The Opportunity Cost of Debt Aversion - Replication

Repliconomics

2024-10-28

Loading Libraries

```
library(haven)
library(dplyr)
```

```
##
## Attache Paket: 'dplyr'

## Die folgenden Objekte sind maskiert von 'package:stats':
##
##     filter, lag

## Die folgenden Objekte sind maskiert von 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v forcats   1.0.0     v stringr   1.5.1
## v lubridate 1.9.3     v tibble    3.2.1
## v purrr     1.0.2     v tidyr     1.3.1
## v readr     2.1.5

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(fixest)
library(modelsummary)
```

```
## `modelsummary` 2.0.0 now uses `tinytable` as its default table-drawing
##   backend. Learn more at: https://vincentarelbundock.github.io/tinytable/
##
## Revert to `kableExtra` for one session:
##
##   options(modelsummary_factory_default = 'kableExtra')
##   options(modelsummary_factory_latex = 'kableExtra')
##   options(modelsummary_factory_html = 'kableExtra')
##
## Silence this message forever:
##
##   config_modelsummary(startup_message = FALSE)
```

```
library(forcats)
library(kableExtra)
```

```
##
## Attache Paket: 'kableExtra'
##
## Das folgende Objekt ist maskiert 'package:dplyr':
##
##     group_rows
```

Figure 1 - Allocation Shares of the Intial Endowment in Day 1

```
data <- read_dta("data/main_work.dta")

data <- data %>%
  mutate(
    share_a1_initial = share_pointssaving1,
    share_a2_initial = share_pointssaving2,
    share_a3_initial = ifelse(treatment != 0, share_pointsdebt1, share_pointssaving3),
    share_a4_initial = ifelse(treatment != 0, share_pointsdebt2, share_pointssaving4),
    auxiliar11 = NA,
    treatmentLabel = case_when(
      treatment == 1 ~ "Low Debt",
      treatment == 0 ~ "No Debt",
      TRUE ~ "."
    )
  )

fig1.dat = data %>%
  select(share_a1_initial, share_a2_initial, share_a3_initial, share_a4_initial, treatment, day) %>%
  filter(treatment <= 1 & day == 1) %>%
  group_by(treatment) %>%
  summarise(
    share_a1_initial = mean(share_a1_initial),
    share_a2_initial = mean(share_a2_initial),
    share_a3_initial = mean(share_a3_initial),
    share_a4_initial = mean(share_a4_initial)
  ) %>%
  pivot_longer(cols = c(share_a1_initial, share_a2_initial, share_a3_initial, share_a4_initial), names_

fig1.dat$treatment = ifelse(fig1.dat$treatment == 0, "No debt", "Low debt")

fig1.dat$account = case_when(
  fig1.dat$account == "share_a1_initial" ~ "Savings 1 (20%)",
  fig1.dat$account == "share_a2_initial" ~ "Savings 2 (10%)",
  fig1.dat$account == "share_a3_initial" ~ "Savings 3 / Debt 1 (15%)",
  fig1.dat$account == "share_a4_initial" ~ "Savings 4 / Debt 2 (5%)"
)

fig1.dat$treatment = fig1.dat$treatment %>%
  fct_relevel("No debt", "Low debt")

ggplot(fig1.dat, aes(x = treatment, y = share, fill = account)) +
  geom_col(position = position_dodge2()) +
  labs(x = NULL, y = "Inital allocation share", fill = NULL, title = "Figure 1: Allocation of Shares of
  theme(legend.position = c(0.75,0.8), legend.box.background = element_rect(size = 1)) +
  geom_text(aes(label=round(share, 2)), position=position_dodge(width=0.9), vjust=-0.25, size = 3) +
  scale_fill_manual(values = c("#476a90", "#5f9786", "#a33f49", "#be7c71")) +
  scale_y_continuous(labels = scales::number_format(accuracy = 0.1), limits = c(0,1))
```

```
## Warning: The `size` argument of `element_rect()` is deprecated as of ggplot2 3.4.0.
## i Please use the `linewidth` argument instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```

```
## Warning: A numeric `legend.position` argument in `theme()` was deprecated in ggplot2
## 3.5.0.
## i Please use the `legend.position.inside` argument of `theme()` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```

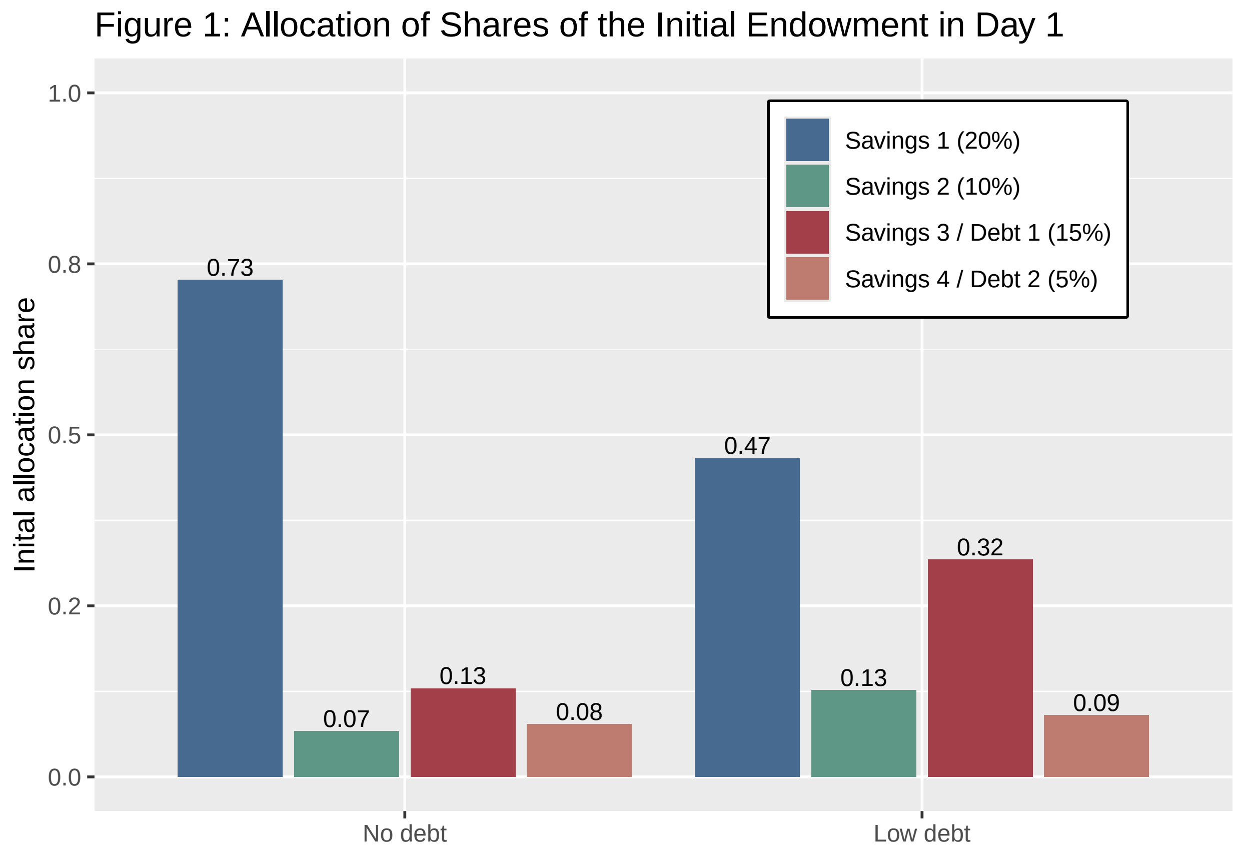


Figure 2 - Percent of Subjects That Maximize Returns in All Decisions

```
data <- read_dta("data/main_work.dta")

fig2.dat = data %>%
  filter(day == 4)
```

```
fig2.dat <- fig2.dat %>%
  mutate(counter = 1)

fig2.model <- lm(ind_optimal_ia_all ~ factor(treatment), data = fig2.dat %>% filter(treatment <= 1))
summary(fig2.model, conf.int = TRUE)
```

```
## 
## Call:
## lm(formula = ind_optimal_ia_all ~ factor(treatment), data = fig2.dat %>% 
##     filter(treatment <= 1))
## 
## Residuals:
##     Min      1Q  Median      3Q     Max 
## -0.3837 -0.3837 -0.1279  0.6163  0.8721 
## 
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)    
## (Intercept)         0.38372    0.04525   8.481 1.05e-14 ***
## factor(treatment)1 -0.25581    0.06399  -3.998 9.51e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 0.4196 on 170 degrees of freedom
## Multiple R-squared:  0.08594,    Adjusted R-squared:  0.08056 
## F-statistic: 15.98 on 1 and 170 DF,  p-value: 9.513e-05
```

```
confint(fig2.model)
```

```
##                         2.5 %     97.5 %
## (Intercept)         0.2944043  0.4730375
## factor(treatment)1 -0.3821267 -0.1295012
```

```
fig2.dat.collapsed <- fig2.dat %>%
  group_by(treatment) %>%
  summarise(mean_optimal = mean(ind_optimal_ia_all, na.rm = TRUE),
            sd_optimal = sd(ind_optimal_ia_all, na.rm = TRUE),
            n = sum(counter))

fig2.dat.collapsed <- fig2.dat.collapsed %>%
  mutate(hiwrite = ifelse(treatment == 1, (.3837209 - .255814) + (.3821267 - .255814), NA),
         lowrite = ifelse(treatment == 1, (.3837209 - .255814) - (.255814 - .1295012), NA))

fig2.dat.collapsed <- fig2.dat.collapsed %>%
  mutate(spacing = ifelse(treatment == 0, 0.2, ifelse(treatment == 1, 0.8, NA)))

fig2.dat.plot <- fig2.dat.collapsed %>%
  mutate(text_label = ifelse(spacing == 0.2, ".38", ".13")) %>%
  filter(!is.na(mean_optimal) & !is.na(spacing))

ggplot(fig2.dat.plot, aes(x = spacing, y = mean_optimal, fill = factor(spacing))) +
  geom_bar(stat = "identity", width = 0.3) +
  scale_fill_manual(values = c("0.2" = "#476a90", "0.8" = "#a33f49")) +
  geom_errorbar(aes(ymin = lowrite, ymax = hiwrite), width = 0.1, color = "black") +
  scale_x_continuous(breaks = c(0.2, 0.8), labels = c("No-Debt", "Low-Debt")) +
  scale_y_continuous(limits = c(0, 0.5), breaks = seq(0, 0.5, by = 0.1)) +
  geom_text(aes(label=round(mean_optimal, 2)), position=position_dodge(width=0.9), vjust=-0.25, size =
  labs(y = "Percent of Subjects", x = NULL, title = "Figure 2: Percent of Subjects That Maximize Return
  theme(legend.position = "none")
```

```
## Warning: `position_dodge()` requires non-overlapping x intervals.
```

