Integrating Behavior Programs into Portfolio Plans to Encourage Cross-program Effects

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ABSTRACT

Behavioral energy efficiency programs have a clear portfolio benefit: they help to increase participation and savings in other energy programs while raising awareness about energy efficiency. Many argue that it is this effect that can be the most beneficial impact of these programs: increases in installed measures will ensure more persistent savings. However, our current methods to avoid double-counting savings discourage cross-program promotion. The savings associated with driving participation in other programs are removed from the behavior program and, as a result, impact the program's goals and cost-effectiveness. In turn, this may discourage behavioral implementers and program managers from promoting other programs that lift the entire energy efficiency portfolio. In this paper, the authors discuss these challenges from the perspective of a Massachusetts utility implementing behavioral programs.

To do so, the authors address the following question: are there alternative evaluation and planning approaches that can be used to diminish or remove this disincentive while also avoiding double-counted savings? The authors will present several scenarios based on a concrete program example to examine these questions and to discuss how alternative-planning approaches may better encourage a portfolio-focus and enhance the overall effectiveness of behavior programs.

Introduction

For the purposes of this paper, we adopt ACEEE's definition of a "Calculus" Behavioral Program (CBP), which relies, in part, on the dissemination of energy usage information to prompt customers to take action, outlined in the "ACEEE Field Guide to Utility-Run Behavior Programs" (Mazur-Stommen and Farley 2013). It is important to note here that we have chosen this program type because of its prevalence in the industry and its history of producing claimable energy savings in energy efficiency portfolios through home energy reports (HERs). However, we assert that the issues outlined in this paper (and our suggested solutions) can be applied to other behavioral programs as well.

Since their introduction to program portfolios, CBPs have been largely treated as a unique energy savings measure. Portfolios nationwide claim savings from CBPs by utilizing (quasi-)experimental designs and econometric analyses to estimate savings generated by CBPs and claim these savings as part of their residential program portfolio.

As information-driven programs, CBPs have the ability to influence action through direct (b) and indirect means (c), as shown in Figure 1. Using experimental and quasi-experimental approaches, we can identify, with relative certainty, the savings generated by the CBP in other programs. This is done by looking at CBP participant lift over the control or comparison group. Drawing on program participation databases, we can easily quantify the lift in

energy savings associated with path (c) using a control in the pre- and post- periods of the evaluation, emulating the Difference-in-Differences (DiD) econometrics approach.

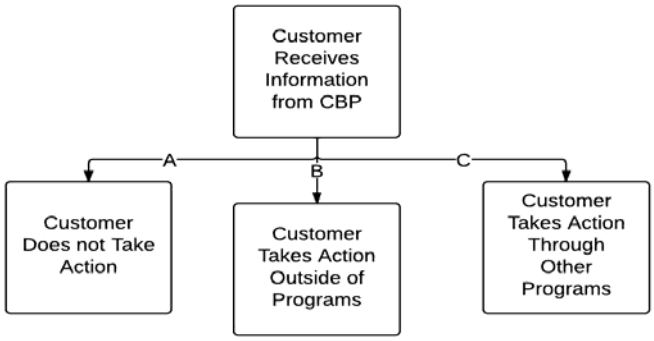

Figure 1. Simplified demonstration of paths to energy savings via CBP programs.

This savings path, however, poses a fundamental challenge in attributing savings generated by CBPs: if CBPs generate participation in standard resource programs above the levels seen in the control group, where and how should the corresponding savings be counted?

While we understand these savings to be attributable to the co-presence of both programs in the market (e.g. both the CBP and the other program have to be in place to produce the savings), we cannot claim these savings twice. Evaluators typically discount the resulting savings generated in other programs by CBPs from the CBPs overall net impact estimates, referred to as "adjusted net savings" throughout this paper. This process is the typical way to account for double-counting in evaluation and has created a significant disincentive for CBPs. Risk averse CBP implementers and administrators may refrain from utilizing CBPs to cross-promote other programs due to potential reductions in savings and the associated benefits. In effect, any successful efforts aimed at driving greater portfolio-wide participation may cannibalize overall CBP savings estimates and also adversely impact the program's benefit cost ratio (BCR) – a key metric in assessing the relative value of a program. A poor BCR can be the kiss of death for a new program model.

