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Information and Advertising: Multivariate Matching with Campaign Exposure

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1. In Brief

I investigate the impact of campaign exposure on individual political knowledge with a potential outcomes framework. Utilizing multivariate matching with exposure, I find that individuals *learn* from campaign exposure.

2. Questions

- Do campaign advertisements affect individuals' political knowledge?
- Is it appropriate to think of presidential campaign exposure as a dichotomy?
- How can one properly match on an ordinal treatment?

3. Overview

- I investigate the impact of campaign advertisements on political knowledge in the 2000 presidential election
- I model the relationship between advertisements and individuals' information with a potential outcomes framework: multivariate matching with exposure
- Multivariate matching with exposure allows for an ordinal treatment and expects a heterogeneous treatment effect
- I find that campaign advertisements increase individuals' understanding of candidate policy platform knowledge
- Extant literature has underestimated such an effect due to an unnatural dichotomization of campaign exposure

4. Methodological Hurdles: Endogeneity and Confounders

- Campaign exposure and political information are correlated, in so far as those of greater political information are likely to seek out campaign related information (Zaller 1992)
- Campaigns are targeted and exposure to campaigns may be dependent on various political characteristics, demographics, and news consumption habits
- Difficulties associated with properly modeling the endogeneity and the potential confounders have hampered the contributions to this scholarship
- Such issues demand a method that can control for the confounders and properly operationalize exposure to campaigns

5. Methodological Solution: Multivariate Matching with Exposure

- In matching treated subjects to untreated controls various distances present themselves
- However in matching with an ordinal treatment, the algorithm for an optimal match is more complicated
- The procedure must match observations according to their covariates, while simultaneously distancing observations according to the ordinal treatment
- Consider the linear distance between covariates and the distance between doses as a single distance equation (Lu et al 2001)
- Close on covariates and far on amount of exposure

6. Data: 2000 Presidential Election

Annenberg

- 1992 observations from the post-election
- Dependent Variable: political information
- 10 point index of political questions
- In this presentation I have limited the questions to candidate policy platforms
- However the effects of exposure on various other dimensions of information is at the core of my dissertation
- Covariates: political variables, demographics, and news consumption

WiscAds

- Treatment Variable: Campaign Exposure
- Quantity of presidential campaign advertisements by DMA from Wisconsin Advertising Project

Dependent Variable

Dependent Variable: Political Information Information Index
Which favors suing HMOs
Which with biggest tax-cut
Which with biggest increase in social security
Which pay down national debt most
Which use Medicare to cut taxes
Each on prescription drugs for seniors
Each on abortion

Treatment Variable

Treatment Variable: Presidential Campaign Advertisements

	Freq.	Percent	Cum.
1 = Low	540	27.11	27.11
2	295	14.81	41.92
3	386	19.38	61.3
4	430	21.59	82.88
5 = High	341	17.12	100
Total	1,992	100	

Covariates Before Matching

Covariates and Their Rank Correlations with Amount of Campaign Exposure

	Kendall's τ	Std. Err.	P>z
Sex	-0.005	0.013	0.701
Party ID	-0.035	0.014	0.014
Age	0.003	0.015	0.829
Work Status	-0.003	0.013	0.845
Black	-0.002	0.007	0.754
Marital Status	0.013	0.012	0.292
Citizenship	-0.008	0.005	0.065
Religious Attendance	-0.039	0.015	0.007
Education	0.052	0.014	0.000
Income	0.066	0.014	0.000
Urbanity	0.064	0.015	0.000
Ideology	-0.033	0.014	0.017
Retrospective Sociotropic	0.050	0.013	0.000
Union	0.013	0.009	0.172
White	-0.003	0.009	0.770
Days/Week of TV News	-0.013	0.014	0.356
Days/Week of Cable News	-0.039	0.014	0.005
Days/Week of Local News	0.015	0.014	0.279
Days/Week of Newspaper	-0.019	0.014	0.181
Days/Week of Talk Radio	0.038	0.013	0.004
Internet Access	0.032	0.012	0.008

Non-bipartite, Optimal Matching Distance:

Consider a distance of values between the observed covariates of treated and controlled groups

$$\delta(x_k, x_{k'}) \geq 0$$

Also consider the distance between the amounts of campaign exposure

$$(Z_k - Z_{k'})^2$$

Thus the distance used here is simply

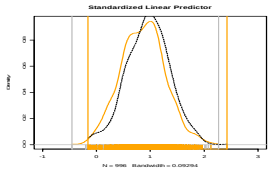
$$\Delta(x_k, x_{k'}) = \frac{(\beta^T x_k - \beta^T x_{k'})^2 + \epsilon}{(Z_k - Z_{k'})^2}$$