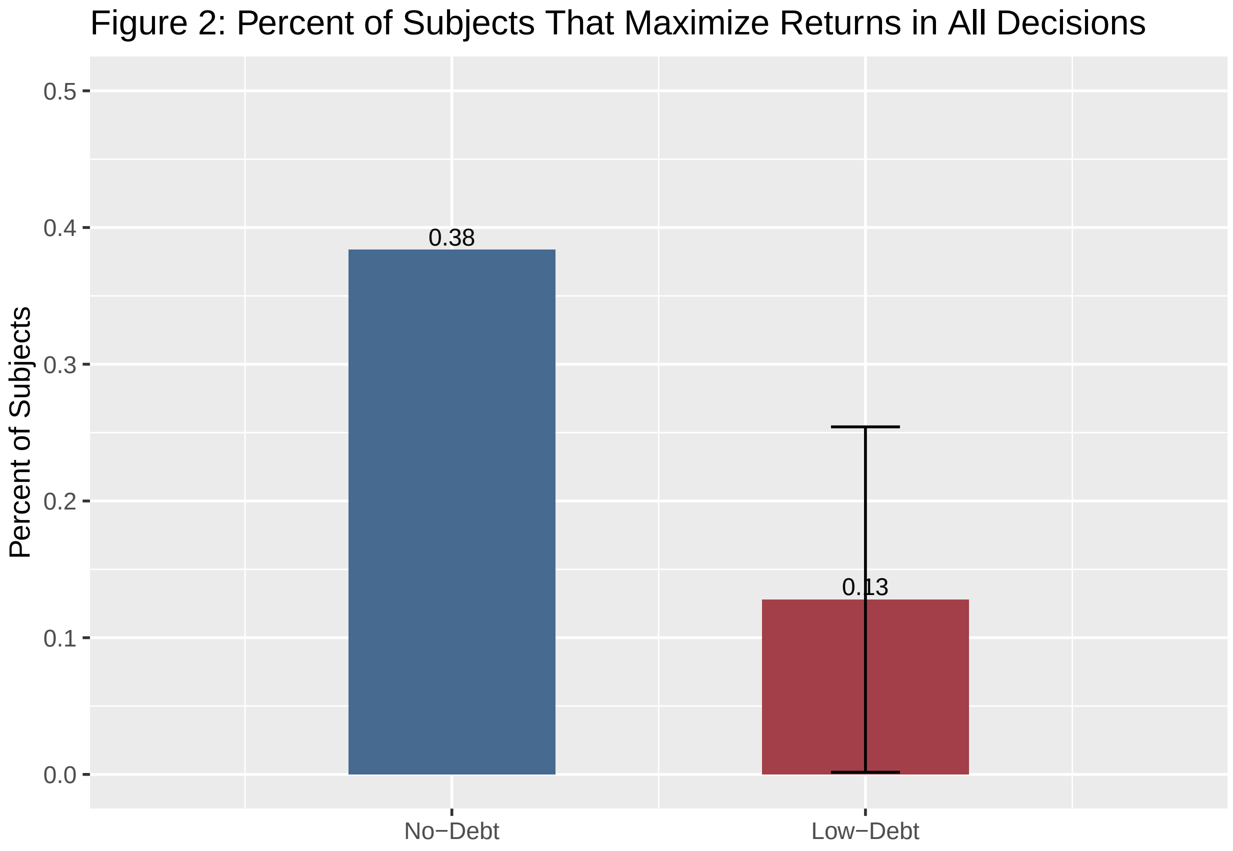
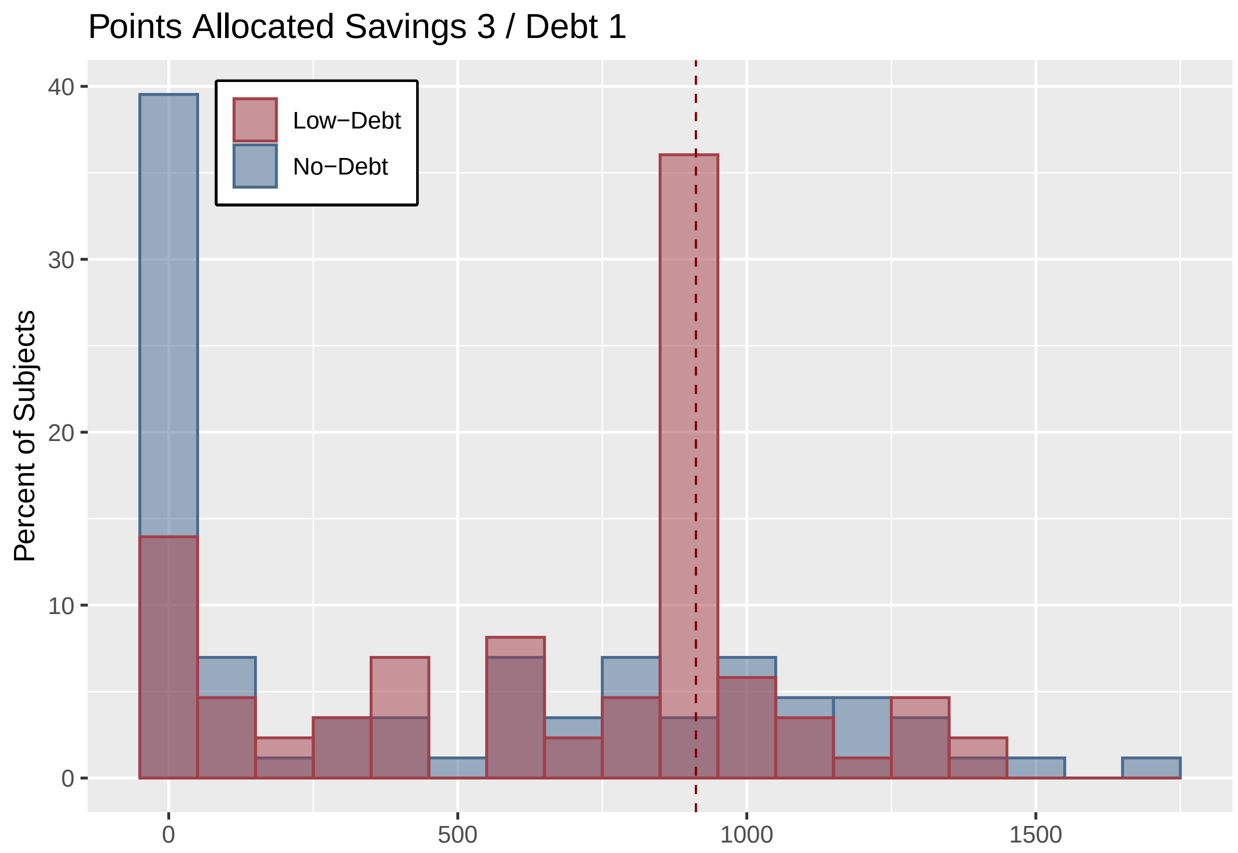


