

# Pre-Analysis Plan: Matching Experiment

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## Trial Title

Estimating the Causal Effect of Matching on Fundraising Velocity

## Analysis Plan

The analysis plan has three steps:

### 1. Validation

We will first isolate the sample to complier loans (including both treatment and control compliers). In this sample, loans are matched exogenously, based on our randomization. We will compute the *experimental* average treatment effect of matching by regressing outcomes on a matched indicator and controls. This will recover the difference between matched (treatment complier) and unmatched (control complier) loans in Part A.

Then, for loans in this sample, we will use machine learning methods to predict this experimental result using the Part B hypothetical responses, using the method described in our working paper (Bernheim, Björkegren, Naecker, & Rangel, 2013).

### 2. Demonstration with confounded sample

We will next mimic the estimates that could be attained with observational data. We will isolate the sample to loans that we had intended to be in control (including both control compliers and control always takers). In this sample, loans are matched endogenously based on the criteria of the other matching organizations.

We will compute the *observational* average treatment effect of matching by restricting to a random sample of control loans and regressing outcomes on a matched indicator and controls. This will measure the difference between matched (control always takers) and unmatched (control complier) loans. We will compare this estimate to the experimental estimate derived in step 1 to assess bias from endogenous treatment assignment.

Then, we will attempt to correct for endogenous treatment using our non-choice response procedure. We will use our non-choice responses from Part B for this sample of loans. We will use machine learning to estimate the mapping between observed responses, and non-choice responses for the observed state of the world.

Then, we recover a corrected treatment effect using the mapped difference between non-choice responses in the observed state of the world, and those in the counterfactual state of the world.

By comparing these corrected responses we will isolate the impact of treatment from endogenous treatment selection.

### **3. Heterogeneous treatment effects**

Our framework also allows us to estimate the treatment effect for each loan, because we observe hypothetical responses under both the treated and untreated state of each posting. We will consider heterogeneous average treatment effects in different subsets defined by loan characteristics, including for example loan sector, amount, and risk rating, as well as interactions between loan characteristics.

Within the set of complier loans, for each subset, we will estimate the experimental treatment effect as in step 1, by regressing outcomes on a matched indicator and controls.

We will then compute parallel estimates using our hypothetical model estimated in step 1, for each loan in the control complier subset.

We will then compare the experimental and hypothetical treatment effects, analyzing the correlation, and slope of the relationship.

We may also report whether matching funds cannibalize contributions, by comparing the experimental treatment effect between sectors with low and high randomized match rates.

## **References**

Bernheim, B. D., Bjorkegren, D., Naecker, J., & Rangel, A. (2013). *Non-Choice Evaluations Predict Behavioral Responses to Changes in Economic Conditions* (Working Paper No. 19269). National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w19269>