INCREASING SURVEY PARTICIPATION RATES

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Contents

Abstract

Do social good or monetary incentives impact survey taking behavior (time spent and number of questions answered?

Studies show that people respond to surveys because of three reasons – altruistic (wanting to help society), egoistic (monetary incentives), and motivations associated with the aspects of the study (topic interest). Many studies rely on survey participants to be successful; therefore, gaining a better understanding of what drives an increase in survey participation rates may benefit these studies. In this study, we test the effectiveness of social good and financial incentives for online surveys. We divide our survey population into two treatment groups (social good incentive and financial incentive) and one control group (no incentive). We measure participant time spent, and the number of questions answered on the survey and analyze differences between each treatment group and the control group. Our analysis results showed the data is not statistically significant. Therefore, through this analysis, we failed to conclude that results on survey-taking behavior, particularly time spent, and the number of questions answered, are affected by each treatment and control group.

Background

Past studies have proved that monetary compensation increases survey participation rates. In 2016, DeCamp and Manierre conducted a study to test the impact of financial incentives on undergraduate students for online surveys. For this study, individuals either received $5, $2, or nothing for their participation. They implemented this by sending different invitations to each group to participate in the study. They found that the payment of $5 did increase online survey participation when compared to the control group. Previous studies have proved the effectiveness of financial incentives on survey participation, but this study focused on conditional incentives and online surveys, areas which had previously shown mixed results.

In addition, we believe that having the ability to benefit others through participating will also increase the participation rate. Helping others can make individuals [happier and contribute to a sense of purpose and meaning](). Qualtrics discusses the importance of [using cognitive dissonance to increase survey response rates](). Framing surveys to be in line with participants' values and beliefs can increase survey participation. If people want to help others and have a sense of purpose, then including this in the survey may cause increased participation. There are studies that investigate the impact of non-monetary incentives (goods and services) on response rate as well as on employee incentive programs. The paper that explored employee incentive programs did so through a psychological and economic lens, discussing past experiments to back their theories and explanations. However, we were unable to find studies that investigated the impact of social good on survey participation rates. In addition, this study will be able to compare the positive impact group to the financial incentive group to see if one has a larger impact than the other, if at all. This is a new perspective to take when compared to past research.

Research Question

Based on past experiments, we believe that monetary gain is a mechanism that motivates people to volunteer their time to research studies. In addition, we believe that the feeling of contributing to a specific social good is another mechanism that motivates people to volunteer their time to research studies. To test these hypotheses, we will implement the following research question:

Do social good or monetary incentives impact survey taking behavior (time spent and number of questions answered?

Hypothesis
- Ho: No treatment effect for either monetary incentives or social good for people responding to surveys.
- Ha: Positive treatment effect for monetary incentives or social good for people responding to surveys.

Experiment Design
Treatment and Control Groups and Sample Size

Treatment and Control Groups:
- Control Group: No survey incentive
- Treatment Group 1: monetary incentive
- Treatment Group 2: social good incentive

Through a power analysis, we determined that we need around 125 participants for each of our three groups, totaling 375 survey participants.

Figure 1: Power simulation chart showing the three scenarios and the appropriate sample sizes needed for each.
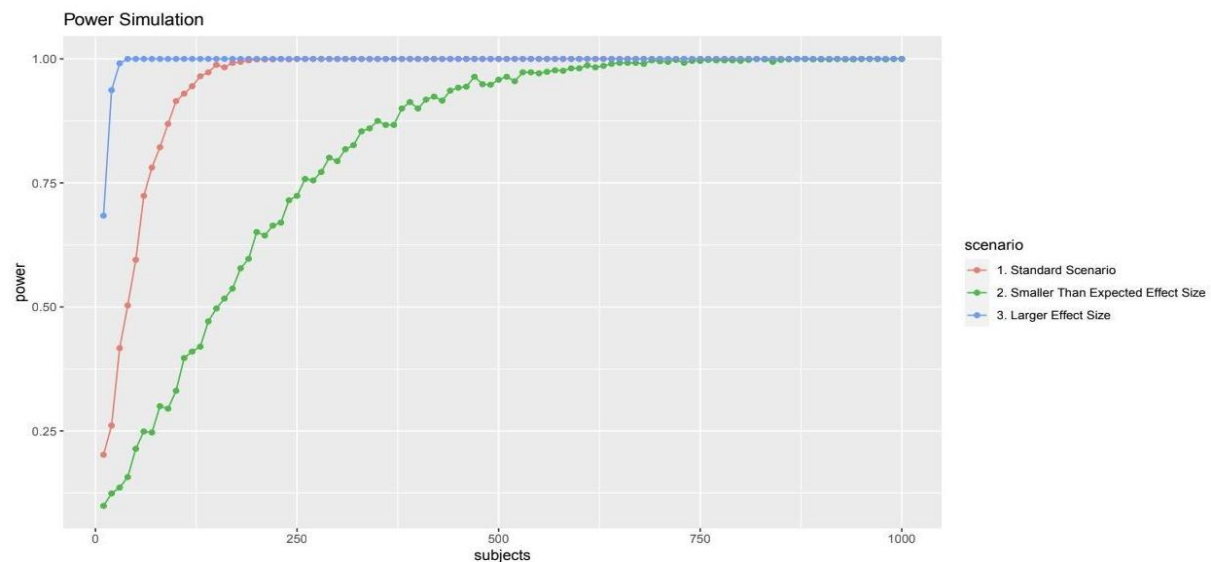
Project Timeline

Creating the Survey	Pilot Study Data Collection	Updating the Survey	Final Study Data Collection	Data Analysis

7/1/2022 –	7/10/22 –	7/12/2022 –	7/15/2022 –	7/25/2022 –
7/10/2022	7/12/2022	7/15/2022	7/24/2022	7/28/2022

Survey Design

We designed our survey in Qualtrics. Our survey begins with a pre-survey questionnaire, with questions to collect covariate data:
- How the participant received the survey (via Slack, Berkeley email, Facebook, Linkedin, or Other).
- Likelihood they will complete the survey
- Time willing to spend on the survey
- Demographics: gender, age, ethnicity, education, employment status

From there, the participants are randomly assigned to the control group or one of the treatment groups. At this point, they will receive the treatment/control messaging:
- **Control Group Message:** "Now that we got a sense of who you are, we are inviting you to complete the rest of the survey regarding employment and unemployment. All your responses will be kept confidential and anonymous. Thank you for your participation."
- **Monetary Incentive Treatment Group Message:** "Now that we got a sense of who you are, we are inviting you to complete the rest of the survey regarding employment and unemployment. You will be entered to win one of five $25 Amazon gift cards for your time. All your responses will be kept confidential and anonymous. Thank you for your participation."
- **Social Good Treatment Group Message:** "Now that we got a sense of who you are, we are inviting you to complete the rest of the survey regarding employment and unemployment. By taking part in this study, you will help contribute to research on unemployment mitigation. The results of this study will be used to promote job security and help individuals navigate unemployment and its risks. All your responses will be kept confidential and anonymous. Thank you for your participation."

We measure the time each user takes to read the messaging to ensure they have received the treatment. In addition, we keep the treatment present over the course of the entire survey to increase our effect size of the treatment and to ensure users do not forget about their treatment.

After the control and treatments were assigned, each participant received a long, 100 question survey. The survey included both multiple choice and open-ended type questions. The motivation of having a very long survey stemmed from the fact that if we wanted to measure any real difference in engagement among different groups, a short survey won't tell much since most of our participants will just finish it all. We took time spent on the survey as well as the number of questions completed on the survey as our outcome measurements. We also include survey questions throughout to check that each participant is reading the survey rather than just speeding through the questions and clicking boxes. In the end, we compare the number of questions answered and time spent on the survey for our control and two treatment groups to determine if the treatments do impact the participants' willingness to participate in the survey. We include covariates in our analysis to control for factors that may add variation to our data.

We also hold a pilot study to fix any bugs in our process and gain a better understanding of how things are going before we launch our final study.

Recruitment

We conducted our experiment in two stages. First, we held a pilot study with friends and family to ensure our survey and data collection methods were working as expected and getting feedback to improve our process. Then we ran our final study.

Modifications based on the pilot study

The pilot group was smaller than the final sample, with 35 participants. From the pilot study, we could identify that the messages we displayed for the treatment group needed to be positioned with similar colors and fonts. Based on these findings, we adjusted to make the treatment group messaging look alike. Running through this exercise gave us the confidence to distribute the survey to larger groups. Also, this ensured us that the randomization in treatments was working.

Final Study

From there, we began our final study, collecting data by posting the survey link with a short message on slack channels, LinkedIn, Facebook, Instagram, etc. We also utilized Mturk for 215 responses since we couldn't meet our sample goal without it. Through this process, we collected 417 samples, with 139 each in the financial incentive treatment group, the good social incentive treatment group, and the control group. We acknowledge that our sample of participants is not a random sample from the overall U.S. population; therefore, our conclusions in this paper may not be generalizable.

ROXO Grammar

The first step was randomization by Qualtrics. This was the "R" notation that makes our experiment results valid as we have randomized covariates between the different survey versions. Following the initial randomization (33.33% in the control group and both treatment groups), participants were assigned to a survey version and were given the survey. We estimated that our survey had reached over 1000 people, out of which 417 people clicked on the survey. This is the "N" in the ROXO grammar. Then in the survey assignment, each randomized survey is assigned to the control group, which is the "ROY," and the treatment groups assigned financial treatment, which is the "RX1Y," and assigned social treatment, which is the "RX2Y" in ROXO grammar.

Figure 2: ROXO diagram noting our experimental design.
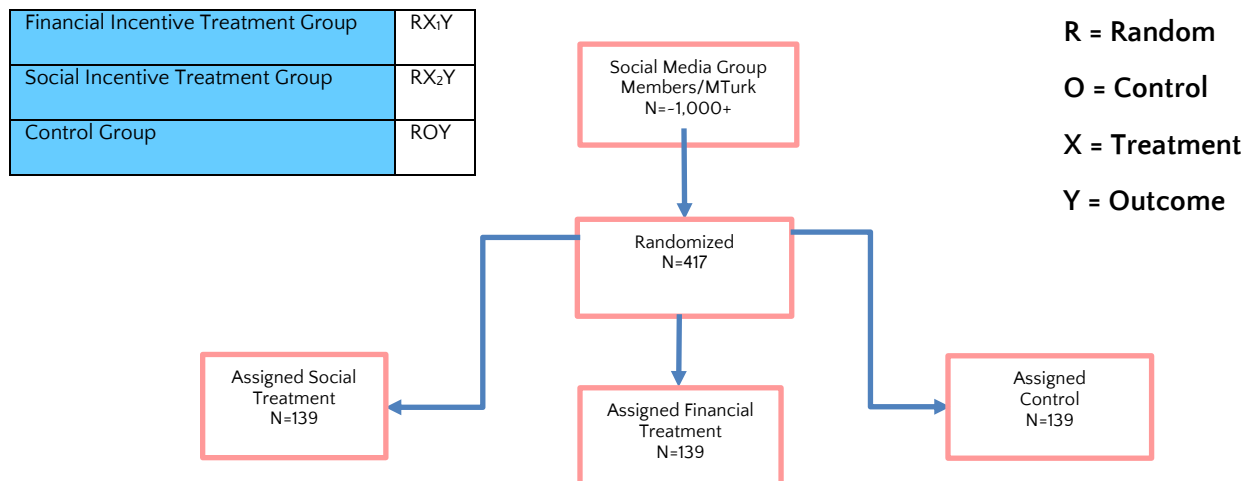
Main Study Findings

Data Prep

We started with data cleaning and removing outliers. In the data, we identified three outliers in the minute variable where the time taken for the survey was over 500 mins. We also identified a few IP addresses who had taken the survey more than once. Before proceeding with the analysis, we removed the outliers in the minute's variable. We also removed the duplicate IP addresses and kept only the record with the first-time stamp as we wanted the data to be independent as the later attempts will depend on the first attempt.