The aim of this paper is to directly address this challenge by answering the following question: are there alternative evaluation and planning approaches that can be used to diminish or remove this disincentive while also avoiding double-counted savings? Here we use a single example based on actual filed numbers from the 2012 NSTAR Electric home energy report behavioral energy efficiency program (NSTAR HER) as a test case for quantifying the potential effects of three alternative approaches to adjusting for cross-program participation. These alternative approaches to cross-program participation adjustments include: (1) assigning benefits based on self-reported level-of-influence, (2) a marketing non-energy impact that can be assigned as a benefit to CBPs, and (3) reallocating CBP costs to marketing budgets for cross program participation.

Background

Before we begin our discussion of each of these three alternative approaches, it is important to provide background on the existing evaluation and regulatory framework pertinent to the test case: the current approach to developing an adjusted net savings value for CBPs and how Massachusetts program administrators calculate BCR.

Precedence for Double Counting Adjustments

The Department of Energy SEE Action Behavioral Energy Efficiency Program Protocols (Todd et al. 2012) state that the net savings measured for CBP efforts should also be net of savings generated through other programs. This analysis is conducted using the following steps:

1. **Estimate the overall net savings inclusive of other programs.** Using econometrics analyses, the evaluators first estimate the overall net savings (treatment above control post- over the pre-period) during the treatment period. This is the overall value that will be ultimately adjusted to discount savings from other programs.
2. **Determine the savings gained through other program participation (path c in Figure 1) during the pre- and post-period.** Drawing on program databases and the associated measures and deemed savings, evaluators estimate the savings gained in other programs in both the pre- and post- treatment period.
3. **Estimate the difference in cross-program participation savings in the pre- and post-treatment periods for the treatment group above the control group.** In this analysis, the evaluators develop an overall savings value associated with other programs. This is the final cross-program participation number.
4. **Subtract the cross-program participation savings from the overall net savings to get an "adjusted net" savings value.** Once a cross-program savings value is determined, evaluators then adjust the overall net savings

Benefit Cost Ratios and Testing in Massachusetts

In Massachusetts, a Total Resource Cost (TRC) test is utilized for determining cost effectiveness of energy efficiency measures and programs. In the TRC test, the BCR is determined by dividing total benefits by total costs. Both program and participant costs are included in the TRC test while avoided resource costs associated with decreased energy usage and non-energy benefits are included as benefits. Any program with a BCR above 1, or more simply a program that has more benefits than costs, is deemed to be cost effective. So, any increase in program benefits or decrease in program costs will positively affect a program's BCR. This distinction is important for the subsequent analysis as different ways to attribute costs and savings are explored.

Program Example

Throughout this report, we will be comparing our alternative BCR assessment approaches to the standard approach used for CBPs in Massachusetts by demonstrating changes from the "base case" of the NSTAR HER efforts as filed in Massachusetts as part of NSTAR Electric's

2012 Annual Report (DPU 2013). This is a valuable program to examine because the effects of joint program participation are significant, representing nearly one-fifth of the total program savings, as shown in Table 1.

Table 1. 2012 NSTAR Electric home energy report savings generated through joint participation in the HER and other NSTAR programs

2012 NSTAR Electric Cohorts	Net Savings (average % kWh Reduction per Household)	Joint Savings (average % kWh Reduction per Household)	Percent of Total Savings Derived from Joint Program Participation
Wave 3	1.08%	0.24%	18%
Wave 4	1.02%	0.23%	18%

Table 2 outlines the BCR assessment when the savings and associated benefits of joint program savings are allocated to other programs (and not to the HER).

Table 2. 2012 NSTAR Electric home energy report savings BCR as filed

Total Participants	Sales, Technical Assistance & Training	All other Costs	Total Costs	Filed Savings MWh	Benefits	Net Benefits	BCR
76,544	$675,000	$68,407	$743,407	7,439	$1,055,195	$311,788	1.42

In the following sections of this paper, we discuss and demonstrate how the above BCR, as filed, would be affected using alternative attribution approaches for program benefits and costs.

Alternative Methods to Assess BCR

In this section, we discuss three hypothetical and alternative approaches that affect the attribution of costs and benefits gained through joint program participation in order to remove cross-program promotion disincentives. As cited above, these are: (1) assigning benefits based on self-reported level-of-influence "Level of Influence Adjustment", (2) a marketing non-energy impact (NEI) that can be assigned as a benefit to CBPs "Marketing NEI Adjustment," and (3) reallocating CBP costs to marketing dollars for cross program participation "Marketing Costs Reallocation."