Figure 3 - Total Points Allocated to 15 Percent and 5 Percent Accounts

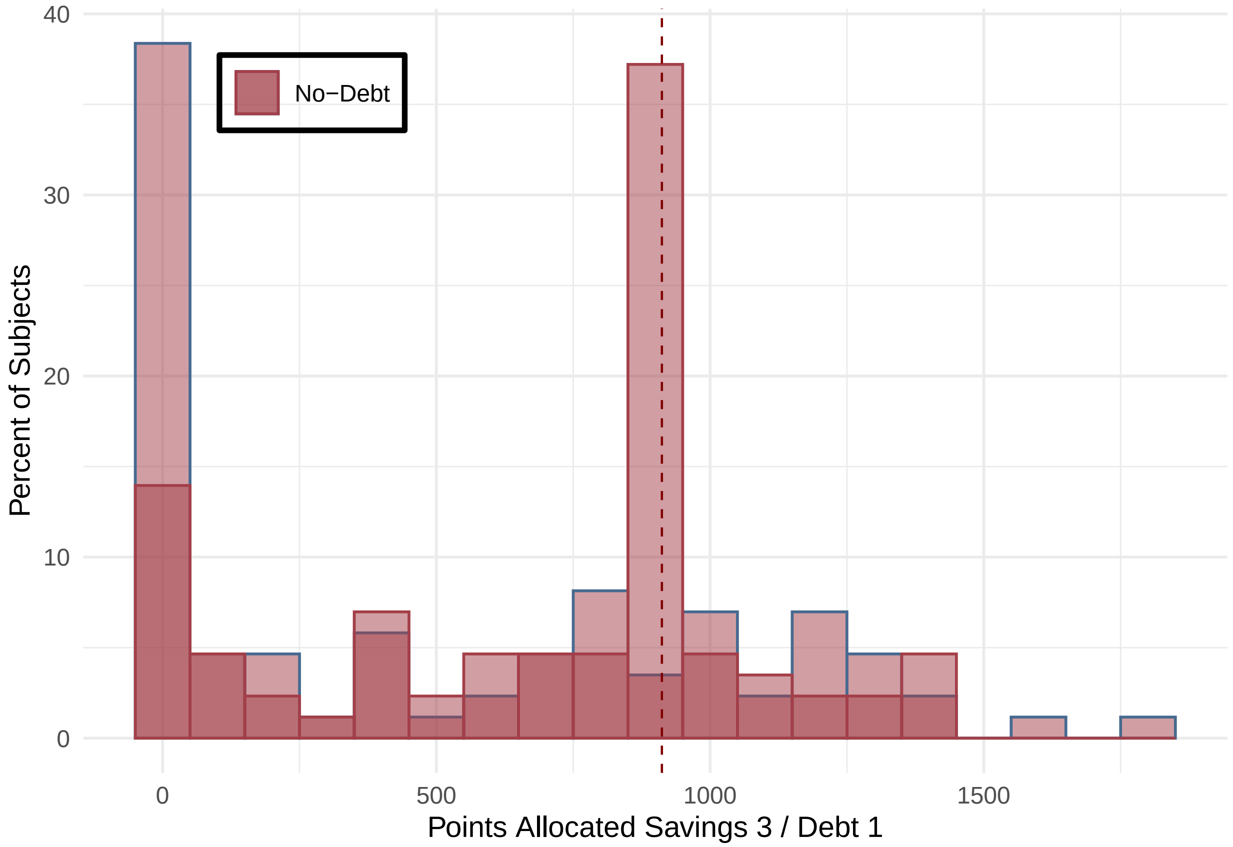
```
data <- read_dta("data/main_work.dta")

fig3.dat <- data %>%
  group_by(idturk, treatment) %>%
  summarise(tot_points_ia_a1 = sum(points_ia_a1, na.rm = TRUE),
            tot_points_ia_a2 = sum(points_ia_a2, na.rm = TRUE),
            tot_points_ia_a3 = sum(points_ia_a3, na.rm = TRUE),
            tot_points_ia_a4 = sum(points_ia_a4, na.rm = TRUE),
            tot_points_aa_a1 = sum(points_aa_a1, na.rm = TRUE),
            tot_points_aa_a2 = sum(points_aa_a2, na.rm = TRUE),
            tot_points_aa_a3 = sum(points_aa_a3, na.rm = TRUE),
            tot_points_aa_a4 = sum(points_aa_a4, na.rm = TRUE),
            .groups = 'drop')

fig3.dat <- fig3.dat %>%
  filter(!is.na(treatment))
```

```
fig3.dat <- fig3.dat %>%
  mutate(tot_points_a1 = tot_points_ia_a1 + tot_points_aa_a1,
         tot_points_a2 = tot_points_ia_a2 + tot_points_aa_a2,
         tot_points_a3 = tot_points_ia_a3 + tot_points_aa_a3,
         tot_points_a4 = tot_points_ia_a4 + tot_points_aa_a4)

fig3.dat <- fig3.dat %>%
  mutate(tot_points_a3_aux = tot_points_a3,
         tot_points_a3_aux = ifelse(treatment == 1, tot_points_a3_aux+25,tot_points_a3_aux),
         tot_points_a3_aux = tot_points_a3_aux - 50)

### Panel A
ggplot() +
  geom_histogram(data = filter(fig3.dat, treatment == 0),
                 aes(x = tot_points_a3_aux, y = ..count../sum(..count..)*100, fill = "No-Debt", color =
  geom_histogram(data = filter(fig3.dat, treatment == 1),
                 aes(x = tot_points_a3_aux, y = ..count../sum(..count..)*100, fill = "Low-Debt", color
  scale_x_continuous(breaks = seq(0, 1500, by = 500)) +
  scale_y_continuous(breaks = seq(0, 60, by = 10)) +
  labs(y = "Percent of Subjects", title = "Points Allocated Savings 3 / Debt 1", x = NULL) +
  geom_vline(xintercept = 912, linetype = "dashed", color = "#800000", linewidth = 0.4) +
  scale_fill_manual(values = c("#a33f49", "#476a90"), NULL) +
  theme(legend.position = c(0.2,0.89), legend.box.background = element_rect(size = 1))
```

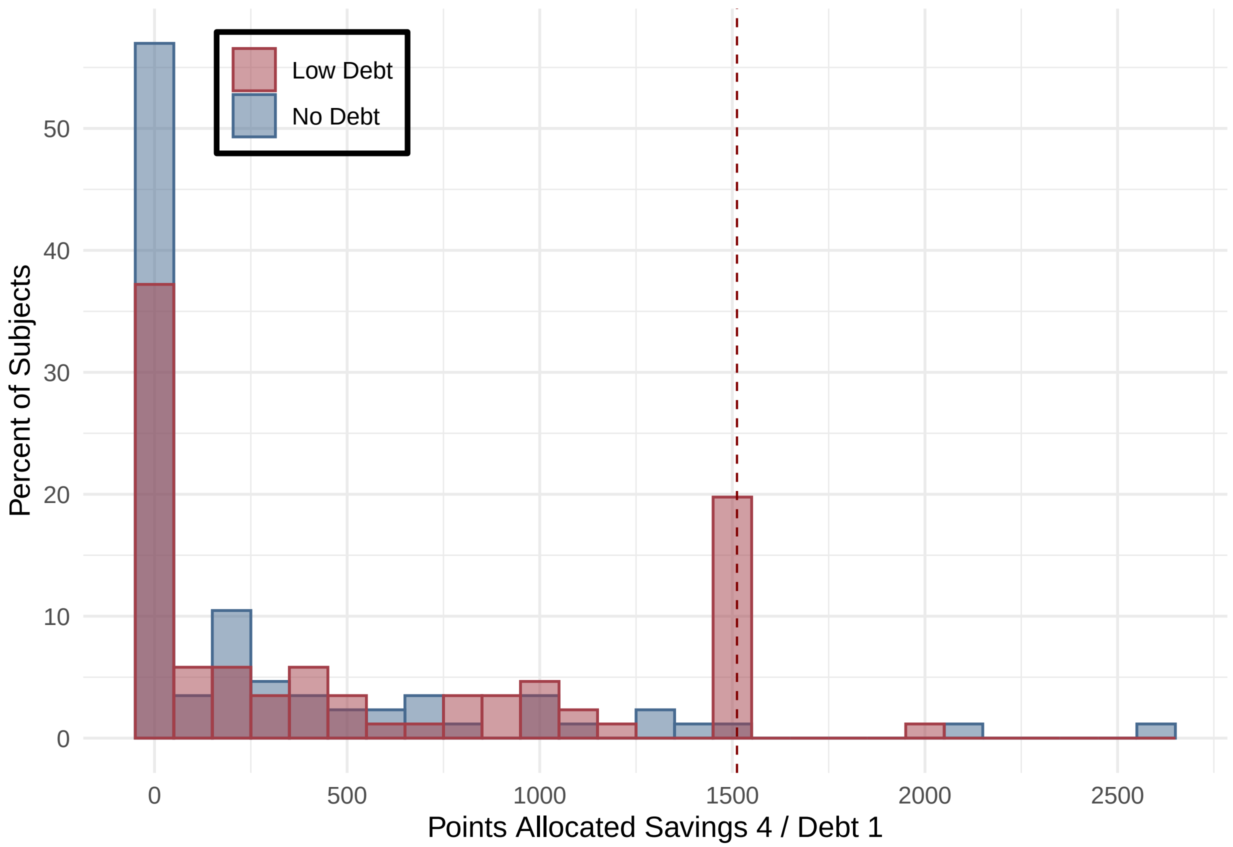
```
## Warning: The dot-dot notation (`..count..`) was deprecated in ggplot2 3.4.0.
## i Please use `after_stat(count)` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```



```
### Robustness Check: Replace tot_points_a3_aux by tot_points_a3
ggplot() +
  geom_histogram(data = filter(fig3.dat, treatment == 0),
                 aes(x = tot_points_a3, y = ..count../sum(..count..)*100, fill = "No-Debt", color = "#4
  geom_histogram(data = filter(fig3.dat, treatment == 1),
                 aes(x = tot_points_a3, y = ..count../sum(..count..)*100, fill = "No-Debt", color = "#4
  scale_x_continuous(breaks = seq(0, 1500, by = 500)) +
  scale_y_continuous(breaks = seq(0, 60, by = 10)) +
  labs(y = "Percent of Subjects", x = "Points Allocated Savings 3 / Debt 1") +
  theme_minimal() +
  theme(legend.position = "none") +
  geom_vline(xintercept = 912, linetype = "dashed", color = "#800000", linewidth = 0.4) +
  scale_fill_manual(values = c("#a33f49", "#476a90"), NULL) +
  theme(legend.position = c(0.2,0.89), legend.box.background = element_rect(size = 1))
```



