
MEASURING FREE RIDERS: DOES THE ECONOMIC CLIMATE MAKE A DIFFERENCE?

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Introduction

A free rider is commonly defined as a participant in an energy conservation program who would have undertaken the same energy conservation actions if the program were not available. Accounting for the free rider factor is essential to determine net program impacts because free riders represent a cost to the program without a corresponding benefit.

Despite considerable research in the area of free rider measurement, there is no definitive formula for accurately determining free rider rates. In fact, the research has frequently resulted in confusing and inconclusive data, such as participants identified as free riders claiming the program was influential in their decision to implement an energy conservation action.

This paper addresses free rider measurement issues with a focus on experience with the New York State Energy Efficient Appliance Rebate Demonstration Program. New findings are presented that suggest that economic conditions may influence free rider rates.

The New York State Appliance Rebate Program

The New York State Appliance Rebate Program was introduced in 1987 by the State Energy Office to determine if financial incentives influence consumers to purchase energy efficient appliances. It was also designed to serve as a mechanism for returning petroleum overcharge dollars to consumers in an expeditious manner (Ref. 1). The program offered rebates of \$50 to \$125 for refrigerators and \$35 to \$100 for room air conditioners meeting the Program's standards for energy efficiency.

Over 73,000 rebates (\$5.6 million) were awarded between April 1, 1987, and May 21, 1988, to consumers in seven counties located in both upstate (Cortland, Erie, Niagara, Onondaga) and downstate (Nassau, Suffolk, Orange) regions of the State.

After a hiatus between May 1988 and December 1989, the Program was reintroduced on December 15, 1989, and is expected to operate at least through the end of 1991. As of May 3, 1991, 25,137 rebates totaling \$1,285,580 were awarded under Cycle II of the program.

Several modifications had been made to the second cycle of the Program based on the results of an evaluation conducted in 1989. The three most notable changes include:

- Room air conditioner rebates were eliminated primarily because the free rider rate for this program component was significantly higher than for the refrigerator component. In the downstate region, for example, 81% of the air conditioner rebate recipients were classified as free riders.
- Rebate amounts were lowered from a range of \$50 to \$125 to a range of \$35 to \$100.
- The standards for refrigerator rebate eligibility were tightened. Under Cycle II, refrigerators in the top 15% of energy efficiency in their class are eligible for a rebate compared to the top 25% in the first cycle.

In the law authorizing the second cycle of the Program (Chapter 659 of the New York State Laws of 1989), five counties previously eligible for the Program were eliminated. These changes were made for policy reasons and were not related to recommendations in the evaluation. The two counties in which nearly half of the refrigerator rebates had been awarded—Nassau and Suffolk (commonly referred to as Long Island)—remained in the Program. Under Cycle II, approximately 75% of the rebates had been awarded to Long Island consumers as of May 1991.

Evaluation Approach

Introduction

The first cycle of the Program was evaluated by the New York State Energy Office's Evaluation Unit from

both a process and impact perspective. The second cycle was also evaluated but less comprehensively. The focus of the second cycle research was on determining the free rider rate.

The evaluation methodology for Cycle I featured a multifaceted approach. Specifically, a consumer questionnaire was included as part of the rebate application form to determine the impact of the rebate on the consumer's purchase decisions. This questionnaire was followed up by a phone survey of randomly selected consumers who received rebate checks to verify the application questionnaire data and gather additional information. A mail questionnaire of all participating appliance retailers was used to determine the Program's influence on inventory and sales. For the ongoing Cycle II component, the results from over 22,000 application form surveys were analyzed.