Level of Influence Adjustment

Evaluators often use survey instruments and self-report methods to estimate the level of influence a given intervention had on a target outcome (such as a rebate or incentive on the purchase of a new piece of equipment). Drawing on the same net-to-gross approaches, we can identify how best to allocate costs and benefits of joint program participation between CBPs and other programs. By differentiating the influence of each program on joint savings, we can better allocate those joint savings between the CBP and other programs. In Table 3 we provide a series

of metrics that may be used to estimate the level of influence of a CBP on cross-program participation.

Table 3. Metrics to assess level of influence of behavioral energy efficiency programs on cross-program participation

Metric Category	Metric	Description
Timing of Engagement	Timing of decision to participate in other program(s)	Did the customer decide to participate in the program before or after receiving the HER?
		Did the customer decide to participate in the program earlier than planned as a result of the HER?
Quantity of Engagement	Number of measures installed	Did the participant install more measures as a result of the HER?
	Level of Efficiency	Did the participant increase the level or quality of efficiency as a result of the HER?
Self-Reported Influence	New Information	Did the HER provide useful information to the customer on their energy use?

We operationalize these metrics into a “level of influence” logic diagram, outlined in Figure 2, to demonstrate how such metrics might be used to develop an influence ratio to appropriate costs and benefits. Here, we focused on the timing of the engagement, the quantity of the engagement, and then level of self-reported influence. Additional metrics could be used as well, such as the extent to which CBPs prompt or remind customers to take action, though such concepts are more difficult to quantify.

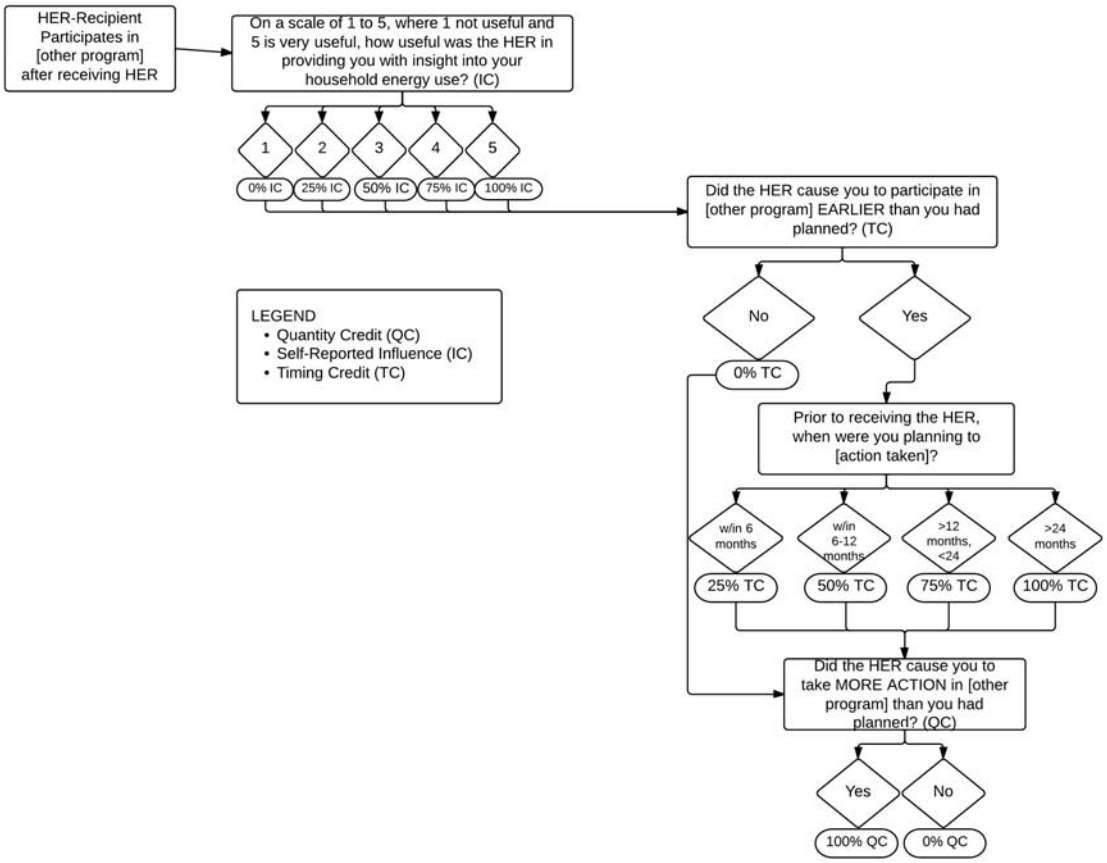

Figure 2. Level of influence survey logic to assess behavioral energy efficiency program impacts on cross-program participation.