```r
fig3.dat <- fig3.dat %>%
  mutate(tot_points_a4_aux = tot_points_a4,
         tot_points_a4_aux = ifelse(treatment == 1, tot_points_a4_aux+25,tot_points_a4_aux),
         tot_points_a4_aux = tot_points_a4_aux - 50)

### Panel B
ggplot() +
  geom_histogram(data = filter(fig3.dat, treatment == 0),
                 aes(x = tot_points_a4_aux, y = ..count../sum(..count..)*100, fill = "No Debt", color =
                 binwidth = 100, color = "#476a90", alpha = 0.5, position = "identity") +
  geom_histogram(data = filter(fig3.dat, treatment == 1),
                 aes(x = tot_points_a4_aux, y = ..count../sum(..count..)*100, fill = "Low Debt", color =
                 binwidth = 100, color = "#a33f49", alpha = 0.5, position = "identity") +
  scale_x_continuous(breaks = seq(0, 2500, by = 500)) +
  scale_y_continuous(breaks = seq(0, 60, by = 10)) +
  labs(y = "Percent of Subjects", x = "Points Allocated Savings 4 / Debt 1") +
  theme_minimal() +
  theme(legend.position = "none") +
  geom_vline(xintercept = 1512, linetype = "dashed", color = "#800000", linewidth = 0.4) +
  scale_fill_manual(values = c("#a33f49", "#476a90"), NULL) +
  theme(legend.position = c(0.2,0.89), legend.box.background = element_rect(size = 1))
```



```
### Robustness Check: Replace tot_points_a3_aux by tot_points_a3
ggplot() +
  geom_histogram(data = filter(fig3.dat, treatment == 0),
                 aes(x = tot_points_a4, y = ..count../sum(..count..)*100, fill = "No Debt", color = "#47
                 binwidth = 100, color = "#476a90", alpha = 0.5, position = "dodge") +
  geom_histogram(data = filter(fig3.dat, treatment == 1),
                 aes(x = tot_points_a4, y = ..count../sum(..count..)*100, fill = "Low Debt", color = "#a
                 binwidth = 100, color = "#a33f49", alpha = 0.5, position = "dodge") +
  scale_x_continuous(breaks = seq(0, 2500, by = 500)) +
  scale_y_continuous(breaks = seq(0, 60, by = 10)) +
  labs(y = "Percent of Subjects", x = "Points Allocated Savings 4 / Debt 1") +
  theme_minimal() +
  theme(legend.position = "none") +
  geom_vline(xintercept = 1512, linetype = "dashed", color = "#800000", linewidth = 0.4) +
  scale_fill_manual(values = c("#a33f49", "#476a90"), NULL) +
  theme(legend.position = c(0.2,0.89), legend.box.background = element_rect(size = 1))
```

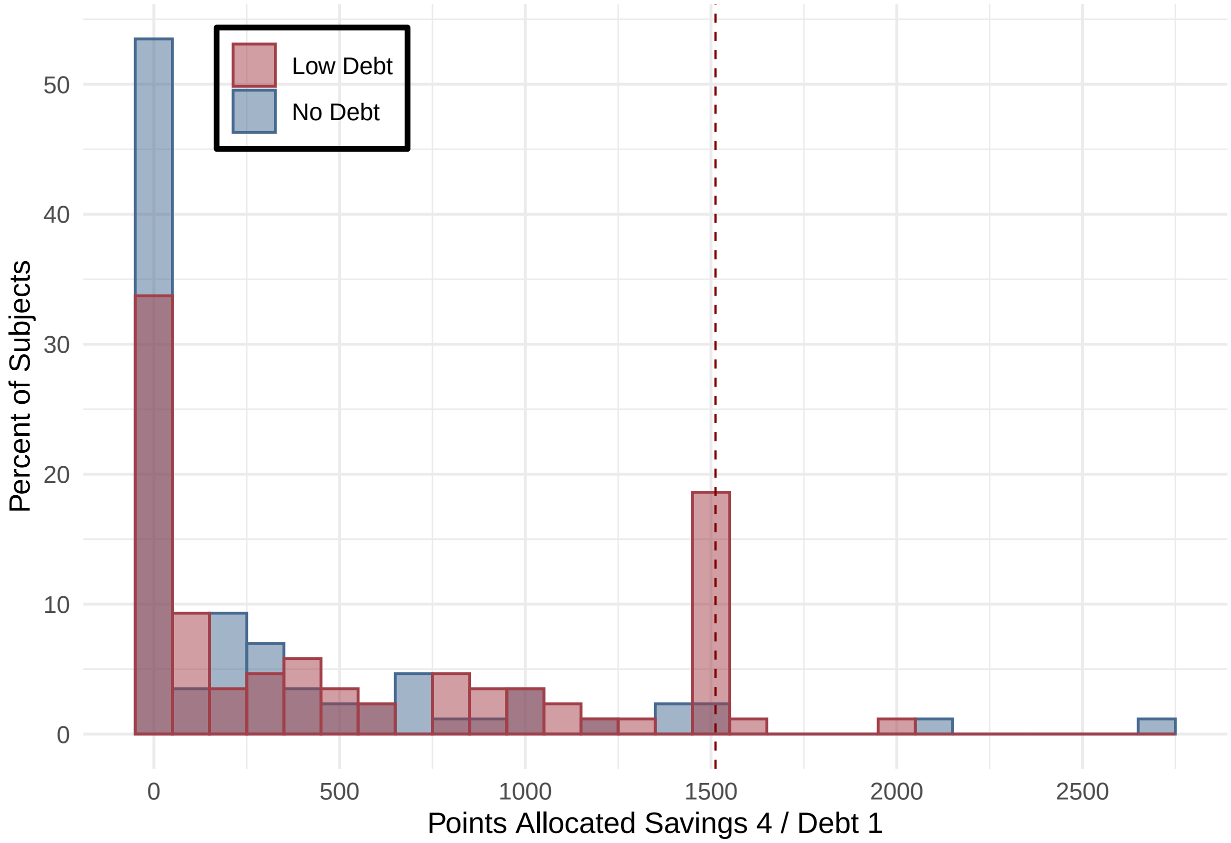
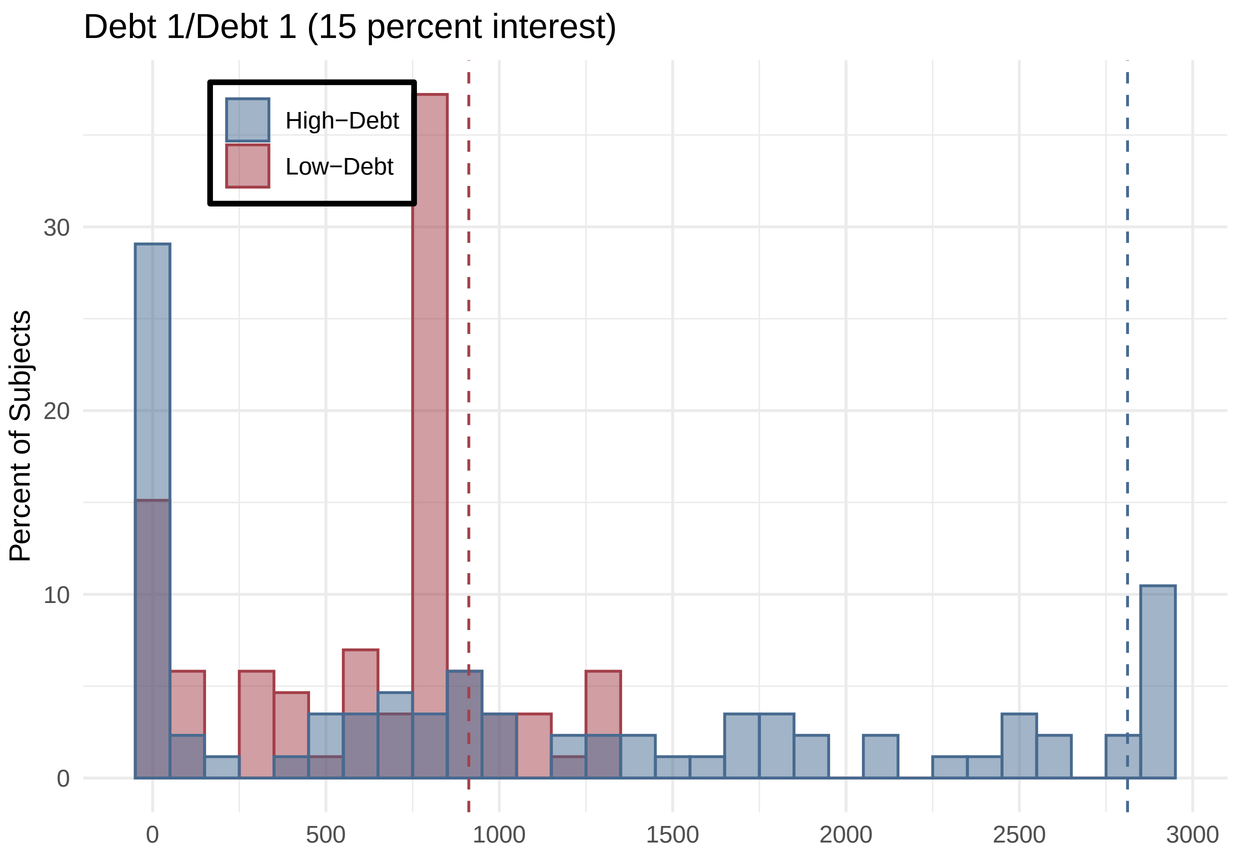


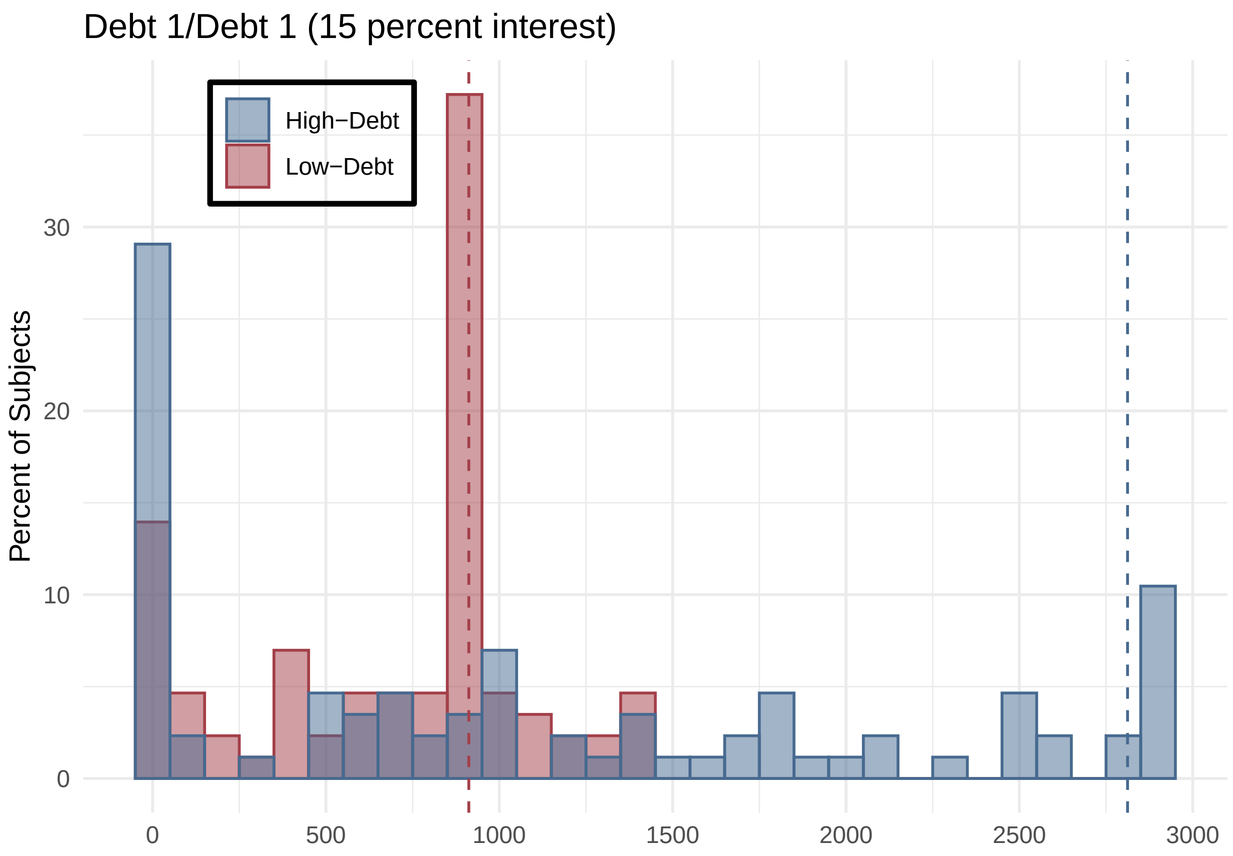
Figure 4 - Total Points Allocated to Debt Accounts