Exploratory Data Analysis

Now that the main study data was prepped, we examine the distribution of the data both to ensure that the study design ran as anticipated and to understand better the population of respondents that comprise the sample.

First, we looked at the outcomes of total time spent on the survey and total questions answered across the treatment and control groups. We checked this information with the outliers and without the outliers. Below box plots and histograms represent this information. After removing the outliers, the data shows the total time spent on the survey by both treatment and control groups are evenly distributed. There is little difference in the total number of questions answered with and without the outliers. Also, more people answered all questions in the control group compared to the treatment groups. Interestingly, the number of people who did not answer questions is higher for the financial incentive group than for the other two.

Figure 3: Box plot showing the spread of both outcomes by groups with outliers included.
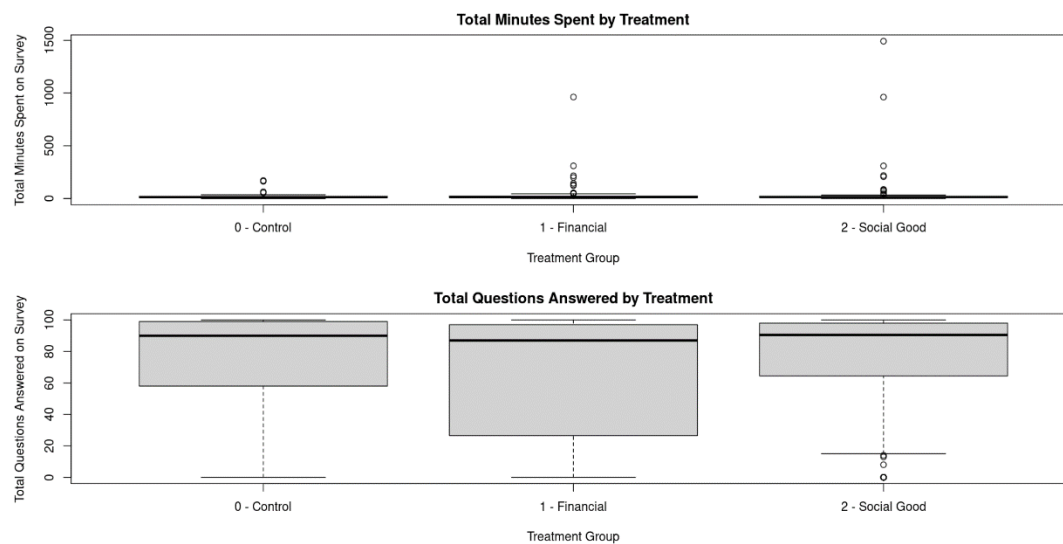
Figure 4: Histogram showing count of both outcomes with outliers included.
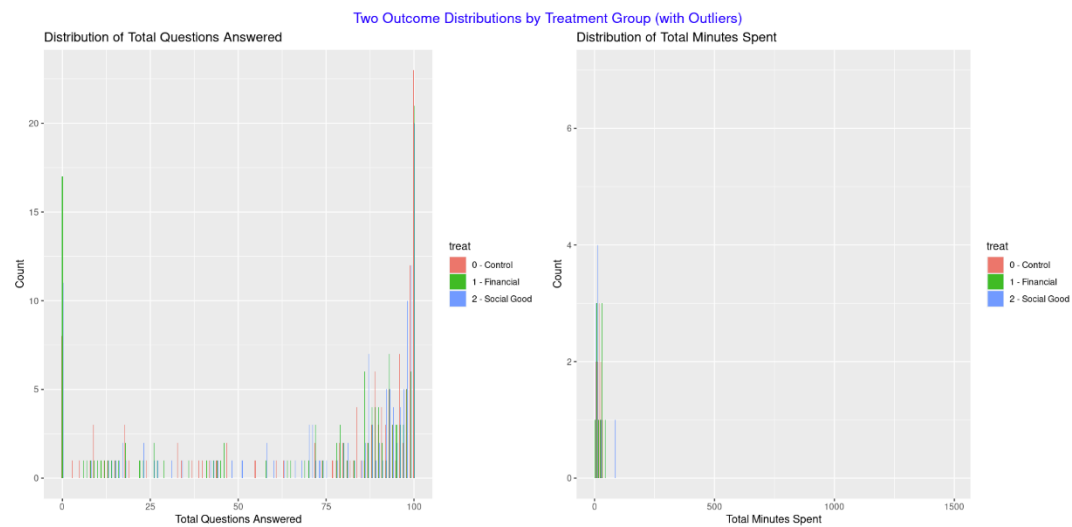
Figure 5: Box plot showing the spread of both outcomes by groups with outliers removed.
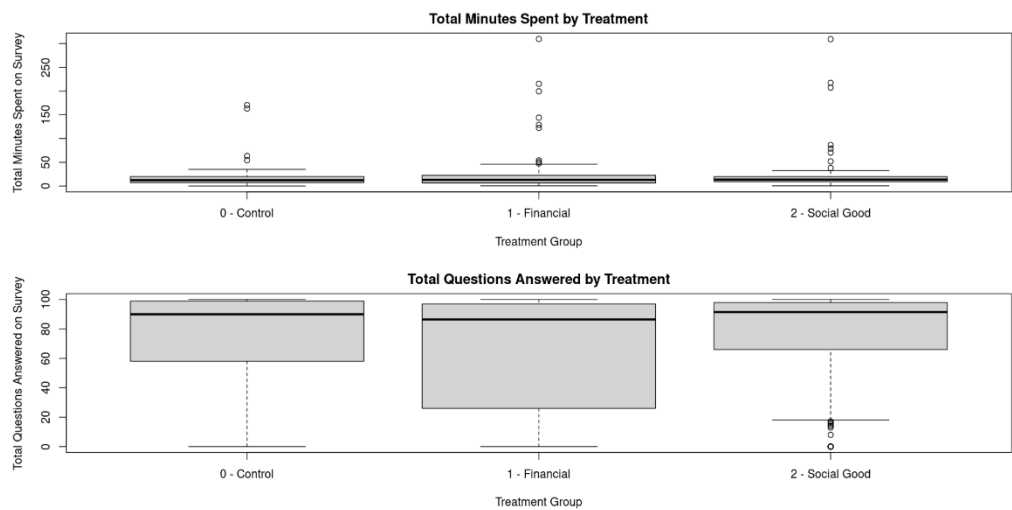
Figure 6: Histogram showing count of both outcomes with outliers removed.
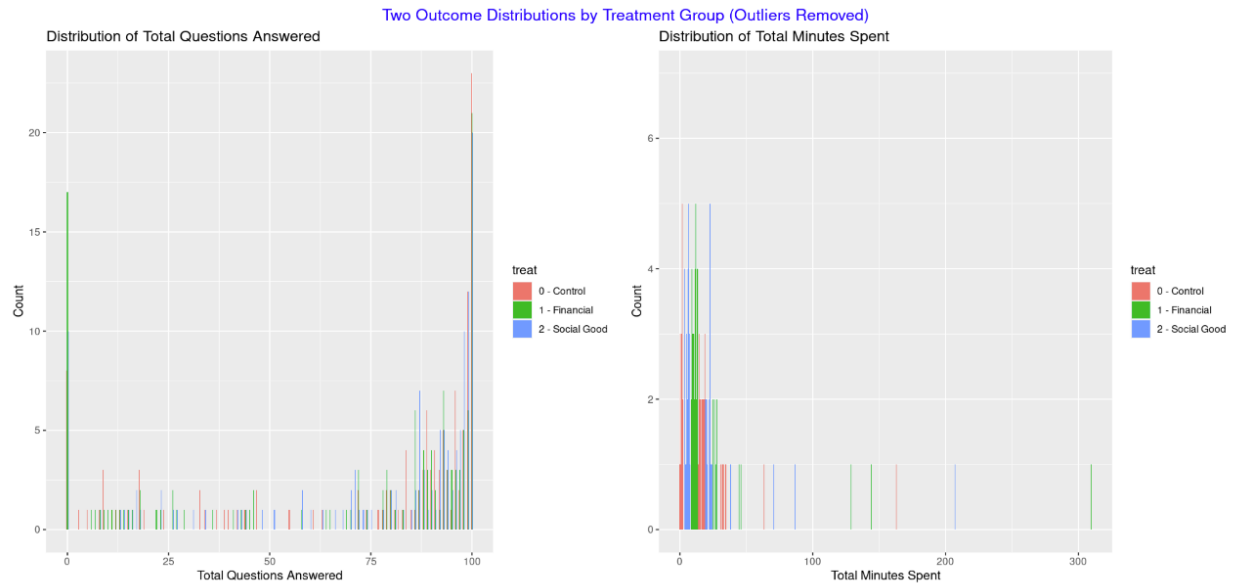
Figure 7: Boxplot of both outcomes with points overlaid outliers removed.
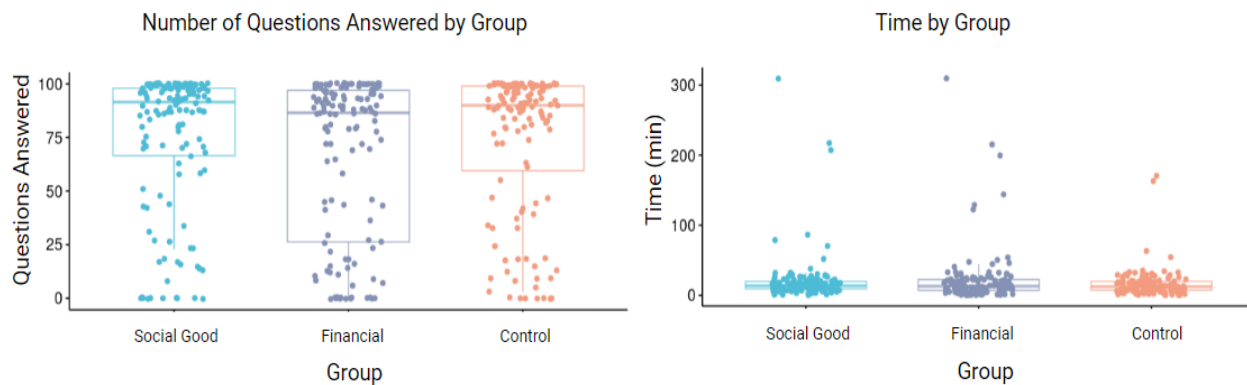
We also had random questions placed in equal intervals in the survey to check if the treatment and control groups were paying attention to the questions before answering. We performed the EDA for treatment and control groups. Below is the histogram showing the results of the treatment and control groups.

