la mitad unas tres cuartas partes todo otro _____
40. ¿Qué tipo de materiales incluye? Aluminio Vidrio Plástico

41. ¿Cuáles son los ingresos anuales aproximados de su familia?
 A B C D E
42. Estamos tratando de calcular qué fracción del reciclaje proviene de diferentes tipos de personas. ¿Quiere ser tan amable de anotar en esta tarjeta el peso de sus materiales de reciclaje o la cantidad de dinero que recibe como reembolso y entregárnosla cuando haya terminado de llenarla? Ó pida al cajero que le de una copia del recibo. ¡Muchas gracias!

¹ Cardenas, Jose (2001). Other papers that examine homeless recyclers include: Gowan (1997), Hill and Stamey (1990), and Conroy (1998).

² See also Sigman (1995), Fullerton and Kinnaman (1995), Palmer and Walls (1997), and Reschovsky and Stone (1994).

³ CA DOC/DOR 1999a, Section 14549.6.

⁴ The disaggregated data is proprietary, but to give you an example the average amount of Aluminum for the larger centers was over 9.5 tons and for the supermarket buybacks the average was about 1.5 tons, for glass the averages are approximately 75 tons and 2 tons and for plastic they are about 3.5 tons and 1.5 tons.

⁵ The Santa Barbara South Coast is defined as the city of Santa Barbara, Goleta CDP and Isla Vista CDP. For the rest of the paper the community will be referred to as the Santa Barbara South Coast. A census-designated place (CDP) is an area identified by the United States Census for separate statistical reporting.

⁶ California Department of Conservation, "Biannual Report of Beverage Container Sales, Returns, Redemption and Recycling Rates", May 2007.

⁷ 2002 Santa Barbara Municipal Code 7.16.305.

⁸ Santa Barbara County Code 17.29.

⁹ Santa Barbara Municipal Code, 1.28.030, Santa Barbara County Code 17.82

¹⁰ USCB Officer Mark Larson, telephone interview June 3, 2003

¹¹ Berck (2003), p.33.

¹² Berck (2003), p.38.

¹³ Some papers in this area include; Grogger (1998), Gould (2002), and Machin (2004).