Determining Appliance Sales Data

In the first cycle of the rebate program, evidence provided by the appliance dealers suggested that the Program was highly successful and played a significant role in encouraging the sale of energy efficient appliances in the target counties. Based on the results of a survey of participating dealers, 63% indicated that they increased the availability of appliances meeting the Program's rebate qualifying standards. Approximately 50% of these dealers increased their inventory of qualifying models by at least 30%. This occurred during a period when the national shipment weighted efficiency averages of refrigerators and room air conditioners remained essentially unchanged (Ref 2). While we do not know exactly what appliances would have been stocked if the Rebate Program never existed, approximately 50% of the dealers who increased their inventory of more efficient appliances cited the Program as the primary factor in their decision.

To obtain these data, appliance dealers were asked general questions to indicate trends in their appliance sales and inventory practices. Specifically, they were asked to identify percent increases in equipment qualifying for the rebate in ranges (e.g., 10-20%, 40% or more). Our goal in asking this type of question was to provide enough detail to detect any significant trends, but remain general enough to alleviate dealers' concerns about releasing proprietary sales information. Obviously, precision is sacrificed because of the use of ranges, and some dealers may have "guess-timated" their answers since they were not required to document their responses. An additional concern was that some dealers may have over-estimated the impact of the rebate, fearing that a less than

enthusiastic response might influence the Energy Office to cancel or curtail the Program.

We did not use a dealer survey in the second cycle because of the overall increase in the availability of energy efficient appliances resulting from the National Appliance Energy Conservation Act (Public Law 100-12). Asking dealers general questions about increased stocking and sales of energy efficiency appliances would have added to the potential for misleading results because of the overall increases in refrigerator efficiency resulting from the promulgation of the standards.

A better alternative to using a dealer survey is to obtain sales data for both the participating counties and a similar region as a control group. Assuming the control group counties have characteristics similar to the participating counties (e.g., mean income level, energy costs), the difference between the two sets of numbers would produce a reliable indication of net program impact. This method has some limitations (e.g., self-selection bias) but eliminates the problems associated with self-reported consumer and dealer data.

Unfortunately, actual sales and inventory data are difficult and sometimes impossible to obtain because of their proprietary nature. The Energy Office had only limited success in obtaining actual sales data. Experience in obtaining sales data for free rider analysis of various program types has been mixed nationwide. Some utilities are requiring that dealers provide sales data as a prerequisite for participating in their rebate programs. A notable example is the San Diego Electric & Gas "Earthwise Appliance" program. The Program, which began in late 1990, requires dealers to provide both pre-program and program sales data as a requirement of program participation. Most of the major appliance dealers in the San Diego area (about 60) have agreed to participate. Some dealers have even offered to provide names and addresses of consumers that purchased appliances that did not qualify for a rebate. Because of the geographical proximity of the dealers, the utility plans to conduct a survey of appliances displayed in the dealers' showroom for additional data validation (Ref. 3).

Surveying Program Participants (Consumers)

Consumer data was the primary method used in our study to estimate free rider rates. This method has the advantage of being relatively easy and inexpensive to administer, but is likely to produce results of questionable reliability. The problems with self reported consumer data are well documented. In the Rebate Program (Cycle

II), we found that over 71% of the participants indicated that the rebate made a difference in their appliance purchase, but only about 34% indicated that they would have purchased different appliances if the rebate were not available. Similar contradictions have been found in Cycle I as well as other free rider studies conducted throughout the country.

Specific problems with self-reported data include consumers that may not accurately recall the details of their program participation and a tendency to react positively toward their purchase. Research indicates that, once a purchase is made, the consumer's perception of the product not selected will move toward the negative, and the perception of the product actually purchased will become more positive (Ref. 4). This trend would make it less likely that a consumer would indicate a desire to purchase a different appliance model, with or without a rebate.

The Importance of Free-rider Measurement on New York's Program

The free-rider rate was an important factor in assessing the effectiveness of New York's rebate program because the level of free riders has a direct influence on the Program's net impact calculation. Under Cycle I, a 20% reduction in the free-rider rate would have provided the opportunity to include the estimated energy savings attributable to nearly 15,000 participants without a corresponding increase in program costs. For the refrigerator component alone, estimated annual kWh program savings would have increased from 3,415,291 kWh to 5,366,886 kWh for the same program cost (approximately \$5 million).