```
data <- read_dta("data/main_work.dta")

fig4.dat <- data %>%
  group_by(idturk, treatment) %>%
  summarise(tot_points_ia_a1 = sum(points_ia_a1, na.rm = TRUE),
            tot_points_ia_a2 = sum(points_ia_a2, na.rm = TRUE),
            tot_points_ia_a3 = sum(points_ia_a3, na.rm = TRUE),
            tot_points_ia_a4 = sum(points_ia_a4, na.rm = TRUE),
            tot_points_aa_a1 = sum(points_aa_a1, na.rm = TRUE),
            tot_points_aa_a2 = sum(points_aa_a2, na.rm = TRUE),
            tot_points_aa_a3 = sum(points_aa_a3, na.rm = TRUE),
            tot_points_aa_a4 = sum(points_aa_a4, na.rm = TRUE),
            .groups = 'drop')

fig4.dat <- fig4.dat %>%
  filter(!is.na(treatment))

fig4.dat <- fig4.dat %>%
  mutate(tot_points_a1 = tot_points_ia_a1 + tot_points_aa_a1,
         tot_points_a2 = tot_points_ia_a2 + tot_points_aa_a2,
         tot_points_a3 = tot_points_ia_a3 + tot_points_aa_a3,
         tot_points_a4 = tot_points_ia_a4 + tot_points_aa_a4)
```

```
fig4.dat <- fig4.dat %>%
  mutate(tot_points_a3_aux = tot_points_a3,
         tot_points_a3_aux = ifelse(treatment == 1, tot_points_a3_aux+25,tot_points_a3_aux),
         tot_points_a3_aux = tot_points_a3_aux - 50)

fig4.dat <- fig4.dat %>%
  mutate(tot_points_a3_aux = ifelse(treatment == 1, tot_points_a3_aux - 25,
                                    ifelse(treatment == 2, tot_points_a3_aux + 25,tot_points_a3_aux)))

#Panel A

### aux
ggplot() +
  geom_histogram(data = filter(fig4.dat, treatment == 1),
                 aes(x = tot_points_a3_aux, y = ..count../sum(..count..)*100, fill = "Low-Debt", color =
                 binwidth = 100, color = "#a33f49", alpha = 0.5, position = "identity") +
  geom_histogram(data = filter(fig4.dat, treatment == 2),
                 aes(x = tot_points_a3_aux, y = ..count../sum(..count..)*100, fill = "High-Debt", color
                 binwidth = 100, color = "#476a90", alpha = 0.5, position = "identity") +
  scale_x_continuous(breaks = seq(0, 3000, by = 500)) +
  scale_y_continuous(breaks = seq(0, 60, by = 10)) +
  labs(y = "Percent of Subjects", title = "Debt 1/Debt 1 (15 percent interest)", x = NULL) +
  theme_minimal() +
  theme(legend.position = "top") +
  geom_vline(xintercept = 912, linetype = "dashed", color = "#a33f49", linewidth = 0.5) +
  geom_vline(xintercept = 2812, linetype = "dashed", color = "#476a90", linewidth = 0.5) +
  scale_fill_manual(values = c("#476a90", "#a33f49"), NULL) +
  theme(legend.position = c(0.2,0.89), legend.box.background = element_rect(size = 1))
```

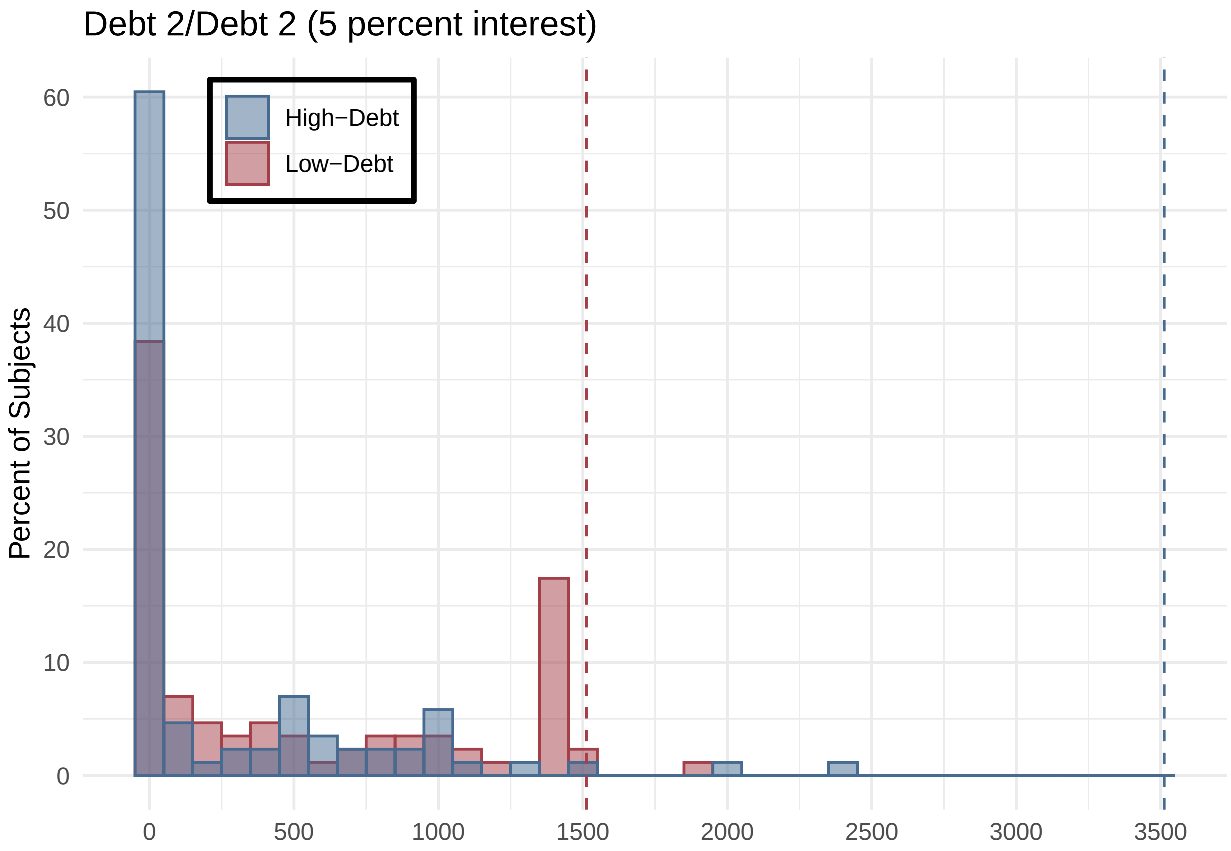