Figure 8: Bar plots representing distribution of survey check questions among the control group.
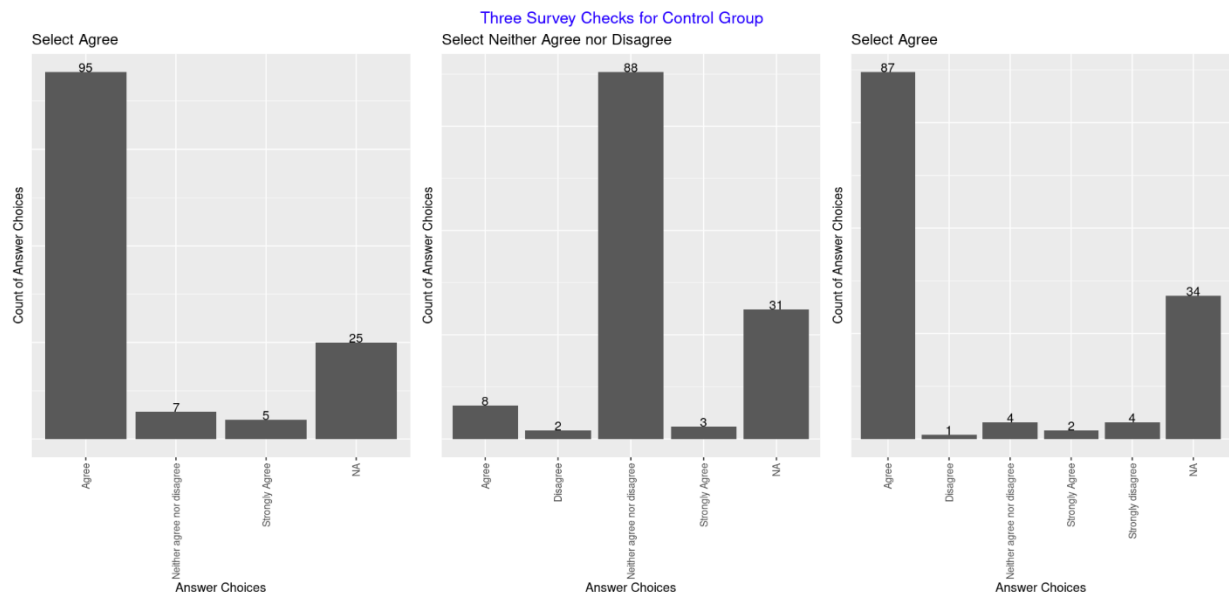
Figure 9: Bar plots representing distribution of survey check questions among the financial group.

Figure 10: Bar plots representing distribution of survey check questions among the social group.
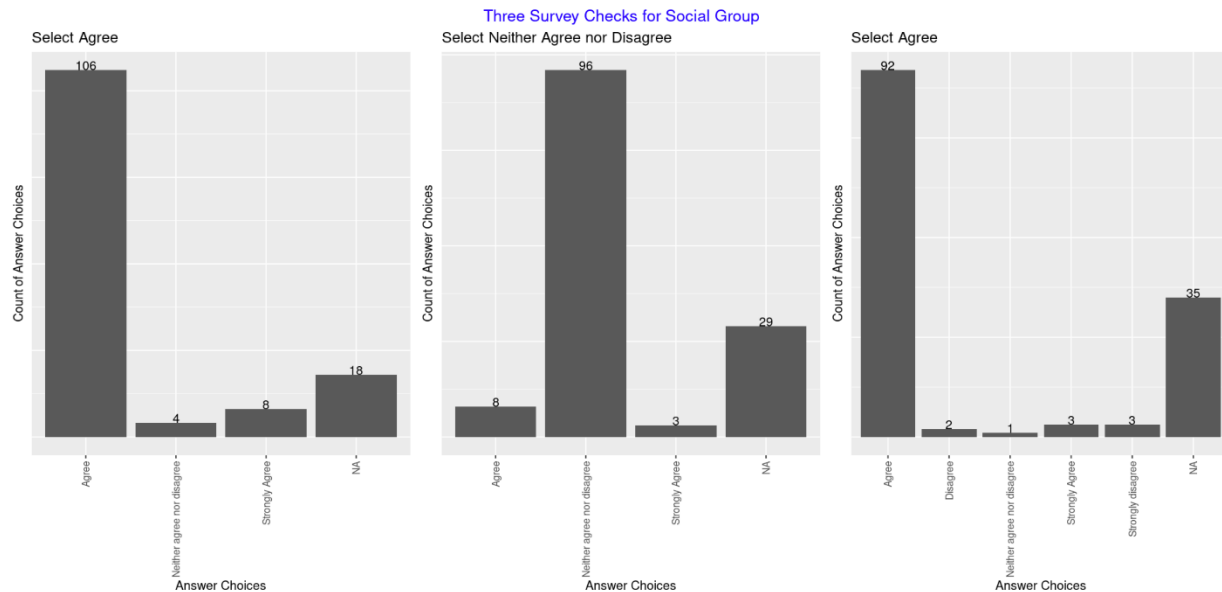
The above bar charts show that among the three groups, not all the people answered the questions correctly. Further breaking it down, it shows that the number of people who answered the first question correctly is higher than the second and third. Also, the number of people who answered the 2nd question correctly is more than the 3rd one. This shows that as the survey progressed, people's attention span reduced. Also, another interesting observation is that the social incentive group has a higher number of people with correct answers than the financial and control group. People might be more motivated to answer the survey for social good.

Attrition and Non-Compliance

The study we conducted was to identify the survey participation rate of individuals depending on whether they were randomly assigned to one of the treatment groups (social good or financial incentives). So, if the participant ended the survey without completing it is also considered survey participation; hence we did not have any attrition in our study.

Regarding compliance, once the participant clicked on the survey link, they were redirected to the survey page, which started with the introduction page and the message asking them to be part of a study. After that, there were a few demographic questions; once filled out and clicked, one of the treatment messages was randomly assigned and provided with a 100-question survey. We had both multiple choices and open-ended questions in the survey. The survey was designed, so the participant had to click next after the demographic questions. Once the survey began, every ten questions and every page of the survey was displayed with the treatment message. So, we know that the participant saw the messages. Therefore, we do not need to be concerned about the non-compliance effects.

Assumptions before Linear Modeling

- Randomization – assumption met as no relationship between covariates and treatment. Additionally, qualtrics assured each person was properly randomly assigned a treatment.

- Spillover – we don't think this should be a problem since there is only one survey. We think it is unlikely that individuals will discuss the survey, and if they do it will most likely be after they have completed the survey. Therefore, this will not have an impact on the survey results.
- Excludability – the groups are the same, except for the treatment difference. Therefore, the treatment should be the only way to impact the outcome

Covariate Balance Checks

We conducted covariance balance checks to determine that no covariates are overly represented and verify there was no relationship between our covariates and treatments. We worked with all covariates and no covariates for the covariate balance checks. We also did it with and without the outliers removed. With the covariate balance checks, we confirmed that there are no significant values that validate our assumptions. We identified that the randomization is better with the outliers removed, and the outliers significantly impacted the results between the groups. Since the treatment we provided was the same for all the groups. It was not likely due to the differences in the treatment. Hence, we decided to proceed with the rest of the calculations with outliers removed.

Table 1: Output for the covariate balance checks with outliers included.

```
## 
## ================================================================================
##                                       Dependent variable:
##                             ----------------------------------------
##                             Covariate balance checks with outliers
##                                No Covariates      All Covariates
##                                     (1)                (2)
## --------------------------------------------------------------------------------
## factor(get_survey)Facebook                          -0.244
##                                                      (0.205)
## 
## factor(get_survey)Instagram                         -0.250
##                                                      (0.194)
## 
## factor(get_survey)LinkedIn                           -0.244
##                                                      (0.214)
## 
## factor(get_survey)Other                              0.079
##                                                      (0.168)
## 
## factor(get_survey)Slack                             -0.179
##                                                      (0.181)
## 
## factor(get_survey)Text Message                      -0.203
##                                                      (0.208)
## 
## factor(gender)Male                                  -0.089
```

```
##                                                    (0.087)
##
## factor(gender)Non-binary / third gender              -0.826
##                                                    (0.833)
##
## factor(gender)Prefer not to say                      -0.558
##                                                    (0.954)
##
## factor(age)31-45 years old                            0.061
##                                                    (0.097)
##
## factor(age)45+                                       -0.057
##                                                    (0.136)
##
## factor(age)Prefer not to say                          0.544
##                                                    (0.407)
##
## factor(past_survey_per)26-50%                         0.027
##                                                    (0.145)
##
## factor(past_survey_per)51-75%                        -0.011
##                                                    (0.149)
##
## factor(past_survey_per)76-100%                       -0.131
##                                                    (0.134)
##
## factor(time_on_survey)20-30 minutes                  0.273*
##                                                    (0.139)
##
## factor(time_on_survey)30+ minutes                   0.495**
##                                                    (0.217)
##
## factor(time_on_survey)5-10 minutes                0.372***
##                                                    (0.121)
##
## factor(time_on_survey)Less than 5 minutes           0.303**
##                                                    (0.143)
##
## factor(ethnicity)Asian                               -0.017
##                                                    (0.216)
##
## factor(ethnicity)Caucasian                            0.180
##                                                    (0.200)
##
## factor(ethnicity)Latino or Hispanic                   0.244
##                                                    (0.240)
##
## factor(ethnicity)Native American                      0.125
##                                                    (0.260)
##
## factor(ethnicity)Other/Unknown                       0.737*
##                                                    (0.420)
##
## factor(ethnicity)Prefer not to say                    0.113
```

```
##                                                       (0.341)
##
## factor(ethnicity)Two or More                          -0.044
##                                                       (0.318)
##
## factor(education)High School Degree                   -0.133
##                                                       (0.181)
##
## factor(education)Master's Degree                      -0.024
##                                                       (0.098)
##
## factor(education)Ph.D or higher                        0.493**
##                                                       (0.248)
##
## factor(education)Prefer not to say                     0.179
##                                                       (0.661)
##
## factor(education)Some high school                     -0.500
##                                                       (0.484)
##
## factor(education)Trade School                         -1.206
##                                                       (0.826)
##
## Constant                            1.020***           0.855***
##                                     (0.041)           (0.290)
##
## ----------------------------------------------------------------------
## Observations                          391               391
## R2                                    0.000             0.111
## Adjusted R2                           0.000             0.032
## Residual Std. Error         0.816 (df = 390)   0.803 (df = 358)
## F Statistic                             1.401* (df = 32; 358)
## ======================================================================
## Note:                                   *p<0.1; **p<0.05; ***p<0.01
##
## ==============================================
## Statistic N  Mean   St. Dev.   Min    Max
## ----------------------------------------------
## Res.Df    2 371.000 22.627     355    387
## RSS       2 244.311 19.228   230.714 257.907
## Df        1 -32.000            -32    -32
## Sum of Sq 1 -27.193         -27.193 -27.193
## F         1  1.308            1.308  1.308
## Pr(> F)   1  0.128            0.128  0.128
## ----------------------------------------------
```