We note here that we know from the impact analysis and the use of the control group that the savings "lift" of the CBP in other programs above the control group is fully attributable to the CBP programs; free-ridership is, in effect, already accounted for in the impact analysis. However, this approach allows us to resolve, with some added degree of confidence, the question of how to allocate the benefits and costs associated with these savings in a way that is fair to both traditional and CBP programs.

The resulting ratio can be applied in a similar fashion as a net-to-gross ratio: the benefits associated with cross program participation will be adjusted in direct proportion to the level of influence identified through survey research. With careful sampling techniques and survey design, this approach offers an alternative to the all-or-nothing assignment of savings and benefits to traditional portfolio programs vs. CBPs. We note here that this approach is meant to be illustrative and prompt consideration. For each set of credits, evaluators and regulators would need to determine how to weight each credit in a level of influence diagram. Table 4 below demonstrates the differences in overall program costs and benefits and the resulting BCR under different levels of influence in four hypothetical scenarios.

A couple simplifying assumptions were made in order to fill out Table 4. First, we conducted our estimates using the Home Energy Services (HES) program as our test case because this program has the highest rate of cross-program participation with the NSTAR Electric behavioral program. We also used generic level of influence estimates at clean intervals (10%, 25%, 50%, and 75%) to determine how reallocating benefits and costs would impact the CBP BCR.

Table 4. Final benefits estimates and BCR under varying level of influence scenarios

	Level of Influence Ratio	% Benefits Allocated to other Programs	CBP Costs	CBP Benefits	CBP BCR Ratio
As filed	NA	100%	$743,407	$1,055,195	1.42
Scenario 1	.10	90%	$800,086	$1,197,067	1.50
Scenario 2	.25	75%	$885,104	$1,409,875	1.59
Scenario 3	.50	50%	$1,026,801	$1,764,531	1.72
Scenario 4	.75	25%	$1,168,499	$2,119,211	1.81

In a real-world scenario, this analysis would be very complicated, requiring that we account for the specific measures and associated savings that were allocated "away" from the CBP to the HES program. To create this illustration, we further simplified our analysis and assumed that the benefits gained by the CBP were derived from CFL bulbs in the HES program (the program's most installed measure). From here, we:

1. Identified the total amount of savings generated by the CBP program through the HES program,
2. Assumed these savings were generated with CFL installations,
3. Determined the number of CFLs that would produce this level of savings, and
4. Reassigned the associated benefits and costs with that number of CFLs to the CBP.

Because lighting, in general, is more cost-effective than behavioral programs in Massachusetts, the inclusion of additional CFL costs and benefits increase the BCR of the behavioral program. Even in the scenario where the greatest levels of jointly produced benefits are assigned to the behavior program (75% assigned to the CBP), we see only a 2.28% decline in overall HES benefits, an amount that is relatively inconsequential for a program of its size. The BCR of the HES program is reduced from 5.88 to 5.75. This savings allocation method can have a big impact on the CBP, increasing the program's BCR by almost 30% in this example.

By more accurately allocating credit across jointly produced savings, several things have been accomplished:

1) Increase CBP benefits with minimal impact on the BCR of other programs.
2) Remove disincentives for cross-program promotion by creating a more "fair" attribution process.

Marketing NEI Adjustment

In addition to considering ways to more fairly distribute benefits and savings between CBPs and other programs, it is worth considering the value of CBPs for marketing other programs and the benefits gained. Here, we focus on ways to manage portfolio marketing dollars and CBP channeling effects to reduce the costs to the portfolio overall and how such reductions in costs may be "translated" into benefits for the CBP program in the form of a NEI.

One of the central benefits of CBPs is that they provide a direct line of communication between the utility and the customers, and are frequently sent to a large number of utility customers. If we think of CBP programs as communications and marketing tools as well as efficiency programs, it is worth considering the potential monetary savings to the portfolio if CBPs are better leveraged to promote other programs. In Table 5 below, we outline two scenarios and the potential avoided marketing costs if marketing material was added to HERs, an already existing practice, in lieu of using standard postcards to promote a program effort.