```
### tot
ggplot() +
  geom_histogram(data = filter(fig4.dat, treatment == 1),
                 aes(x = tot_points_a3, y = ..count../sum(..count..)*100, fill = "Low-Debt", color = "#a
                 binwidth = 100, color = "#a33f49", alpha = 0.5, position = "dodge") +
  geom_histogram(data = filter(fig4.dat, treatment == 2),
                 aes(x = tot_points_a3, y = ..count../sum(..count..)*100, fill = "High-Debt", color = "#
                 binwidth = 100, color = "#476a90", alpha = 0.5, position = "dodge") +
  scale_x_continuous(breaks = seq(0, 3000, by = 500)) +
  scale_y_continuous(breaks = seq(0, 60, by = 10)) +
  labs(y = "Percent of Subjects", title = "Debt 1/Debt 1 (15 percent interest)", x = NULL) +
  theme_minimal() +
  theme(legend.position = "top") +
  geom_vline(xintercept = 912, linetype = "dashed", color = "#a33f49", linewidth = 0.5) +
  geom_vline(xintercept = 2812, linetype = "dashed", color = "#476a90", linewidth = 0.5) +
  scale_fill_manual(values = c("#476a90", "#a33f49"), NULL) +
  theme(legend.position = c(0.2,0.89), legend.box.background = element_rect(size = 1))
```



```
#Panel B

fig4.dat <- fig4.dat %>%
  mutate(tot_points_a4_aux = tot_points_a4,
         tot_points_a4_aux = ifelse(treatment == 1, tot_points_a4_aux+25,tot_points_a4_aux),
         tot_points_a4_aux = tot_points_a4_aux - 50)

fig4.dat <- fig4.dat %>%
  mutate(tot_points_a4_aux = ifelse(treatment == 1, tot_points_a4_aux - 25,
                                    ifelse(treatment == 2, tot_points_a4_aux + 25,tot_points_a4_aux)))

### aux
ggplot() +
  geom_histogram(data = filter(fig4.dat, treatment == 1),
                 aes(x = tot_points_a4_aux, y = ..count../sum(..count..)*100, fill = "Low-Debt", color =
                 binwidth = 100, color = "#a33f49", alpha = 0.5, position = "identity") +
  geom_histogram(data = filter(fig4.dat, treatment == 2),
                 aes(x = tot_points_a4_aux, y = ..count../sum(..count..)*100, fill = "High-Debt", color
                 binwidth = 100, color = "#476a90", alpha = 0.5, position = "identity") +
  scale_x_continuous(breaks = seq(0, 3500, by = 500)) +
  scale_y_continuous(breaks = seq(0, 60, by = 10)) +
  labs(y = "Percent of Subjects", title = "Debt 2/Debt 2 (5 percent interest)", x = NULL) +
  theme_minimal() +
  theme(legend.position = "top") +
  geom_vline(xintercept = 1512, linetype = "dashed", color = "#a33f49", size = 0.5) +
  geom_vline(xintercept = 3512, linetype = "dashed", color = "#476a90", size = 0.5) +
  scale_fill_manual(values = c("#476a90", "#a33f49"), NULL) +
  theme(legend.position = c(0.2,0.89), legend.box.background = element_rect(size = 1))
```

```
## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use `linewidth` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```



```
### tot
ggplot() +
  geom_histogram(data = filter(fig4.dat, treatment == 1),
                 aes(x = tot_points_a4, y = ..count../sum(..count..)*100, fill = "Low-Debt", color = "#
                 binwidth = 100, color = "#a33f49", alpha = 0.5, position = "dodge") +
  geom_histogram(data = filter(fig4.dat, treatment == 2),
                 aes(x = tot_points_a4, y = ..count../sum(..count..)*100, fill = "High-Debt", color = "
                 binwidth = 100, color = "#476a90", alpha = 0.5, position = "dodge") +
  scale_x_continuous(breaks = seq(0, 3500, by = 500)) +
  scale_y_continuous(breaks = seq(0, 60, by = 10)) +
  labs(y = "Percent of Subjects", title = "Debt 2/Debt 2 (5 percent interest)", x = NULL) +
  theme_minimal() +
  theme(legend.position = "top") +
  geom_vline(xintercept = 1512, linetype = "dashed", color = "#a33f49", size = 0.5) +
  geom_vline(xintercept = 3512, linetype = "dashed", color = "#476a90", size = 0.5) +
  scale_fill_manual(values = c("#476a90", "#a33f49"), NULL) +
  theme(legend.position = c(0.2,0.89), legend.box.background = element_rect(size = 1))
```