Table 2: Output for the covariate balance checks with outliers removed.

```
## ================================================================================
##                                              Dependent variable:
##                                   ---------------------------------------------
##                                      Covariate balance checks without outliers
##                                  No Covariates   All Covariates   All Balanced Covaria
##                                      (1)             (2)               (3)
## --------------------------------------------------------------------------------
## factor(get_survey)Facebook                          -0.245            -0.249
##                                                      (0.206)           (0.203)
##
## factor(get_survey)Instagram                         -0.244            -0.257
##                                                      (0.195)           (0.189)
##
## factor(get_survey)LinkedIn                          -0.243            -0.188
##                                                      (0.215)           (0.210)
##
## factor(get_survey)Other                              0.079             0.095
##                                                      (0.168)           (0.163)
##
## factor(get_survey)Slack                             -0.180            -0.092
##                                                      (0.182)           (0.169)
##
## factor(get_survey)Text Message                      -0.201            -0.163
##                                                      (0.209)           (0.201)
##
## factor(gender)Male                                  -0.088            -0.082
##                                                      (0.087)           (0.088)
##
## factor(gender)Non-binary / third gender             -0.838            -0.758
##                                                      (0.837)           (0.840)
##
## factor(gender)Prefer not to say                     -0.574            -0.657
##                                                      (0.959)           (0.959)
##
## factor(age)31-45 years old                           0.058             0.006
##                                                      (0.098)           (0.098)
##
## factor(age)45+                                      -0.060            -0.085
##                                                      (0.137)           (0.138)
##
## factor(age)Prefer not to say                         0.435             0.466
##                                                      (0.460)           (0.462)
##
## factor(past_survey_per)26-50%                        0.016            -0.036
##                                                      (0.147)           (0.141)
##
## factor(past_survey_per)51-75%                       -0.015            -0.082
##                                                      (0.150)           (0.137)
##
## factor(past_survey_per)76-100%                      -0.137            -0.159
##                                                      (0.136)           (0.128)
##
## factor(time_on_survey)20-30 minutes                  0.274*
##                                                      (0.140)
```

```
##
## factor(time_on_survey)30+ minutes                     0.499**
##                                                        (0.218)
##
## factor(time_on_survey)5-10 minutes                    0.372***
##                                                        (0.122)
##
## factor(time_on_survey)Less than 5 minutes             0.296**
##                                                        (0.144)
##
## factor(ethnicity)Asian                                -0.015           0.010
##                                                        (0.217)         (0.217)
##
## factor(ethnicity)Caucasian                             0.182           0.211
##                                                        (0.201)         (0.202)
##
## factor(ethnicity)Latino or Hispanic                    0.245           0.297
##                                                        (0.241)         (0.243)
##
## factor(ethnicity)Native American                       0.125           0.197
##                                                        (0.261)         (0.261)
##
## factor(ethnicity)Other/Unknown                         0.738*          0.844**
##                                                        (0.422)         (0.424)
##
## factor(ethnicity)Prefer not to say                     0.071           0.142
##                                                        (0.353)         (0.355)
##
## factor(ethnicity)Two or More                          -0.040           0.008
##                                                        (0.319)         (0.320)
##
## factor(education)High School Degree                   -0.135          -0.113
##                                                        (0.182)         (0.183)
##
## factor(education)Master's Degree                      -0.023           0.008
##                                                        (0.099)         (0.099)
##
## factor(education)Ph.D or higher                        0.485*          0.555**
##                                                        (0.261)         (0.262)
##
## factor(education)Prefer not to say                     0.284           0.166
##                                                        (0.694)         (0.699)
##
## factor(education)Some high school                     -0.483          -0.389
##                                                        (0.487)         (0.491)
##
## factor(education)Trade School                         -1.214          -0.957
##                                                        (0.829)         (0.832)
##
## Constant                              1.015***         0.860***        1.079***
##                                       (0.041)          (0.292)         (0.284)
##
## -----------------------------------------------------------------------------------
## Observations                          388              388             388
```

```
## R2                                          0.000           0.105              0.073
## Adjusted R2                                  0.000           0.025              0.001
## Residual Std. Error               0.816 (df = 387)   0.806 (df = 355)    0.816 (df = 359)
## F Statistic                                      1.308 (df = 32; 355)  1.017 (df = 28; 359
## =================================================================================================
## Note:                                                           *p<0.1; **p<0.05; ***p<0
##
## ======================================
## Statistic N  Mean    St. Dev.   Min     Max
## --------------------------------------
## Res.Df    2 371.000  22.627     355     387
## RSS       2 244.311  19.228   230.714 257.907
## Df        1 -32.000             -32     -32
## Sum of Sq 1 -27.193          -27.193 -27.193
## F         1  1.308            1.308   1.308
## Pr(> F)   1  0.128            0.128   0.128
## --------------------------------------
```

Average Treatment Effect (ATE)

To come up with the ATE, we calculated the difference between the control and treatment groups. The below details show the mean in the first table and ATE with standard deviation in the bracket. The results show that the treatment group with financial incentives answered fewer questions than the control group, and the treatment group with good social incentives answered more questions than the control group. Both the treatment group spent more time on the survey than the control group, with the financial incentive group spending the most time overall.

Table 3: Means & Standard Deviation for each outcome by treatment group.

Treatment	Questions Answered		Time (min)	
	Mean	Standard Deviation	Mean	Standard Deviation
Control	73.99242		16.52223	
Financial	66.17910	37.8151	22.68767	39.7792
Social Good	74.85821	32.6529	20.99443	36.8782

Table 4: ATE for each outcome by treatment group.

Treatment	ATE Questions Answered	ATE Time (min)
Financial	-7.8133	6.1654
Social Good	0.8658	4.4722

Linear Models

We build three variations of models for both our outcomes: the questions answered and the minutes spent.

Model 1 – base model with only the treatment variable

Model 2 – included the treatment variable as well as two covariates we felt that would make the most impact on the outcomes; times participants answered that they will spend on survey and whether participants accessed the survey through Mturk or not.

Model 3– full model with the treatment variable as well as all the covariates we collected in our study.

Table 5: Linear regression outputs for total questions answered for the three different models.

```
##
## ================================================================================
##                                           Dependent variable:
##                      ----------------------------------------------------------
##                                         Total Questions Answered
##                        Treatment Only         Covariates         All Covariates
##                             (1)                   (2)                  (3)
## --------------------------------------------------------------------------------
## treat1 - Financial         -7.813*               -6.829*              -6.220
##                            (4.270)               (3.998)              (4.046)
##
## treat2 - Social Good        0.866                 1.550                2.481
##                            (4.270)               (4.039)              (4.136)
##
## get_surveyFacebook                                                   -21.534***
##                                                                       (8.031)
##
## get_surveyInstagram                                                  -17.417**
##                                                                       (7.626)
##
```

```
## get_surveyLinkedIn                                             -16.602*
##                                                                 (8.588)
##
## get_surveyOther                                                -24.582***
##                                                                 (6.594)
##
## get_surveySlack                                                -22.735***
##                                                                 (7.448)
##
## get_surveyText Message                                         -22.819***
##                                                                 (8.349)
##
## past_survey_per26-50%                                            4.036
##                                                                 (5.764)
##
## past_survey_per51-75%                                            9.671
##                                                                 (5.868)
##
## past_survey_per76-100%                                           8.159
##                                                                 (5.290)
##
## time_on_survey20-30 minutes               -6.063               -10.635*
##                                            (5.156)               (5.470)
##
## time_on_survey30+ minutes                 -1.158                -1.828
##                                            (8.500)               (8.632)
##
## time_on_survey5-10 minutes                -8.045*               -6.606
##                                            (4.756)               (5.102)
##
## time_on_surveyLess than 5 minutes        -21.152***            -15.394**
##                                            (5.517)               (6.139)
##
## genderMale                                                       1.803
##                                                                 (3.405)
##
## genderNon-binary / third gender                                -77.492**
##                                                                 (32.695)
##
## genderPrefer not to say                                         20.783
##                                                                 (37.348)
##
## age31-45 years old                                              -2.235
##                                                                 (3.918)
##
## age45+                                                           4.680
##                                                                 (5.344)
##
## agePrefer not to say                                            21.043
##                                                                 (17.941)
##
## ethnicityAsian                                                 -13.795
##                                                                 (8.629)
##
```

```
## ethnicityCaucasian                                                    -4.193
##                                                                        (7.966)
##
## ethnicityLatino or Hispanic                                           -8.804
##                                                                        (9.451)
##
## ethnicityNative American                                               7.078
##                                                                       (10.172)
##
## ethnicityOther/Unknown                                               -26.140
##                                                                       (16.722)
##
## ethnicityPrefer not to say                                            -2.567
##                                                                       (13.846)
##
## ethnicityTwo or More                                                  -4.565
##                                                                       (12.626)
##
## educationHigh School Degree                                           -4.517
##                                                                        (7.142)
##
## educationMaster's Degree                                              8.339**
##                                                                        (3.956)
##
## educationPh.D or higher                                                5.641
##                                                                       (10.271)
##
## educationPrefer not to say            -                              -15.223
##                                                                       (27.036)
##
## educationSome high school                                              9.527
##                                                                       (19.256)
##
## educationTrade School                                                  0.894
##                                                                       (32.495)
##
## mturk                                              11.620***          9.444*
##                                                     (4.179)           (5.578)
##
## Constant                   73.992***               76.171***         91.885***
##                             (3.031)                 (5.165)          (13.280)
##
## ------------------------------------------------------------------------------
## Observations                  400                     392               388
## R2                           0.013                   0.136             0.238
## Adjusted R2                  0.008                   0.120             0.162
## Residual Std. Error    34.821 (df = 397)    32.061 (df = 384)    31.393 (df = 352)
## F Statistic            2.521* (df = 2; 397) 8.620*** (df = 7; 384) 3.138*** (df = 35; 352
## ==============================================================================
## Note:                                                      *p<0.1; **p<0.05; ***p<0.0
```

From the above the model total questions answered for all covariates, the get_surveyInstagram with the treatment effect of –17.417, time on survey less than 5 mins with treatment effect of –15.394, gender-binary / third gender with the treatment effect of –77.492 and educationMaster's Degree with the treatment effect of 8.339 is statistically significant. For all other outcomes, the treatment effect is not statistically significant.