Free-rider Rates—Cycles I and II

Results

In Cycle I, we found that approximately 72% of the program participants identified themselves as free riders. This rate was consistent with free-rider rates obtained from customer surveys from various utilities. In fact, the majority of studies completed at approximately the same time and using similar data collection methods achieved similar results. Free rider rates of between 65% and 75% were common (Ref 5). Interestingly, we found that responses to questions on the appliance rebate application survey (Cycle I) were virtually identical to similar questions on a follow-up phone survey. As a result, the appearance of a significant variation in similarly collected free-rider

data may signal that something is happening to change the participants' responses to the program.

In Cycle II, the free rider rate underwent a significant decline. Specifically, the free rider rate for refrigerator customers in the first cycle was 69%, but declined to 61% in the second cycle. The proportion indicating that they would not have purchased the energy efficient refrigerator without the rebate rose from 27% to nearly 35%—approximately a 29% increase. Free-rider levels ranged from a low of 53% to a high of 63%. The extremes are from the two counties that, when combined, represent less than 4% of the program total. The free-rider rates declined despite the fact that the rebate amounts were lowered by as much as 30%.

The free-rider rates in this study were determined by asking participants if they "would have purchased this particular appliance model if the rebate were not offered." This question appeared on the rebate application form in both program cycles. Our database contained about 66,000 responses for the first cycle and 22,000 for the second cycle.

Reasons Behind the Decline in Free-rider Rates

Why did the level of free ridership decline? We first looked at the modifications between the first and second cycle. Intuitively, it did not make sense that lowering the rebate amount would result in a lower free-rider rate. The elimination of room air conditioners from the program would be expected to lower the free rider-rate of the Program overall. However, since room air conditioner data were unavailable in the second cycle, this issue was not included as part of our study.

The specific program change that would likely have the most impact on the free rider rate was the increase in the standards for qualifying appliances. An unanticipated factor that may have also influenced the free rider rate was a dramatic decline of the fortunes of the New York State economy just as the second cycle of the Program began. We will discuss the second possibility first.

Hypothesis I—Economic Conditions Impact Free-rider Rates

The relationship between economic conditions and free ridership has not been explored to any significant degree. Does a recession impact free-rider rates? Little is known about this issue, but our data suggest that there is a link. This type of analysis was not incorporated in our evaluation design because we did not anticipate that an

economic decline would occur with the potential to significantly impact the Program.

The New York State Appliance Rebate Program was first introduced during a strong economic expansion, which included a period of significant job growth and an overall robust economy. By contrast, the second cycle of the program is operating in a difficult economic climate that is showing few signs of recovery.

A review of job-related data vividly illustrates the economic decline. According to a New York State Department of Labor study, "from 1982 to 1989, New York State experienced an unprecedented peace time expansion adding 1,003,900 jobs, with employment expanding for seven years in a row" (Ref. 6). In 1987-88, the Long Island region boasted an unemployment rate of approximately 3.5% and added about 12,000 jobs to the economy between January 1, 1987, and the end of 1988 (Ref. 7). Other counties that participated in the Program also were enjoying good economic times. Consumer confidence was high, and the sale of homes, cars, and major appliances soared.

In 1990, the economic growth came to a sudden and dramatic halt. Between January 1990 and January 1991 the State lost approximately 330,000 jobs or about one-third of the jobs lost nationally during the same time period (Ref 8). The two Long Island counties were especially hard hit, losing approximately 64,000 jobs (Ref. 8). Of the counties outside Long Island, all but one county has an unemployment rate higher than the national average. One county's (Cayuga) unemployment rate is nearly 11% (Ref. 9). Not surprisingly, consumer confidence plummeted.