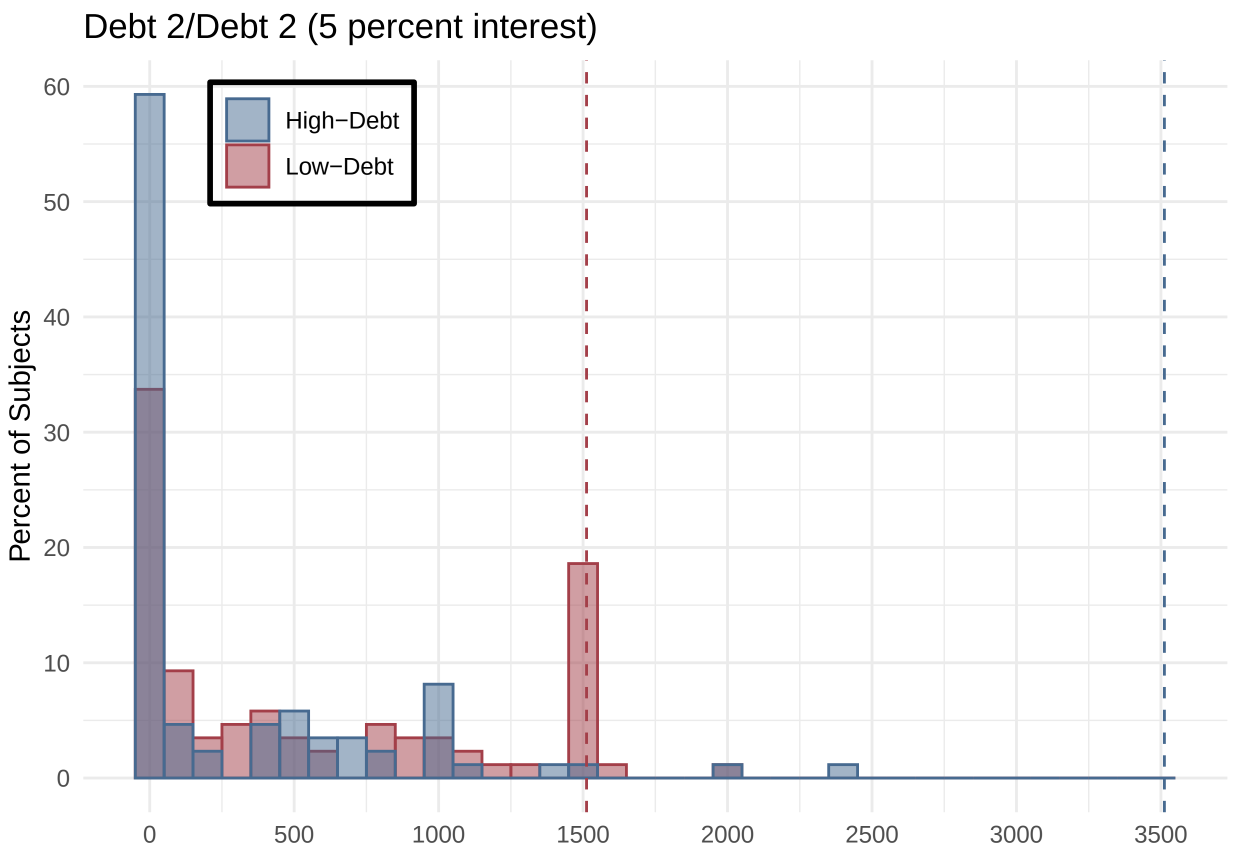


Figure 5 - Percent of Subjects Who Maximize Returns in One-Shot Scenarios

```
# Filter data for day 4
data <- data %>% filter(day == 4)

# Share allocated to account 1
data <- data %>%
  mutate(perco_os_control = oneshotcontrol_s1 / 1000,
         perco_os_debt = oneshotdebt_s1 / 1000,
         perco_os_high = oneshothigh_s1 / 1000)

# Indicator decision is optimal
data <- data %>%
  mutate(ind_perco_os_control = (perco_os_control == 1),
         ind_perco_os_debt = (perco_os_debt == 1),
         ind_perco_os_high = (perco_os_high == 1))

#Control
tab_control <- table(data$ind_perco_os_control, data$treatment)
tab_control_col_perc <- prop.table(tab_control, 2) * 100
tab.c = tab_control_col_perc[2,] %>% as.data.frame() %>% cbind(c("No-Debt", "Low-Debt", "High-Debt"))
tab.c$one_shot_type = "One-Shot No-Debt"

#Debt
tab_debt <- table(data$ind_perco_os_debt, data$treatment)
```

```
tab_debt_col_perc <- prop.table(tab_debt, 2) * 100
tab.d = tab_debt_col_perc[2,] %>% as.data.frame() %>% cbind(c("No-Debt", "Low-Debt", "High-Debt"))
tab.d$one_shot_type = "One-Shot Low-Debt"

#High
tab_high <- table(data$ind_perco_os_high, data$treatment)
tab_high_col_perc <- prop.table(tab_high, 2) * 100
tab.h = tab_high_col_perc[2,] %>% as.data.frame() %>% cbind(c("No-Debt", "Low-Debt", "High-Debt"))
tab.h$one_shot_type = "One-Shot High-Debt"

dat.fig5 = rbind(tab.c, tab.d, tab.h)
colnames(dat.fig5)[c(1, 2)] = c("share", "type")

dat.fig5$type = dat.fig5$type %>%
  as.factor() %>%
  fct_relevel("No-Debt", "Low-Debt", "High-Debt")

dat.fig5$one_shot_type = dat.fig5$one_shot_type %>%
  as.factor() %>%
  fct_relevel("One-Shot No-Debt", "One-Shot Low-Debt", "One-Shot High-Debt")

ggplot(dat.fig5, aes(x = type, y = share, fill = one_shot_type)) +
  geom_col(position = position_dodge()) +
  labs(x = NULL, y = "Share", fill = NULL, title = "Figure 5: Percent of Subjects Who Maximize Returns
  scale_fill_manual(values = c("#476a90", "#a33f49", "#5f9786")) +
  scale_y_continuous(limits = c(0,80)) +
  theme(legend.position = c(0.15,0.89), legend.box.background = element_rect(size = 1)) +
  geom_text(aes(label=round(share, 2)), position=position_dodge(width=0.9), vjust=-0.25, size = 3)
```

Figure 5: Percent of Subjects Who Maximize Returns in One−Shot Scenaric

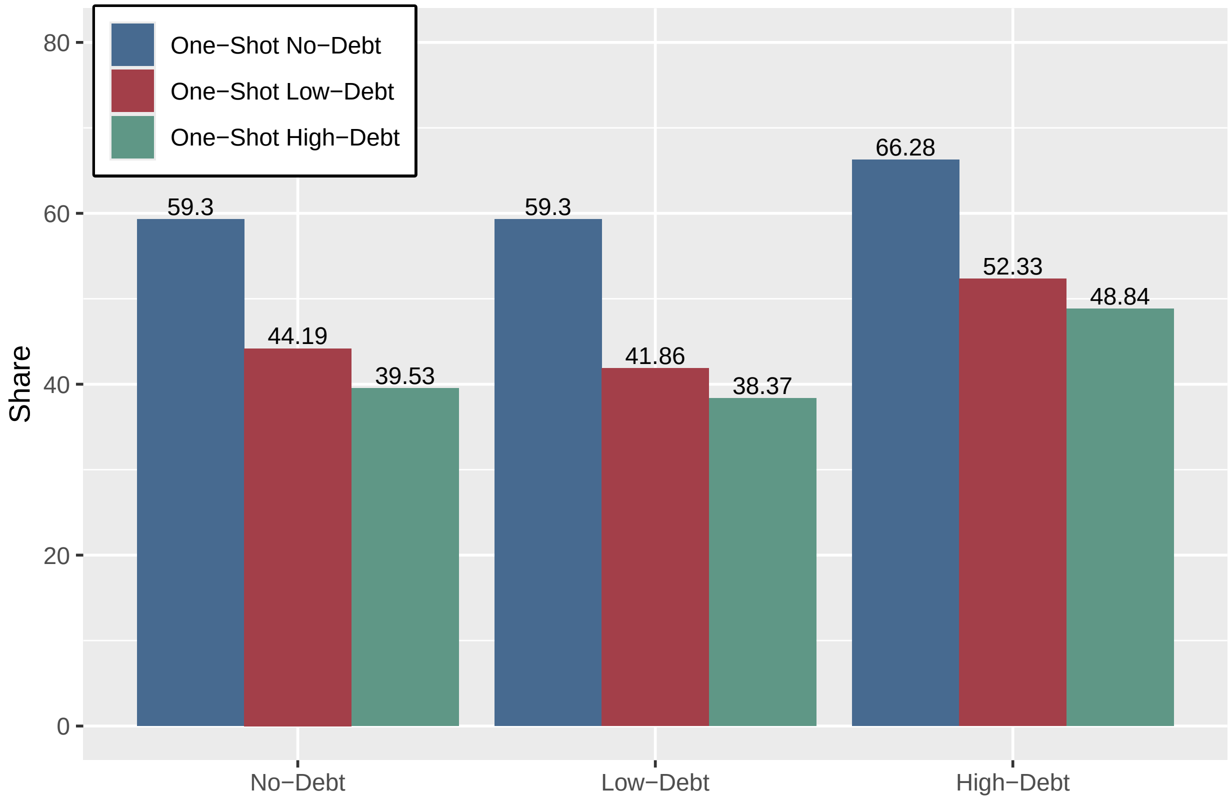


Table 5 - Redistribution Decisions: Share of Subjects Who Consolidate on Day 1

```
# Load data
tab5.dat <- read_dta("data/redistribution_work.dta")

# Define treatment labels
tab5.dat <- tab5.dat %>%
  mutate(treatment = recode(treatment, `0` = "Red. No Debt", `1` = "Red. Debt"))

# Consolidate variables and run regressions
tab5.dat <- tab5.dat %>%
  mutate(consolidateS1_aux = if_else(balance_a1 > 2500 & day == 1, 1, 0),
         consolidateS2_aux = if_else(balance_a2 > 900 & day == 1, 1, 0),
         consolidateS3_aux = if_else((balance_a3 > 900 & day == 1 & treatment == "Red. No Debt") |
                                       (balance_a3 > -100 & day == 1 & treatment == "Red. Debt"), 1, 0)
         consolidateS4_aux = if_else((balance_a4 > 4800 & day == 1 & treatment == "Red. No Debt") |
                                       (balance_a4 > -3800 & day == 1 & treatment == "Red. Debt"), 1, 0

tab5.dat = tab5.dat %>% filter(day == 1)

#Row1
sav1 = feols(consolidateS1_aux ~ treatment, data = tab5.dat, vcov = "hetero") %>%
  summary()
nd.1 = sav1$coeftable[1,1] + sav1$coeftable[2,1]
d.1 = sav1$coeftable[2,1]
```

```
p.1 = sav1$coeftable[2,4]
#Row2
sav2 = feols(consolidateS2_aux ~ treatment, data = tab5.dat, vcov = "hetero") %>%
  summary()
nd.2 = sav2$coeftable[1,1] + sav2$coeftable[2,1]
d.2 = sav2$coeftable[2,1]
p.2 = sav2$coeftable[2,4]
#Row3
sav3 = feols(consolidateS3_aux ~ treatment, data = tab5.dat, vcov = "hetero") %>%
  summary()
nd.3 = sav3$coeftable[1,1] + sav3$coeftable[2,1]
d.3 = sav3$coeftable[2,1]
p.3 = sav3$coeftable[2,4]
#Row4
sav4 = feols(consolidateS4_aux ~ treatment, data = tab5.dat, vcov = "hetero") %>%
  summary()
nd.4 = sav4$coeftable[1,1] + sav4$coeftable[2,1]
d.4 = sav4$coeftable[2,1]
p.4 = sav4$coeftable[2,4]

#Data
df <- data.frame(
  Redistribution = c("Savings 1", "Savings 2", "Savings 3/Debt 1", "Savings 4/Debt 2"),
  Redistribution_No_Debt = c(nd.1, nd.2, nd.3, nd.4),
  Redistribution_Debt = c(d.1, d.2, d.3, d.4),
  p_value = c(p.1, p.2, p.3, p.4)
)

# Create table
kable(df, col.names = c("Redistribution", "No Debt", "Debt", "p-value"), caption = "Table 5-Redistributi
  kable_styling(bootstrap_options = c("striped", "hover", "condensed", "responsive")) %>%
  add_header_above(c(" " = 1, "Redistribution" = 2, " " = 1)) %>%
  column_spec(2, bold = TRUE) %>%
  footnote("Subjects are assigned to one category if they allocate more than the initial endowment to th
```

Table 1: Table 5—R
Consolidate on Day

	Redistribution	
Redistribution	No Debt	Debt
Savings 1	**0.3703704**	0.2015392
Savings 2	**0.0370370**	0.0110630
Savings 3/Debt 1	**0.1358025**	-0.2018599
Savings 4/Debt 2	**0.0864198**	-0.0434504

Note:
Subjects are assigned to one category if they allocate more than the initial endowment to that account. This is only feasib