Table 6: Linear regression outputs for total time spent for the three different models.

```
##
## ================================================================================
##                                        Dependent variable:
##                        ---------------------------------------------------------
##                                         Total Minutes Spent
##                         Treatment Only       Covariates        All Covariates
##                              (1)                 (2)                 (3)
## --------------------------------------------------------------------------------
## treat1 - Financial          6.165               6.674               7.264
##                            (4.134)             (4.228)             (4.429)
##
## treat2 - Social Good        4.472               3.203               3.583
##                            (4.134)             (4.272)             (4.528)
##
## get_surveyFacebook                                                  8.249
##                                                                    (8.793)
##
## get_surveyInstagram                                                -0.227
##                                                                    (8.349)
##
## get_surveyLinkedIn                                                 -1.615
##                                                                    (9.402)
##
## get_surveyOther                                                    -1.910
##                                                                    (7.219)
##
## get_surveySlack                                                     8.876
##                                                                    (8.154)
##
## get_surveyText Message                                              6.526
##                                                                    (9.140)
##
## past_survey_per26-50%                                               1.846
##                                                                    (6.310)
##
## past_survey_per51-75%                                              -1.762
##                                                                    (6.424)
##
## past_survey_per76-100%                                              4.231
##                                                                    (5.791)
##
## time_on_survey20-30 minutes                      1.985              3.874
##                                                 (5.453)            (5.988)
##
## time_on_survey30+ minutes                        9.674             12.719
##                                                 (8.990)            (9.450)
##
## time_on_survey5-10 minutes                       8.370*             9.010
##                                                 (5.030)            (5.585)
##
```

```
## time_on_surveyLess than 5 minutes                -2.209          -2.025
##                                                   (5.835)         (6.720)
##
## genderMale                                                        -3.125
##                                                                   (3.728)
##
## genderNon-binary / third gender                                   -8.553
##                                                                   (35.793)
##
## genderPrefer not to say                                           -8.471
##                                                                   (40.887)
##
## age31-45 years old                                                 6.548
##                                                                    (4.290)
##
## age45+                                                            -0.352
##                                                                   (5.851)
##
## agePrefer not to say                                              -5.460
##                                                                   (19.641)
##
## ethnicityAsian                                                    -9.718
##                                                                   (9.447)
##
## ethnicityCaucasian                                                -9.423
##                                                                   (8.722)
##
## ethnicityLatino or Hispanic                                       -15.372
##                                                                   (10.347)
##
## ethnicityNative American                                          -14.767
##                                                                   (11.136)
##
## ethnicityOther/Unknown                                            -32.084*
##                                                                   (18.307)
##
## ethnicityPrefer not to say                                        -13.840
##                                                                   (15.158)
##
## ethnicityTwo or More                                              -22.611
##                                                                   (13.822)
##
## educationHigh School Degree                                        15.362*
##                                                                    (7.819)
##
## educationMaster's Degree                                          -2.791
##                                                                   (4.331)
##
## educationPh.D or higher                                            8.973
##                                                                    (11.244)
##
## educationPrefer not to say                                        -2.847
##                                                                   (29.598)
##
```

```
## educationSome high school                                                    -18.844
##                                                                               (21.081)
##
## educationTrade School                                                         -11.758
##                                                                               (35.575)
##
## mturk                                                     -0.260               2.381
##                                                           (4.419)              (6.106)
##
## Constant                            16.522***            14.443***            17.245
##                                      (2.934)              (5.463)             (14.539)
##
## --------------------------------------------------------------------------------------
## Observations                           400                  392                 388
## R2                                     0.006                0.022               0.078
## Adjusted R2                            0.001                0.004              -0.014
## Residual Std. Error          33.709 (df = 397)    33.908 (df = 384)    34.369 (df = 352)
## F Statistic                 1.185 (df = 2; 397) 1.231 (df = 7; 384) 0.850 (df = 35; 352)
## ======================================================================================
## Note:                                                     *p<0.1; **p<0.05; ***p<0.01
```

For the model with total time spent in minutes there were no values which are statistically significant.

To summarize the models' results, we can say that overall, the results are not statistically significant. There could be many factors that may have caused this outcome. One is the sample size; the second could be that more than 50% of the survey participants took the survey through MTurk. So, increasing the survey participants through mediums other than survey tools such as MTurk, which required participants to complete the survey, might help with better results.

The Requirements for Linear Modeling:

1. Independent observations
As we assumed for the spillover above, we don't think that observations should be dependent since there is only one survey. We think it is unlikely that individuals will discuss the survey, and if they do, it will most likely be after completing it. Therefore, this will not have an impact on the survey results.

2. Equal variances
The below scale-location plots show if residuals are spread equally, allowing us to check the assumption of equal variances or homoscedasticity. Here we see a line that is close to horizontal for all four models; therefore, it seems this assumption was met.

Total questions answered

Figure 11: Scale location plots for three different models using the total questions answered outcome.

Scale Location Plots Total Questions Answered

No Covariates

Some Covariates

All Covariates
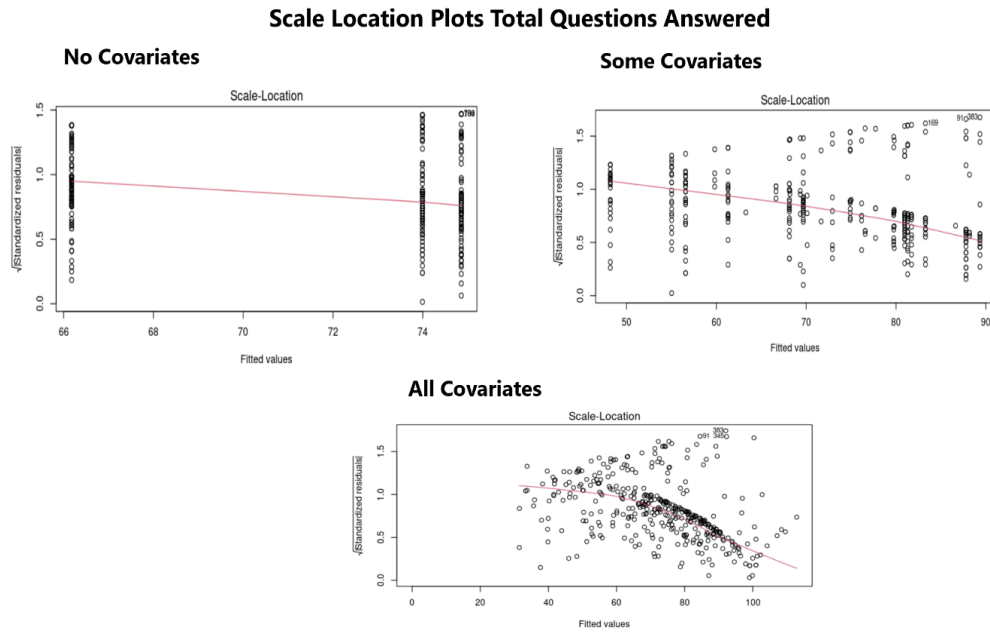
Figure 12: Scale location plots for three different models using the total questions answered outcome with Poisson regression.

Scale Location Plots Total Questions Answered (Poisson Model)

No Covariates

Some Covariates

All Covariates
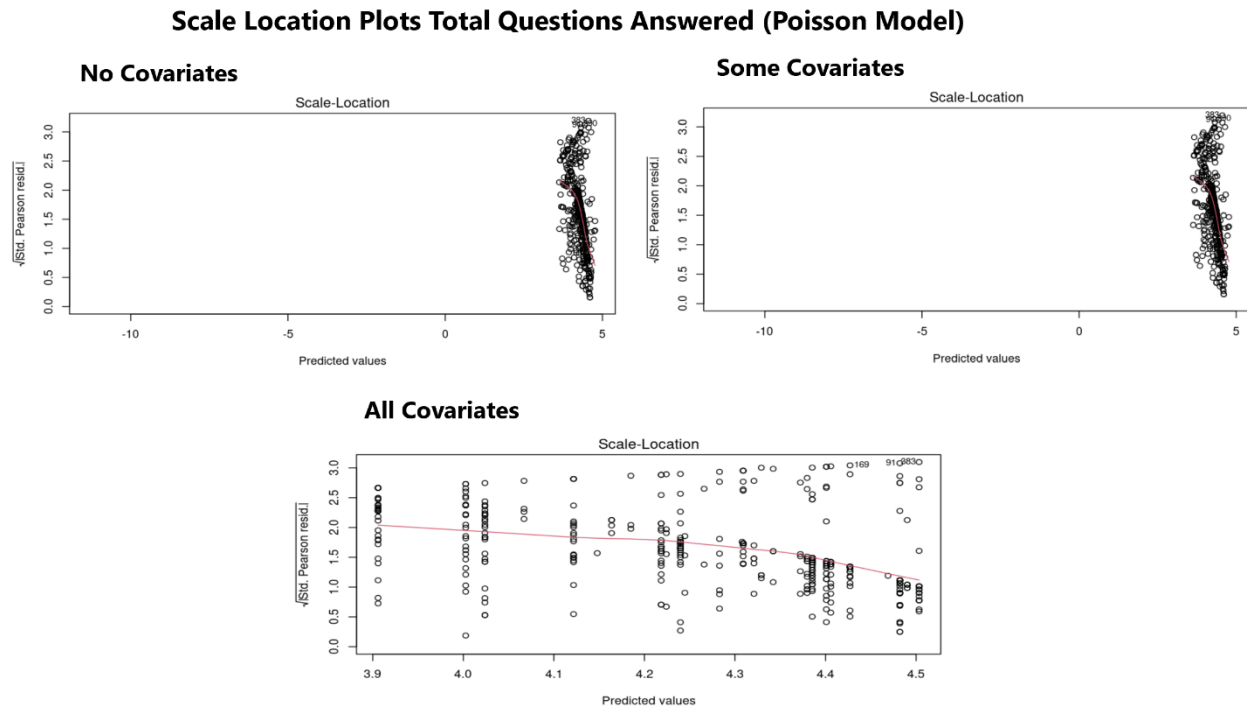
Total Time Spent

Figure 13: Scale location plots for three different models using the total time spent outcome.

