Estimating elasticities with frontier and other regressions in evaluating two advertising strategies for US Army recruiting

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Abstract

To help resolve a long-standing debate in the US Government on advertising strategies for military recruitment, this study applies ordinary least squares (OLS), which here includes (1) stochastic frontier analysis (SFA) and (2) frontierized least squares (FLS), to evaluate two distinct advertising strategies: Service Specific vs. Joint. Thus, in contrast to the customary use of a single central tendency method, such as OLS, on different models, we here use multiple methods on a single model to cross check and validate results. In addition to serving as cross checks, the methods can be used to identify classic problems, including biases in the data and shortcomings in one or more of the methodologies employed. To avoid dealing with problems on identifying motives underlying various patterns in advertising expenditure, data are drawn from a statistically designed experiment where the expenditures were controlled as part of the experiment to resolve the issue of a choice between the two advertising strategies of interest. In contrast to earlier studies, the current paper finds that all methods used lead to the same conclusion: Service Specific is more efficient than Joint, at least for the US Army—which is, by far, the largest military advertiser. Finally, the paper introduces a new method for reallocating advertising budgets between the Uniformed Services which (a) is simpler than the customary use of cross partial derivatives, (b) avoids the need for the *ceteris paribus* assumptions for each such allocation, as in customary reallocation methods and

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(c) simplifies matters so that, for instance, it is not necessary to introduce an entirely new organization to administer the desired coordinating activities.

1. Introduction

Military recruitment, with advertising as an important component of the effort, is of great importance, especially for the US Army in the current US social and political setting. A long-standing issue involves the balance between "Joint" advertising, which is directed to making a military career attractive, and "Service-Specific" advertising, which is directed to securing enlistments for each service—Army, Navy, Air Force, and Marines. This topic, we might note, is analogous to the issue of "category" vs. "brand" advertising in commercial practice—e.g., "drink orange juice" vs. "drink a particular brand." Hence, the approaches used in the current study have more general applicability, and include commercial as well as military recruitment advertising. (See the penultimate section of the paper for an illustrative application with a new method for coordinating such activities.)

The problem of choice between Joint vs. Service-Specific strategies was again brought to the fore in a presentation to the Department of Defense (DoD) by the advertising firm of Bozell-Eskew [1]. It recommended "an exponential increase in the Joint advertising budget"—in which advertising would be directed to promoting a favorable feeling toward the military lifestyle. This recommendation was partly due to a similarly oriented (earlier) recommendation by the US Congressional Budget Office (CBO). However, neither Bozell-Eskew nor CBO offered any empirical evidence in support of their respective recommendations.

This is an issue of great and abiding importance for the military services[6]; so, partly in response to the CBO recommendation, DoD had earlier commissioned an empirical study that was undertaken by the Wharton Center for Applied Research (WCAR) at the University of Pennsylvania. For this purpose, WCAR, in collaboration with the RAND Corporation (RAND), undertook to develop a statistically designed experiment, called the Ad-Mix Test, to develop data designed to address this issue. So far as we know, this effort produced the only data specifically directed to the issue of whether Joint was more efficient than Service-Specific advertising for recruits. See the National Research Council Report [3, p. 84].

Here, we begin by reviewing several studies that used these data to address the same issue. Note that each used different methodologies for reasons that will soon become apparent. These methodologies included data envelopment analysis (DEA) and ordinary least squares (OLS) regressions, as well as two types of "frontier regressions." The issue of the efficiency with which the advertising and recruitment efforts were conducted is thereby surfaced.

Inter alia, the DEA study showed that the Ad Mix experimental design yielded data that are heavily biased in favor of efficient performances by Joint. (See the discussion of Table 1, below). Adjustments were therefore undertaken that included a two-stage combination of DEA and OLS regressions, which we refer to as frontierized least squares (FLS) as one of the two frontier regressions we use in this paper. Importantly, the resulting "frontier estimates" produced results that are highly favorable toward Service-Specific advertising.

Remark. One issue addressed in the current paper involves customary uses of OLS that provide central tendency estimates of the elasticities in question. However, when inefficiency is present in the recruitment (and/or advertising) process, the resulting OLS estimates of elasticities are ambiguous: an increase in the dependent variable (= recruits) can then be achieved without increasing any input (such as advertising expenditures) by simply eliminating the inefficiency and, conversely, the output need not be decreased by

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[6]See, for example, the article by Kiley [2] in *Business Week* which reports that US Army spending on recruitment marketing for fiscal 2006 was at $320 million, and up from $220 million in 2004. It concludes that even this amount may not be sufficient "With polls showing that a majority of Americans have turned against the [Iraq] war, the Army's marketing corps can expect to see plenty of action. See also the National Academy study on military recruitment edited by Sackett and Mavor [3].