Table 5. Estimated avoided marketing costs if HERs are used in lieu of postcard mailers

	Cost of Postcard	Number of HER Participants	Frequency of Report	Avoided Marketing Cost if HER is Used Instead of Postcards
Scenario 1	$0.471*	76,544	7	$252,366
Scenario 2	$0.471*	76,544	6	$216,313

*Cost per postcard, including postage, from a recent direct mail campaign.

For a program of roughly 75,000 HER participants, the savings range from roughly $200,000 to upwards of $250,000 in marketing costs depending on the frequency of reports and the amount of promotional activity in each report. Even if CBPs have costs associated with marketing campaigns, the savings for the portfolio overall are significant. If we further consider that HERs have the ability to promote multiple programs simultaneously, then the dollars saved could be even more dramatic if program teams use HERs as a marketing tool.

This method would help offset savings adjustment disincentives by reallocating the marketing dollars saved to benefits for the CBP. Drawing on the avoided cost estimates cited above, we demonstrate the impact of including the estimated dollars saved to marketing as an added benefit to the CBP. In Table 6 below, we detail how adding a marketing benefit shifts BCR and the overall net benefits in favor of the CBP. If used, this approach would offer an incentive to CBP implementers and program administrators to cross-promote other programs. This approach, unlike the level-of-influence approach, does not remove benefits from traditional programs while also fairly "compensating" CBPs for their efforts to promote other programs.

Table 6. Estimated BCR variation under benefit scenarios 1 and 2

	Benefits	Costs	B/C Ratio	Net Benefits
As Filed	$1,055,195	$743,407	1.42	$311,788
Scenario 1	$1,307,561	$743,407	1.76	$564,154
Scenario 2	$1,271,508	$743,407	1.71	$528,101

By allocating certain avoided marketing costs as benefits, several things have been accomplished:

1) The benefits of the CBP are appropriately adjusted to offset hits to savings from double-counting adjustments.
2) The BCR is increased, thereby improving the overall program benefits at over a 50% increase.
3) Customers are encouraged to participate in a broader range of programs through the same vehicle that provided energy feedback. By bringing these two points of communication closer together, program marketing may be even more effective than through standard postcard and insert channels.

Marketing Cost Reallocation

Alternatively, if we reallocate the costs of the CBP by the amount spent by umbrella marketing efforts to acquire a new customer for other programs, we would see a similar increase in CBP benefits. Practically speaking, there are clear benefits to the portfolio if dollars used to drive program participation are allocated to umbrella marketing costs.

The primary benefit of allocating CBP dollars to marketing, where appropriate, is that it decreases program expenses while keeping benefit levels the same. If we reallocate dollars in this way, the additional efficiency funds could be used to fund other behavioral initiatives or pilots. For example, a cold water detergent program is a very attractive program but it may not be cost-effective as a stand alone measure. Utilities are interested in promoting cold water detergent as a behavioral measure because it allows customers to take action without making any large capital investments. Further, if customers continue to wash in cold water after the subsidized detergent is finished, utilities may be able to claim persistence of savings or market transformation effects.

Further, CBPs provide an attractive distribution channel for coupons for cold water detergent because of their wide reach and are a simple supplement to the CBP effort. A fully subsidized bottle of detergent may be the best way to get a customer to use the product and switch their clothes washing behavior. Fully subsidizing a bottle of detergent, however, is likely not cost effective but when bundled with other behavioral initiatives, the program as a whole may be cost effective.

Table 7 shows examples of the incremental net benefits that are generated from reduced behavioral program costs due to allocating certain costs to the marketing “bucket”. We then show how the change in net benefits can be reallocated to other programs, such as a fully-subsidized cold water detergent program, which can have positive portfolio effects while still keeping the programs cost-effective.

The first portion of Table 7 shows how program net benefits increase as costs decrease from allocating varying percentages of CBP costs to marketing. The range of net benefits gained under these scenarios range from $311,788 to $466,788. We then show how many bottles of cold water detergent could be fully subsidized by the utility, only using the increases in net benefits. Assuming that a bottle of cold water detergent costs approximately $18, anywhere from 1,878 to 7,513 bottles could be fully paid for by the utility. We further demonstrate how many therms would be saved in the cold water detergent program under these scenarios and what such savings would represent as a percent of NSTAR Gas’ 2011 behavioral program goal. Finally, the last

section of the table shows how overall behavioral program costs have not changed but benefits and BCRs have slightly increased.