Scale Location Plots Total Time Duration

No Covariates

Some Covariates

All Covariates
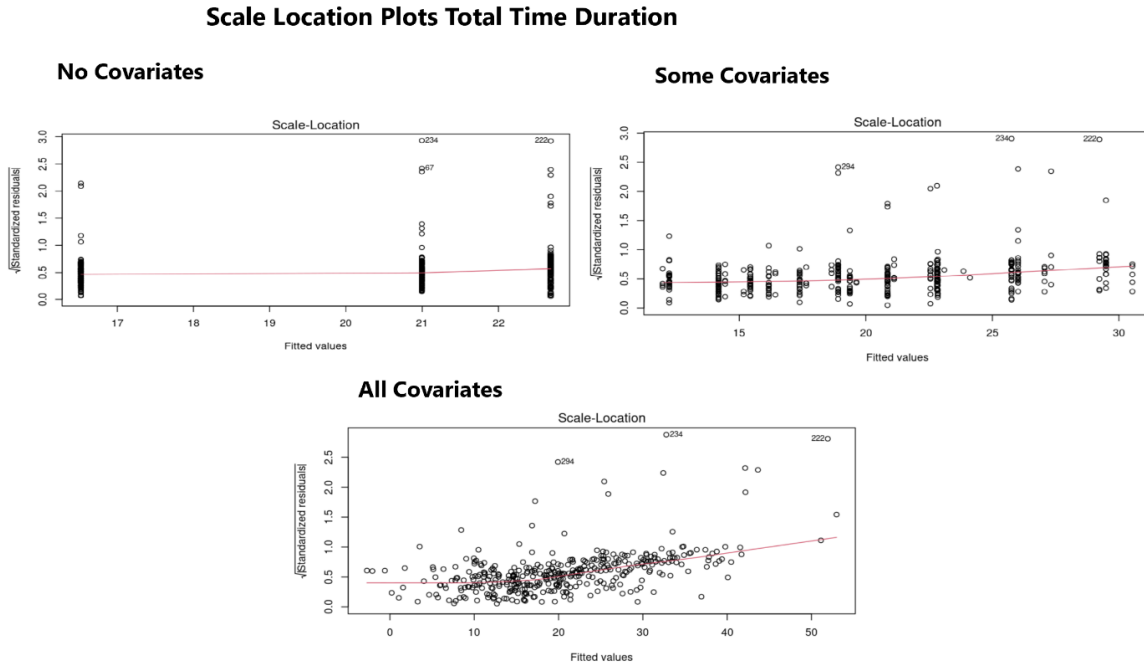
Figure 14: Scale location plots for three different models using the total time spent outcome with log transformation.

Scale Location Plots Total Time Duration Log Transformed

No Covariates

Some Covariates

All Covariates
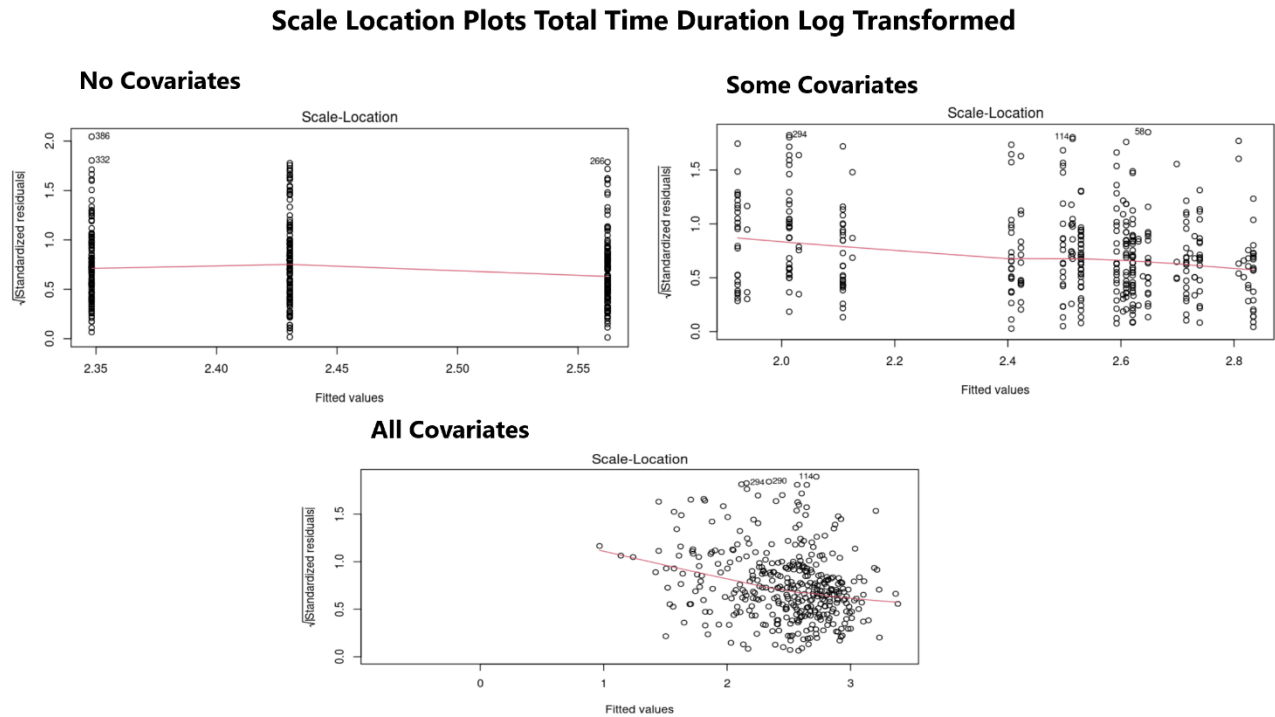
3. Normal distributions

The below normal Q–Q plots show if residuals are normally distributed. Our data does not seem to be normally distributed for either outcome variables, questions answered, or duration. Therefore, this assumption is not met. To meet this assumption, we log transformed output of the dependent variable Total minutes spent and we got the results very close to normal distribution. We couldn't do the same for the dependent variable number of questions answered as there were some surveys with no questions attempted. Taking the log transformation on this will not generate an accurate result. So, for the dependent variable number of questions answered we ran the Poisson model.

Total questions answered

Figure 15: Normal QQ plots for three different models using the total questions answered outcome.
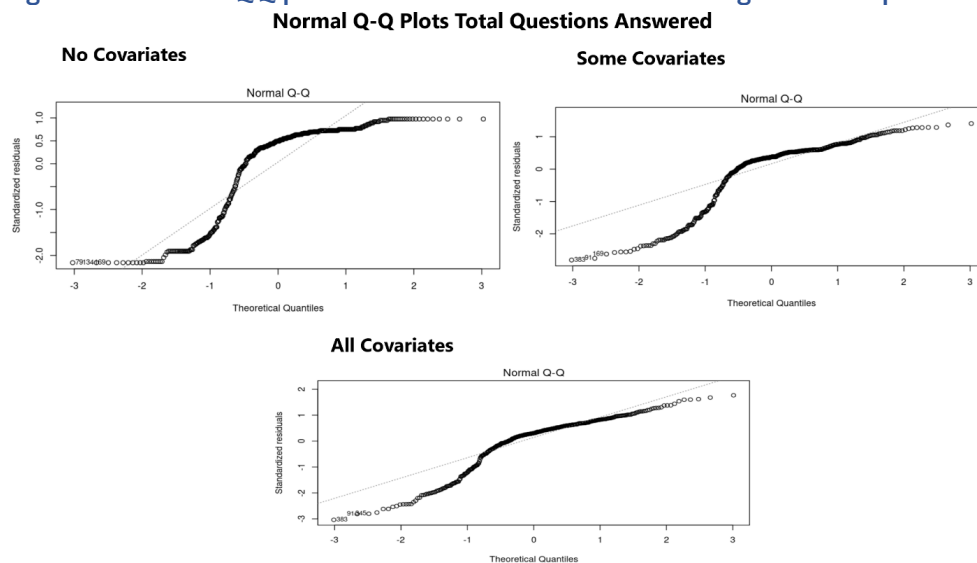
Figure 16: Normal QQ plots for three different models using the total questions answered outcome using Poisson regression.
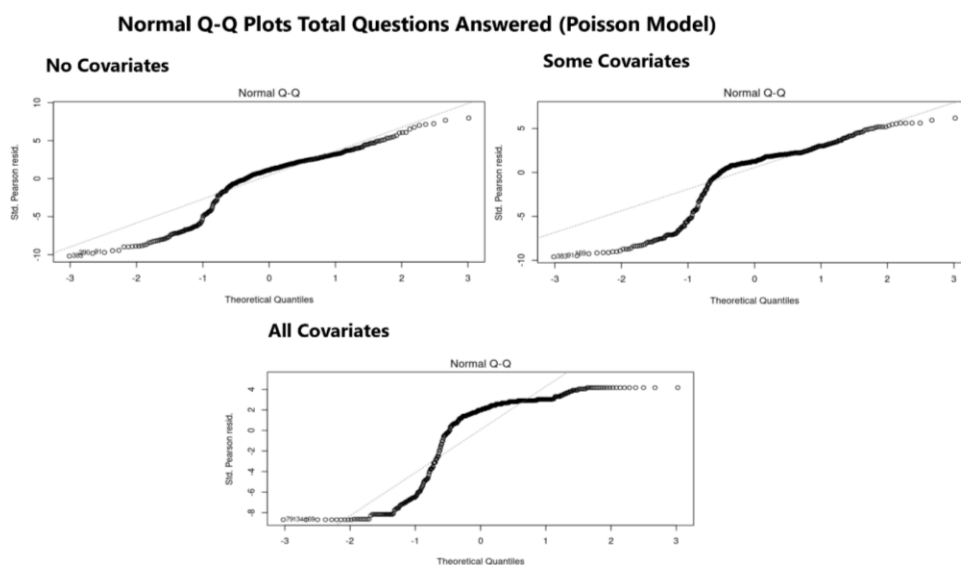
Total Time Spent

Figure 17: Normal QQ plots for three different models using the total time spent outcome.