Moreover, the news is not expected to get better any time soon. A study by the Federal Home Loan Board released in April 1991 estimated that New York State will lose 165,000 jobs over the next two years and retail sales will likely remain "very weak" (Ref. 10). A body of economic research suggests that a difficult economic climate impacts consumer spending patterns. It is clear that consumer spending becomes more conservative in a recession. In a 1991 *Fortune* magazine article assessing the current state of the economy, Linda Morris (a retail analyst at PNC Financial Corporation) noted that bargain hunting intensified as real income declined, and Richard Cutin of the University of Michigan argued that consumers have and will continue to wait for the best prices before buying (Ref. 11).

We theorize that the dismal economy and conservative consumer consumption patterns would influence free

rider rates. A rebate of \$35 to \$100 (approximately 8-15% of the average purchase price of currently available refrigerators) and the promise of future energy savings would be expected to be more important to consumers in a period of economic stress as contrasted to a period of robust economic growth and strong consumer confidence. The rebate can play an important role in making high efficiency refrigerators more attractive from a price standpoint even though there is no apparent correlation with higher cost refrigerators being more energy efficient.

The wide variety of features, pricing policies, manufacturers and other factors appear to have a stronger influence on the consumer's final cost than energy efficiency. In fact, sometimes a lower priced model is more efficient than a more expensive model of similar size and features. On the other hand, there are some lower priced units that are relatively inefficient (Ref. 12).

If we assume that consumers examine certain types of refrigerators that are competitively priced relative to each other, a model with the rebate would likely result in net savings to the consumer. If the consumer is tempted to purchase a low priced model despite a below average energy efficiency rank, the rebate may allow the consumer to purchase a more efficient model for a comparable price.

Consumers cutting back on expenses would likely be more attracted to a money saving incentive such as a rebate. We uncovered some specific evidence in our database that supported this theory. In Cycle I the data suggested that about 25% of the rebate recipients looked only at models with rebates and in the second cycle, the percentage rose to 32%. We also found that the level of participation among new home buyers and people remodeling their homes declined in the second cycle, consistent with the State's generally poor real estate market. This segment of consumers are more likely to be identified as free riders.

We examined the free-rider data on a quarterly basis to see if the drop in the free-rider rate paralleled the drop in the economy. The results were inconclusive. On Long Island, the free rider rate remained relatively constant but, in an aggregate of the other five participating counties, the rate dropped steadily from 62% in the first quarter of 1990 to 55% in the last quarter of the same year.

It is difficult to establish trends between sales and declining economic indicators over a limited time period because of the difficulty in defining the state of the economy. People will often feel that the economy is bad even if it is not confirmed by economic statistics. The results of a

Gallup poll conducted in September 1990 indicated that 84% of Americans felt the country was in a recession even though key economic statistics (e.g., GNP, unemployment rate) were not clearly signalling an economic decline (Ref. 13).

Since a correlation with economic issues and free rider rates was not part of our evaluation design, questions related to economic issues were not included in our questionnaire. As a result, we do not have data to draw definitive conclusions. In future surveys, we are considering asking general economic questions dealing with consumer confidence and overall assessment of the economy, such as, "Is your family better off, worse off, or the same than one year ago?" or "How confident are you that the economy will improve next year?"

Hypothesis II—More Stringent Appliance Eligibility Standards Will Result In Lower Free-rider Rates

A second factor that may have contributed to a lower free-rider rate was the tightening of the efficiency standards for qualifying refrigerators. During Cycle I, approximately the top 25% most efficient refrigerator models available at that time qualified. Under Cycle II, the standard was modified to include only the top 15%. Stated simply, the rebate is being offered on a smaller percentage of refrigerators.