Covariate Balance

Covariate Balance: Means & Standardized Bias of 996 Matched Pairs

Covariate	Low Exposure	High Exposure	Standardized Bias
Sex	0.553	0.560	1.414
Party ID	0.072	-0.238	-14.818
Age	45.712	45.675	-0.231
Work Status	2.190	2.192	0.112
Black	0.070	0.077	2.687
Marital Status	0.628	0.648	4.176
Citizenship	0.967	0.951	-8.088
Religious Attendance	2.978	3.013	2.676
Education	5.051	5.242	8.103
Income	4.929	5.112	8.624
Urbanity	1.957	2.048	12.794
Ideology	3.231	3.127	-10.589
Retro. Sociotropic	2.725	2.772	5.852
Union	0.156	0.158	0.552
White	0.853	0.835	-4.985
Days/Week of TV News	3.928	3.937	0.333
Days/Week of Cable News	3.456	3.371	-2.885
Days/Week of Local News	4.304	4.492	6.906
Days/Week of Newspaper	3.821	3.647	-5.979
Days/Week of Talk Radio	1.832	1.989	6.044
Internet Access	0.660	0.673	2.767

Covariate Prediction of Campaign Exposure: Treatment vs. Control Groups



Average Effect of Campaign Exposure Treatment

Wilcoxon Signed-Rank Test

Avg. Treatment Effect of Campaign Exposure on Information		
Estimate	0.500	
P-Value	0.007	0.050
95% C.I.	0.000	
V	215015	
N	1992	
Matched N	996	

Genetic Matching for Comparison

Genetic Matching Avg. Treatment Effect for Treated	
Estimate	0.100
P-Value	0.501
AI Std. Err.	0.148
T-Statistic	0.673
N	1992
Matched N	771

Sensitivity Analysis

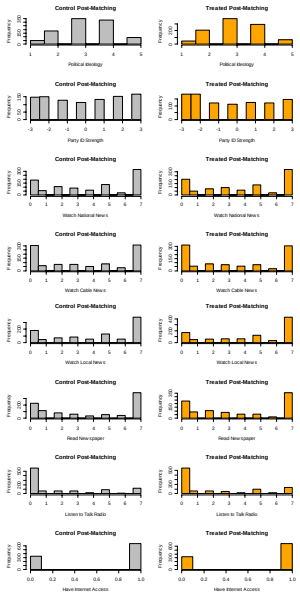
Rosenbaum Sensitivity Analysis for Wilcoxon Signed-Rank Test

Γ	Min. P-value	Max. P-value	
1	0.012	0.012	
1.05	0.002	0.054	
1.1	0.000	0.167	Γ
1.15	0.000	0.360	
1.2	0.000	0.588	
1.25	0.000	0.782	

Rosenbaum Sensitivity Analysis for Hodges-Lehmann Estimate

Γ	Min. HL Est.	Max. HL Est.	
1	0.500	0.500	
1.05	0.000	0.510	
1.1	-0.010	0.520	Γ
1.15	-0.020	0.530	
1.2	-0.030	0.540	
1.25	-0.040	0.550	

Post-Matching Covariate Balance: Distributions of Potential Confounders



7. Post-Matching Balance

- Balances one to one on all observations for a total of 996 matched pairs
- Strong balance on all covariates, in particular the self-reported news consumption variables
- Mean scores are virtually identical – as are the distributions; most with small standardized bias
- Standardized linear prediction of exposure is a match for treated and controlled

8. Results: Treatment Effect of Campaign Advertisements on Political Information

- Advertisements increase individual's level of information on candidates' policy platforms
- Hodges-Lehmann point estimate is .5 with a p-value < .01
- On average we should expect about a half of a point more information for those in locales with more presidential campaign advertisements
- In other words, they do about 5% better on the policy platform exams than their less exposed counterparts

9. Compare Results to Dichotomous Treatment Effect

- Genetic Matching on the same data gives null results
- There is no effect for a dichotomous treatment of campaign exposure on political information

10. Results: Rosenbaum Sensitivity Analysis

- Range of possible magnitudes of hidden bias, measured by Γ
- Want to know the impact of hidden bias: how large the odds of treatment due to unobserved pre-treatment differences would have to be to change the results
- Here, if I forgot to control for a key covariate, that covariate would have to be at least Γ=1.1 times more common among the treated to result in bias that could qualitatively change the conclusions of the study

11. Take Away Points:

1. Exposure to campaign advertisements increases individuals' knowledge of candidates' policy platforms
2. Operationalizing campaign exposure as a dichotomy may underestimate such a finding
3. Multivariate matching with exposure is non-bipartite and optimal (Derigs 1988), and appropriate for a host of social science questions that expect heterogeneous effects

12. The Larger Project

- Dissertation: The Electoral Intersection: Information and Context
- Are general indices appropriate measures of political knowledge?
- If not, as I maintain, which dimensions of political knowledge are impacted by campaigns?
- Compare questions of candidate biographies, policy platforms, and general political institutions
- Analyze intersection of exposure (contextual level) and reception (individual level)

Preview

- Advertisements also increase individual's level of information on candidates' biographical backgrounds
- Advertisements have no effect on individual's level of civic or institutional information
- The interaction between campaigns and political behavior have different effects conditional on the kind of information