Normal Q-Q Plots Total Time Duration

No Covariates

Some Covariates

All Covariates
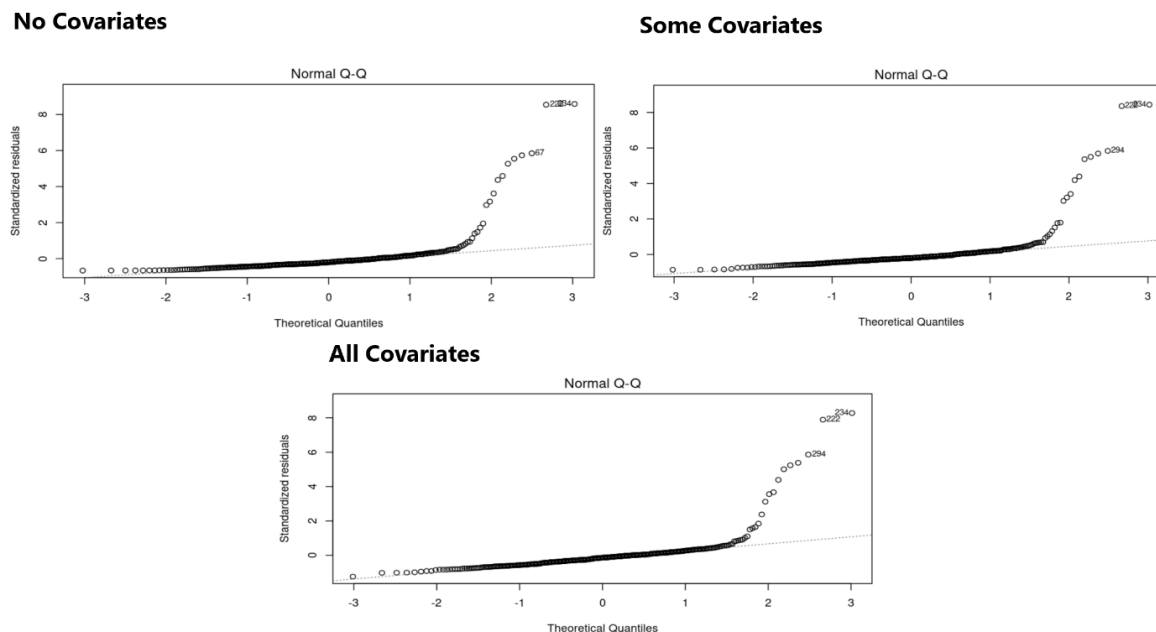
Figure 18: Normal QQ plots for three different models using the total time spent outcome with log transformation applied.

Normal Q-Q Plots Total Time Duration Log Transformed

No Covariates

Some Covariates

All Covariates
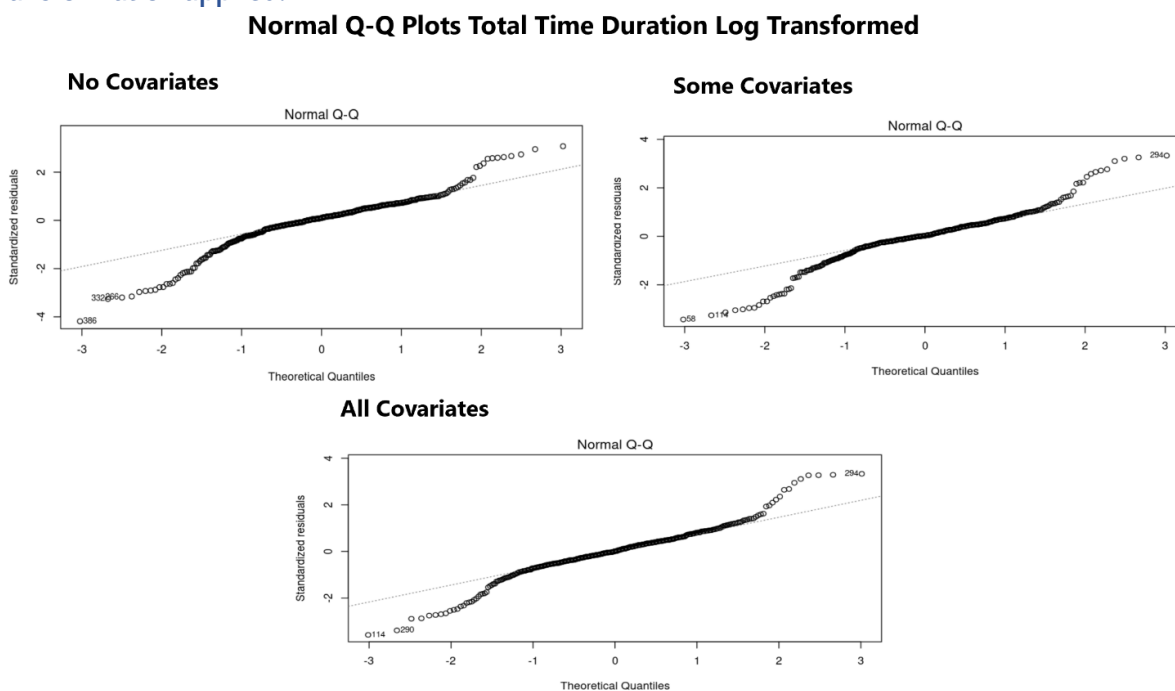
Diagnostics

During the data diagnostics, we identified that our data had independent observations and equal variances, but our residuals were not normally distributed. To address this, we ran another model for time spent taking the log of our outcome variable. We ran model diagnostics and identified the residuals were much closer to normal distribution. To address the same issue for the total number of questions answered, we used a Poisson model. We selected this because there was some data with zero questions answered. Taking the log of this outcome will not give us accurate results.

Log Transformation

Table 7: Linear regression outputs for total time spent log transformed for the three different models.

```
    )

##
## =====================================================================================
##                                             Dependent variable:
##                              -------------------------------------------------------------
##                                          Log Total Time Spent in Minutes
##                              Treatment Only          Covariates         All Covariates
##                                   (1)                    (2)                 (3)
##                              -------------------------------------------------------------
## treat1 - Financial               0.082                  0.091               0.052
##                                  (0.132)                (0.127)             (0.128)
##
## treat2 - Social Good             0.214                  0.186               0.157
##                                  (0.132)                (0.128)             (0.131)
##
## get_surveyFacebook                                                         -0.262
##                                                                            (0.255)
##
## get_surveyInstagram                                                        -0.334
##                                                                            (0.242)
##
## get_surveyLinkedIn                                                         -0.153
##                                                                            (0.272)
##
## get_surveyOther                                                            -0.160
##                                                                            (0.209)
##
## get_surveySlack                                                            -0.212
##                                                                            (0.236)
##
## get_surveyText Message                                                      0.034
##                                                                            (0.265)
##
## past_survey_per26-50%                                                       0.306*
##                                                                            (0.183)
##
## past_survey_per51-75%                                                       0.248
##                                                                            (0.186)
##
## past_survey_per76-100%                                                      0.339**
##                                                                            (0.168)
##
## time_on_survey20-30 minutes                         0.119                   0.167
##                                                     (0.164)                 (0.174)
##
## time_on_survey30+ minutes                           0.110                   0.135
##                                                     (0.270)                 (0.274)
##
## time_on_survey5-10 minutes                         -0.106                  -0.005
##                                                     (0.151)                 (0.162)
##
## time_on_surveyLess than 5 minutes                  -0.590***               -0.355*
##                                                     (0.175)                 (0.195)
```

```
##
## genderMale                                                          -0.072
##                                                                      (0.108)
##
## genderNon-binary / third gender                                    -3.225***
##                                                                      (1.037)
##
## genderPrefer not to say                                             -0.397
##                                                                      (1.185)
##
## age31-45 years old                                                   0.208*
##                                                                      (0.124)
##
## age45+                                                               0.167
##                                                                      (0.170)
##
## agePrefer not to say                                                -0.179
##                                                                      (0.569)
##
## ethnicityAsian                                                      -0.442
##                                                                      (0.274)
##
## ethnicityCaucasian                                                  -0.222
##                                                                      (0.253)
##
## ethnicityLatino or Hispanic                                         -0.556*
##                                                                      (0.300)
##
## ethnicityNative American                                            -0.136
##                                                                      (0.323)
##
## ethnicityOther/Unknown                                              -1.403***
##                                                                      (0.530)
##
## ethnicityPrefer not to say                                          -0.270
##                                                                      (0.439)
##
## ethnicityTwo or More                                                -0.774*
##                                                                      (0.401)
##
## educationHigh School Degree                                          0.193
##                                                                      (0.227)
##
## educationMaster's Degree                                             0.206
##                                                                      (0.126)
##
## educationPh.D or higher                                              0.395
##                                                                      (0.326)
##
## educationPrefer not to say                                          -0.724
##                                                                      (0.858)
##
## educationSome high school                                           -0.607
##                                                                      (0.611)
##
##
## educationTrade School                                               -0.157
##                                                                      (1.031)
##
## mturk                                              0.017             0.055
##                                                   (0.133)           (0.177)
##
## Constant                      2.348***            2.512***          2.528***
##                               (0.094)             (0.164)           (0.421)
##
## ----------------------------------------------------------------------------
## Observations                    400                 392               388
## R2                             0.007               0.069             0.179
## Adjusted R2                    0.002               0.052             0.097
## Residual Std. Error      1.079 (df = 397)    1.017 (df = 384)    0.996 (df = 352)
## F Statistic          1.334 (df = 2; 397) 4.060*** (df = 7; 384) 2.189*** (df = 35; 352)
## ============================================================================
## Note:                                           *p<0.1; **p<0.05; ***p<0.01
```

However, the data becomes much closer to normal when we take the log of our outcome variables.