Free-rider research suggests that, in general, free rider rates can be lowered by employing more selective participation criteria and applying the rebate to products with a lower market share (Ref. 14). Interestingly, the number of rebates awarded during Cycle II declined sharply. In the Long Island counties, the rebates awarded dropped from 23,851 to 13,657 during a similar 12-month period. This, however, is not necessarily indicative of declining interest in the Program because sales of refrigerators have also experienced a significant decline. The drop in sales is not surprising. Retail analyst Walter Loeb (Loeb Associates) noted that, from a retail perspective, New York and its neighboring states "are in a depression not a recession" (Ref. 15). Unfortunately, we were unable to obtain actual sales data from the appliance distributors and retailers to confirm this trend and more effectively analyze the impact of modifying the eligibility standards.

Conclusions

The discussion of our theories dealing with the reasons for the changes in the free-rider rates illustrates important lessons about free ridership measurement. In both instan-

ces, it was impossible to conclusively prove or disprove the two theories. The art of interpreting what consumers would have done if the program or service never existed is tenuous at best. The accuracy of free-rider rates can legitimately be questioned because of the research techniques used to collect them. Moreover, the meaning of the data can easily be subject to differing interpretations.

It is impossible to accurately interpret the meaning of free rider proportions unless data is conducted relative to what is occurring in the marketplace. If, for example, in response to a rebate program, appliance dealers significantly increased the percentage of high efficiency appliances available to the consumer, sales of higher energy efficient appliances would likely increase. From the perspective of determining net program impacts, it may not be important whether the rebate influenced appliance selection by the dealer or by the consumer, as long as the product purchased is more efficient than what would have been purchased had the program not existed.

It is also important to consider other factors in free-rider analysis. For example, were free riders encouraged to take any additional action that may not have been taken otherwise, or purchase a more efficient appliance than originally planned (*i.e.*, incremental free rider)? What about "free drivers"? A "free driver" is a person who was influenced to take an action by a program, but not identified as a program participant. An example would be a consumer who is encouraged to purchase an energy efficient appliance because of a rebate program, but does not claim the rebate.

The most effective method of understanding free riders is to collect as much data from different sources and use the results to validate recurring trends. A serious flaw would be to collect data from one source, such as a consumer survey, and state conclusively that the free rider rate is 62.34% without considering the limitations of the data and the presence of related factors such as changes in the marketplace.

As more is becoming known about factors that influence free rider rates, efforts can be made to design programs to mitigate the impact. The problem may not be in the program concept but in the program design.

Interestingly, in addition to New York State's Rebate Program, several similar programs have undergone major changes in their designs or were eliminated altogether. For example, of the 14 utilities identified in a survey conducted in 1987 by the Electric Power Research Institute as offering rebates for the purchase of energy efficient refrigerators and freezers, only one utility, North-

ern States Power, offered rebates in 1991 (Ref. 16). Northern States Power's financial incentives are among the lowest of any rebate program; they range from \$10-20, which in most instances would represent less than 5% of the cost of a refrigerator.

According to a survey by the Association of Home Appliance Manufacturers (AHAM) conducted in early 1991, 18 utilities were offering or plan to offer rebate programs in the near future. These utilities range from large utilities such as Northeast Utilities to small companies such as the Turlock Irrigation District in Turlock, California (Ref. 17).

A major change between the rebate programs offered in 1987 and 1991 is that the newer programs are attempting to more accurately target consumers less likely to be free riders. The earlier generation of rebate programs tended to be more straightforward; you purchase a qualifying product and receive a rebate. By contrast, more requirements have built into many of the newer programs. For example, 7 of the 18 programs identified by the AHAM study have adopted a refrigerator turn-in program. While the specific rules vary, generally you are required to turn in a working refrigerator in order to receive the rebate. A key goal of these programs is to properly dispose of inefficient refrigerators that could end up operating as second units. In the New York State rebate program, we found that about 9% of the participants planned to continue to use their old refrigerators.

Another change was a trend to tighten the standards for qualifying refrigerators. Most of the programs focus on the top 10% of efficiency. Earlier programs often had more liberal rebate qualifying standards such as products in the top 15-30% of efficiency levels.

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