Table 7. HER net benefits applied to offset cold water detergent costs

	BCR	**Benefits**	**Costs**	**Net Benefits**
As filed	1.42	$1,055,195	$743,407	$311,788
5% to Mrktg	1.49	$1,055,195	$709,657	$345,538
10% to Mrktg	1.56	$1,055,195	$675,907	$379,288
15% to Mrktg	1.64	$1,055,195	$642,157	$413,038
20% to Mrktg	1.73	$1,055,195	$608,407	$446,788
	Incremental Net Benefits	**Bottles of CW detergent**	**Additional therm savings**	**% of 2011 program gas goal**
As filed				
5% to Mrktg	$33,750	1,878	6,592	2%
10% to Mrktg	$67,500	3,756	13,184	5%
15% to Mrktg	$101,250	5,634	19,777	7%
20% to Mrktg	$135,000	7,513	26,369	10%
	New BCR	**New Benefits**	**New Costs**	
As filed	1.42	$1,055,195	$743,407	
5% to Mrktg	1.43	$1,060,700	$743,407	
10% to Mrktg	1.43	$1,066,205	$743,407	
15% to Mrktg	1.44	$1,071,712	$743,407	
20% to Mrktg	1.45	$1,077,217	$743,407	

By more accurately allocating some program costs to marketing, several things have been accomplished:

1) A new energy saving product was put in the hands of consumers that might not otherwise receive it.
2) Between 2% and 10% of CBP gas goals were achieved with no substantial impact to program budgets.
3) Customers are encouraged to take a persistent and simple behavior change. We note that detergent savings numbers are likely understated from the utility point of view because any continued change of behavior, i.e. continued cold water washing, would result in longer measure life or savings persistence.

Discussion and Conclusions

In this paper, we have outlined three distinct approaches to allocating costs and benefits associated with cross-program participation between CBPs and traditional programs: (1) assigning benefits based on self-reported level-of-influence "Level of Influence Adjustment", (2) a marketing non-energy impact (NEI) that can be assigned as a benefit to CBPs "Marketing NEI Adjustment," and (3) reallocating CBP costs to marketing dollars for cross program

participation "Marketing Costs Reallocation." Each of these three scenarios aims to offset the disincentives in cross program promotion as a result of double-counting adjustments to CBPs.

When compared one to the next, each approach has a different impact on the BCR and resulting net benefits of CBP efforts. Table 8 below compares these approaches to one another to examine their relative impact on CBP programs. Examining these results, we find:

- The "level of influence" approach has the highest BCRs. This approach requires more admin and evaluation dollars allocated to determining the level of influence and may not be the most cost-effective approach to adjusting benefits.
- The marketing benefits scenario is the most straight-forward. By assigning marketing dollars saved to the benefits of the CBP, we produce a higher BCR which more directly encourages cross-program promotion. While this may not impact the overall savings if this "incentive" is successful, the overall gains to the portfolio may be great. Further, the upward BCR adjustment from the marketing NEI may offset any hits to the BCR caused by jointly produced savings being channeled away to other programs.
- The final approach, reallocating marketing costs associated with cross-program promotion to other budgetary buckets, generates net benefits that fall roughly between the level of influence approach and the marketing benefits approach. It is a simple approach to adjusting the BCR and may also allow program managers to experiment with new initiatives in order to optimize behavioral programs.

Table 8. Estimated savings and benefits under different cross-program adjustment scenarios

Scenario	Program Costs	Program Benefits	BCR	Gas Savings (therms)
As Filed	**$743,407**	**$1,055,195**	**1.42**	
Level of Influence: 25%	$885,104	$1,409,875	1.59	
Level of Influence: 50%	$1,026,801	$1,764,531	1.72	
Level of Influence: 75%	$1,168,499	$2,119,211	1.81	
Marketing Benefits Assessment: Scenario 1	$743,407	$1,307,561	1.76	
Marketing Benefits Assessment: Scenario 2	$743,407	$1,27,508	1.71	
Detergent Scenario at 5% to Marketing	$743,407	$1,060,700	1.43	6,592
Detergent Scenario at 20% to Marketing	$743,407	$1,077,217	1.45	26,369

At minimum, we hope this paper demonstrates that "fairness" in attribution of costs and benefits supports the overall portfolio. By carefully managing behavioral programs as part of a portfolio strategy, rather than one program among many, we demonstrate how the whole is greater than the sum of its parts.

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