Poisson model

Table 8: Poisson regression outputs for total questions answered for the three different models.

```
##
## ======================================================================
##                                           Dependent variable:
##                                 ----------------------------------------
##                                         Total Questions Answered
##                                 Treatment Only Covariates All Covariates

##                                      (1)          (2)           (3)
## ---------------------------------------------------------------------
## treat1 - Financial                -0.112***    -0.097***    -0.090***
##                                    (0.015)      (0.015)      (0.015)
##
## treat2 - Social Good                0.012        0.021        0.034**
##                                    (0.014)      (0.015)      (0.015)
##
## get_surveyFacebook                                          -0.285***
##                                                              (0.029)
##
## get_surveyInstagram                                         -0.227***
##                                                              (0.027)
##
## get_surveyLinkedIn                                          -0.209***
##                                                              (0.031)
##
## get_surveyOther                                             -0.321***
##                                                              (0.023)
##
## get_surveySlack                                             -0.298***
##                                                              (0.027)
##
## get_surveyText Message                                      -0.294***
##                                                              (0.031)
##
## past_survey_per26-50%                                        0.076***
##                                                              (0.023)
##
## past_survey_per51-75%                                        0.148***
##                                                              (0.023)
##
## past_survey_per76-100%                                       0.131***
##                                                              (0.021)
##
## time_on_survey20-30 minutes                     -0.076***   -0.137***
##                                                 (0.018)      (0.020)
##
## time_on_survey30+ minutes                        -0.013       -0.026
##                                                 (0.029)      (0.031)
##
## time_on_survey5-10 minutes                      -0.102***   -0.088***
##                                                 (0.017)      (0.019)
##
## time_on_surveyLess than 5 minutes               -0.318***   -0.243***
##                                                 (0.021)      (0.024)
##
## genderMale                                                   0.029**
##                                                              (0.013)
##
## genderNon-binary / third gender                             -15.641
##                                                             (172.655)
##
## genderPrefer not to say                                      0.224*
```

```
##                                              (0.125)
##
## age31-45 years old                          -0.038**
##                                              (0.015)
##
## age45+                                       0.057***
##                                              (0.019)
##
## agePrefer not to say                         0.223***
##                                              (0.058)
##
## ethnicityAsian                              -0.195***
##                                              (0.032)
##
## ethnicityCaucasian                           -0.039
##                                              (0.028)
##
## ethnicityLatino or Hispanic                 -0.112***
##                                              (0.034)
##
## ethnicityNative American                     0.091***
##                                              (0.035)
##
## ethnicityOther/Unknown                      -0.409***
##                                              (0.074)
##
## ethnicityPrefer not to say                   -0.013
##                                              (0.051)
##
## ethnicityTwo or More                         -0.042
##                                              (0.049)
##
## educationHigh School Degree                 -0.066**
##                                              (0.027)
##
## educationMaster's Degree                     0.125***
##                                              (0.015)
##
## educationPh.D or higher                      0.101**
##                                              (0.040)
##
## educationPrefer not to say                   -0.192*
##                                              (0.107)
##
## educationSome high school                    0.139*
##                                              (0.071)
##
## educationTrade School                        0.033
##                                              (0.122)
##
## mturk                              0.161***  0.136***
##                                    (0.015)   (0.021)
##
## Constant                4.304***   4.321***  4.489***
```

```
##                                       (0.010)      (0.019)       (0.049)
##
## -----------------------------------------------------------------------
## Observations                            400          392           388
## Log Likelihood                      -6,168.095   -5,352.252    -4,966.524
## Akaike Inf. Crit.                    12,342.190   10,720.500    10,005.050
## =======================================================================
## Note:                                           *p<0.1; **p<0.05; ***p<0.01
```

The above results show almost all the covariates are statistically significant.

Heterogeneous Treatment Effect

We also checked the heterogeneous treatment effect but identified that the survey did not give any significant effect. In particular, we were curious to see whether or not treatment effect depended on the method of receiving the survey (i.e. Facebook, Slack, Linkedin, etc.) or if the participant was from Mturk.

Table 9: Model outputs on both outcomes with HTE effects.

```
##
## ==================================================================================
##                                            Dependent variable:
##                              -----------------------------------------------------
##                              Total Questions Answered Total Time Spent in Minutes
##                                        (1)                        (2)
## ----------------------------------------------------------------------------------
## treat1 - Financial                    -0.913                     6.407
##                                       (15.528)                  (16.994)
##
## treat2 - Social Good                  13.367                    -3.587
##                                       (15.205)                  (16.708)
##
## get_surveyFacebook                    -14.295                    6.315
##                                       (12.369)                  (13.606)
##
## get_surveyInstagram                    -4.318                   -3.336
##                                       (12.093)                  (13.067)
##
## get_surveyLinkedIn                    -26.733*                  -3.668
##                                       (14.481)                  (15.880)
##
## get_surveyOther                       -12.838                    3.211
##                                       (11.634)                  (12.796)
##
## get_surveySlack                       -23.397*                   2.432
##                                       (12.206)                  (13.255)
##
## get_surveyText Message                -18.217                    4.061
##                                       (13.828)                  (15.193)
##
## past_survey_per26-50%                   3.494                    3.052
##                                       (5.827)                   (6.409)
##
## past_survey_per51-75%                   9.990*                  -1.519
##                                       (5.903)                   (6.490)
##
## past_survey_per76-100%                  7.776                    4.771
##                                       (5.356)                   (5.887)
##
## time_on_survey20-30 minutes            -8.756                    3.968
##                                       (5.614)                   (6.103)
##
## time_on_survey30+ minutes              -1.200                   12.947
##                                       (8.879)                   (9.771)
##
## time_on_survey5-10 minutes             -3.815                    8.431
##                                       (5.287)                   (5.798)
##
```

```
##
## time_on_surveyLess than 5 minutes          -12.089*              -2.374
##                                              (6.374)              (7.008)
##
## genderMale                                     1.999
##                                              (3.516)
##
## genderNon-binary / third gender             -87.447***
##                                             (33.218)
##
## genderPrefer not to say                       24.221
##                                             (37.739)
##
## age31-45 years old                            -1.831               6.261
##                                              (3.994)              (4.359)
##
## age45+                                         4.470              -0.578
##                                              (5.443)              (5.972)
##
## agePrefer not to say                          25.075              -6.087
##                                             (18.375)             (20.218)
##
## ethnicityAsian                               -13.746             -11.000
##                                              (8.896)              (9.746)
##
## ethnicityCaucasian                            -4.030              -9.937
##                                              (8.214)              (9.029)
##
## ethnicityLatino or Hispanic                  -10.492             -15.503
##                                              (9.792)             (10.771)
##
## ethnicityNative American                       7.422             -13.121
##                                             (10.390)             (11.434)
##
## ethnicityOther/Unknown                       -29.241*            -30.835
##                                             (17.326)             (19.022)
##
## ethnicityPrefer not to say                    -3.834             -13.424
##                                             (14.118)             (15.415)
##
## ethnicityTwo or More                          -4.586             -24.022*
##                                             (12.821)             (14.098)
##
## educationHigh School Degree                   -4.359              14.072*
##                                              (7.381)              (8.121)
##
## educationMaster's Degree                       8.217**            -2.195
##                                              (4.042)              (4.431)
##
## educationPh.D or higher                        4.380              7.784
##                                             (10.689)             (11.762)
##
## educationPrefer not to say                   -13.691              -2.840
##                                             (27.985)             (30.686)
```

```
##
## educationSome high school                        9.958                 -15.212
##                                                 (19.616)                (18.846)
##
## educationTrade School                           -8.427                 -10.270
##                                                 (33.182)                (36.383)
##
## mturk                                           11.629                  -2.116
##                                                  (8.193)                 (8.933)
##
## treat1 - Financial:mturk                         3.669                   3.515
##                                                 (11.045)                (12.102)
##
## treat2 - Social Good:mturk                      -7.357                   4.128
##                                                 (10.701)                (11.696)
##
## treat1 - Financial:get_surveyFacebook          -22.284                  22.983
##                                                 (19.180)                (21.079)
##
## treat2 - Social Good:get_surveyFacebook         -7.523                  -7.718
##                                                 (17.375)                (19.112)
##
## treat1 - Financial:get_surveyInstagram         -25.030                  -1.499
##                                                 (16.347)                (17.805)
##
## treat2 - Social Good:get_surveyInstagram       -15.946                   9.936
##                                                 (16.987)                (18.576)
##
## treat1 - Financial:get_surveyLinkedIn           24.298                  -2.087
##                                                 (18.972)                (20.677)
##
## treat2 - Social Good:get_surveyLinkedIn          2.117                   6.631
##                                                 (19.737)                (21.601)
##
## treat1 - Financial:get_surveyOther             -18.253                 -11.326
##                                                 (15.382)                (16.893)
##
## treat2 - Social Good:get_surveyOther           -14.643                  -1.705
##                                                 (15.055)                (16.569)
##
## treat1 - Financial:get_surveySlack               2.338                   0.330
##                                                 (16.997)                (18.533)
##
## treat2 - Social Good:get_surveySlack            -2.649                  14.496
##                                                 (16.488)                (18.101)
##
## treat1 - Financial:get_surveyText Message      -10.324                   3.443
##                                                 (19.010)                (20.916)
##
## treat2 - Social Good:get_surveyText Message     -3.542                  -0.009
##                                                 (20.594)                (22.666)
##
## Constant                                        84.432***               20.003
##                                                 (16.411)                (17.959)
##
##
## ----------------------------------------------------------------------------------
## Observations                                      388                     388
## R2                                                0.268                   0.097
## Adjusted R2                                       0.162                  -0.025
## Residual Std. Error                       31.392 (df = 338)        34.557 (df = 341)
## F Statistic                            2.528*** (df = 49; 338)    0.796 (df = 46; 341)
## ==================================================================================
## Note:                                                        *p<0.1; **p<0.05; ***p<0.01
```

The above results show almost no statistically significant covariates.

Results

The results show that the financial or social good incentives did not significantly impact either of our outcome variables (time spent on the survey and the total number of questions answered). Based on the results of our study, we **failed to reject the null hypothesis**; **No treatment effect for either monetary incentives or social good for people responding to surveys.** This might be different if this experiment was conducted in a different scenario.

Conclusions

As mentioned above, our experiment provided us with the result that monetary incentives or social good did not have any significant impact on the survey participation rate. However, we believe if we made some changes to how we conducted the survey, it might potentially improve the results. Some of them are listed below.

- We believe that if the survey was conducted for a longer time frame, with a larger sample size, and distributed to a broader and more reliable sample population might have a significant impact on results.
- If we provided the participants with a more meaningful cause for social good such as reducing homelessness might have motivated the cause of social good and may have increased the response rate.
- It might have increased the response rate if provided the treatment group with financial incentives with more incentives, such as paying all the participants instead of spending five people from a random draw or paying them more money, such as $50 instead of $25.
- We collected 50% of our sample using the MTurk platform. Using this platform, we had to pay all the survey participants no matter the treatment group they were assigned. The motivation factor for this group might not be as truthful as if we had this group participated in the survey by getting it through other means such as social networking sites, slack, etc. This sample size might have played a significant role in the survey results.

Limitations and Future Enhancements

- We acknowledge that our sample of participants is not a random sample from the overall U.S. population; therefore, our conclusions in this paper may not be generalizable.
- Our residuals were not normally distributed.
- We collected 50% of our data using MTurk. Using this platform, we had to pay all the survey participants. So, the motivation factors for the participants in this group might be different and might impact our survey results.
- We received multiple feedbacks from participants about how long the survey was. Also, we received a few comments from some participants guessing the intentions of our study. In the future, if we repeat this survey, it would be by settling the study intentions in a better manner.
- If we repeat this, we plan to increase the financial incentives to a higher margin or pay every participant in the financial incentive treatment group rather than opting for a random draw.

Appendix

Final project analysis R outputs

PDF

W241-Final-Project.
pdf

Final project PowerPoint presentation

PDF

W241 Final
Presentation.pdf

Works Cited:

- [How Helping Other Can Help At-Risk People](#)
- [How to Increase Survey Response Rates](#)
- ["Money Will Solve the Problem": Testing the Effectiveness of Conditional Incentives for Online Surveys](#)
- [Money Talks: non-monetary incentives and Internet administration fail to increase response rates to a physician survey](#)
- [The Benefits of Tangible Non-Monetary Incentives](#)