Figure 6 - Total Returns

```
# Load data
dat.fig6 <- read_dta("data/redistribution_work.dta")
```

```r
# Sort data
dat.fig6 <- dat.fig6 %>%
  arrange(idturk, day)

dat.fig6 = dat.fig6 %>%
  group_by(idturk) %>%
  mutate(initalendowment.lead = lead(initialendowment, 1)) %>%
  ungroup()

# Generate returns
dat.fig6 <- dat.fig6 %>%
  mutate(returns = ifelse(day == 4 & treatment == 1,
                        round(balance_a1 * .2 + balance_a2 * .1 + balance_a3 * .15 + balance_a4 * .05
                        ifelse(day == 4 & treatment == 0,
                               round(balance_a1 * .2 + balance_a2 * .1 + balance_a3 * .15 + balance_a
                               initalendowment.lead)))

# Generate cumulative returns
dat.fig6 = dat.fig6 %>%
  filter(day != 0)

dat.fig6 <- dat.fig6 %>%
  group_by(idturk) %>%
  mutate(cum_returns = cumsum(returns)) %>%
  ungroup()

#Day 4 only
dat.fig6 = dat.fig6 %>%
  filter(day == 4)

dat.fig6 = dat.fig6 %>%
  mutate(treatment = as.factor(treatment)) %>%
  select(treatment, cum_returns)

dat.fig6$treatment = ifelse(dat.fig6$treatment == 0, "Redistribution No Debt", " Redistribution Debt")

dat.fig6$treatment = dat.fig6$treatment %>%
  fct_relevel("Redistribution No Debt", " Redistribution Debt")

#Plot
ggplot(data = dat.fig6, aes(x = cum_returns, color = treatment)) +
  stat_ecdf(size = 0.65) +
  scale_color_manual(values = c("#476a90", "#a33f49")) +
  theme(legend.position = c(0.2,0.85), legend.box.background = element_rect(size = 1)) +
  xlim(1300, 3500) +
  scale_y_continuous(labels = scales::number_format(accuracy = 0.1), limits = c(0,1)) +
  labs(x = "Total returns", y = "Pr (total returns < x)", title = "Figure 6: Total Returns", color = NU
```

```
## Warning: Removed 1 row containing non-finite outside the scale range
## (`stat_ecdf()`).
```

Figure 6: Total Returns

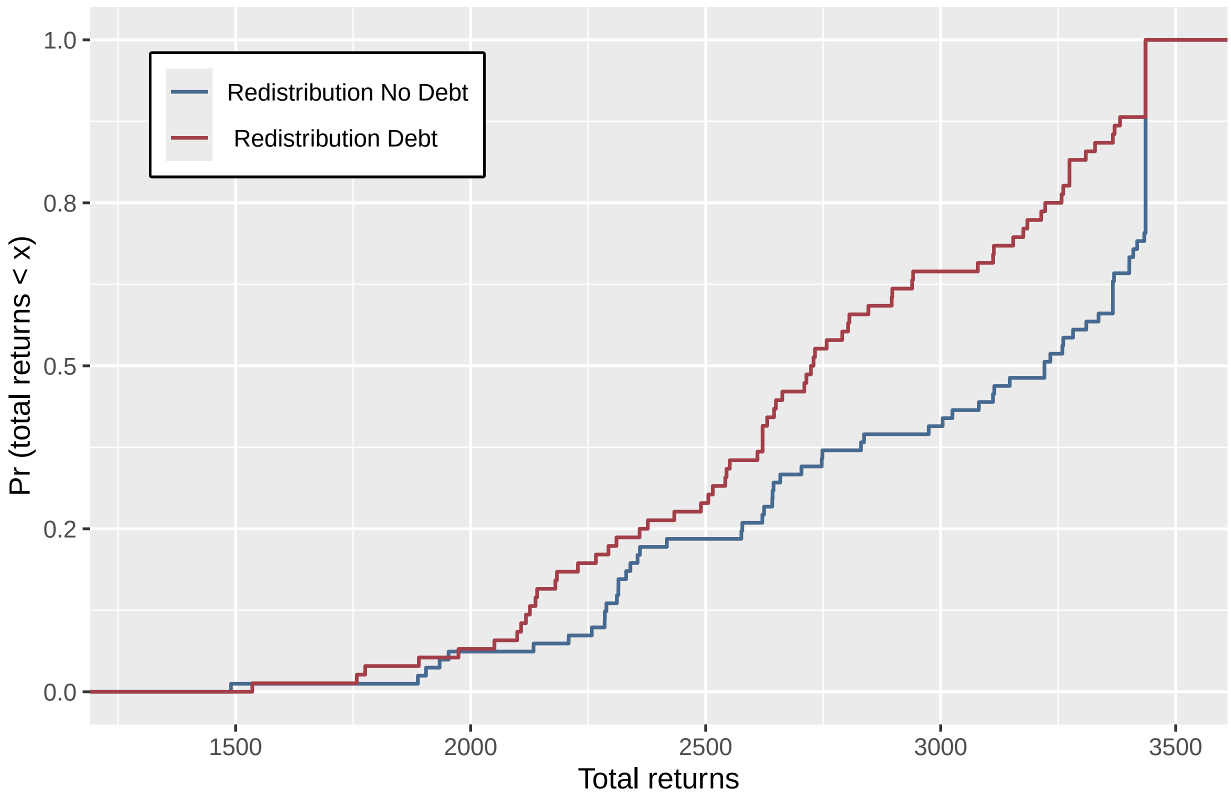


Figure 7 - Percent of Subjects Who Borrow The Maximum Amount From Both Accounts

```
# Load the data
data <- read_dta("data/borrowing_work.dta")

# Values for the error bars
model1 <- lm(borrow_max_both ~ factor(treatment), data = data %>% filter(day == 4))
summary(model1)
```

```
##
## Call:
## lm(formula = borrow_max_both ~ factor(treatment), data = data %>%
##     filter(day == 4))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6250 -0.3415 -0.3415  0.3750  0.6585
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)          0.62500    0.05390  11.595  < 2e-16 ***
## factor(treatment)1 -0.28354    0.07576  -3.742 0.000254 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.4821 on 160 degrees of freedom
## Multiple R-squared:  0.08049,    Adjusted R-squared:  0.07474
## F-statistic: 14.01 on 1 and 160 DF,  p-value: 0.0002537
```

```
# Coefficients: -.2835366, CI: -.4331979 to -.1338753, Constant: .625

model2 <- lm(borrow_max_both ~ factor(treatment), data = data %>% filter(day == 4 & ind_optimal_ia_all =
summary(model2)
```

```
##
## Call:
## lm(formula = borrow_max_both ~ factor(treatment), data = data %>%
##     filter(day == 4 & ind_optimal_ia_all == 1))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.96154 -0.45714  0.03846  0.54286  0.54286
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)          0.9615     0.0793  12.125  < 2e-16 ***
## factor(treatment)1  -0.5044     0.1047  -4.818 1.05e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4044 on 59 degrees of freedom
## Multiple R-squared:  0.2823, Adjusted R-squared:  0.2702
## F-statistic: 23.21 on 1 and 59 DF,  p-value: 1.053e-05
```

```
# Coefficients: -.5043956, CI: -.6921199 to -.3166713, Constant: .9615385

# Prepare data for plotting
data <- data %>% filter(day == 4)
data <- data %>%
  mutate(counter = 1) %>%
  group_by(treatment) %>%
  summarise(mean_borrow_max_both = mean(borrow_max_both, na.rm = TRUE),
            sd_borrow_max_both = sd(borrow_max_both, na.rm = TRUE),
            n = n()) %>%
  mutate(optimal = 0)

write_dta(data, "data/auxiliarBorrowing1.dta")

data_optimal <- read_dta("data/borrowing_work.dta") %>%
  filter(day == 4 & ind_optimal_ia_all == 1) %>%
  mutate(counter = 1) %>%
  group_by(treatment) %>%
  summarise(mean_borrow_max_both = mean(borrow_max_both, na.rm = TRUE),
            sd_borrow_max_both = sd(borrow_max_both, na.rm = TRUE),
            n = n()) %>%
  mutate(optimal = 1)

write_dta(data_optimal, "data/auxiliarBorrowing2.dta")
```

```r
# Append data
data_combined <- bind_rows(data, data_optimal)

# Add error bars for the treatment difference
data_combined <- data_combined %>%
  mutate(hiwrite = ifelse(treatment == 1 & optimal == 0, (.625 - .2835366) + (.4331979 - .2835366), NA)
         lowrite = ifelse(treatment == 1 & optimal == 0, (.625 - .2835366) - (.2835366 - .1338753), NA)
         hiwrite = ifelse(treatment == 1 & optimal == 1, (.9615385 - .5043956) + (.6921199 - .5043956),
         lowrite = ifelse(treatment == 1 & optimal == 1, (.9615385 - .5043956) - (.5043956 - .3166713),
         spacing = case_when(
           treatment == 0 & optimal == 0 ~ 0.2,
           treatment == 1 & optimal == 0 ~ 0.525,
           treatment == 0 & optimal == 1 ~ 1.8,
           treatment == 1 & optimal == 1 ~ 2.125
         ))

data_combined$treatment = ifelse(data_combined$treatment == 0, "Borrow-Savings", "Borrow-Debt")

# Plot the graph
ggplot(data_combined, aes(x = spacing, y = mean_borrow_max_both, fill = factor(treatment))) +
  geom_bar(stat = "identity", position = "dodge", width = 0.3) +
  geom_errorbar(aes(ymin = lowrite, ymax = hiwrite), width = 0.2, color = "black", alpha = 0.5) +
  scale_fill_manual(values = c("Borrow-Savings" = "#476a90", "Borrow-Debt" = "#a33f49")) +
  labs(y = "Percent of Subjects", x = NULL, fill = NULL, title = "Figure 7: Percent of Subjects Who Bor
  theme(legend.position = c(0.2,0.85), legend.box.background = element_rect(size = 1)) +
  scale_x_continuous(breaks = c(0.3625, 1.9625), labels = c("All subjects", "Only max returns")) +
  scale_y_continuous(labels = scales::number_format(accuracy = 0.1), limits = c(0,1)) +
  geom_text(aes(label=round(mean_borrow_max_both*100, 0)), position=position_dodge(width=0.9), vjust=-0
```

```
## Warning: `position_dodge()` requires non-overlapping x intervals.
```

Figure 7: Percent of Subjects Who Borrow the Maximum Amount From Botl

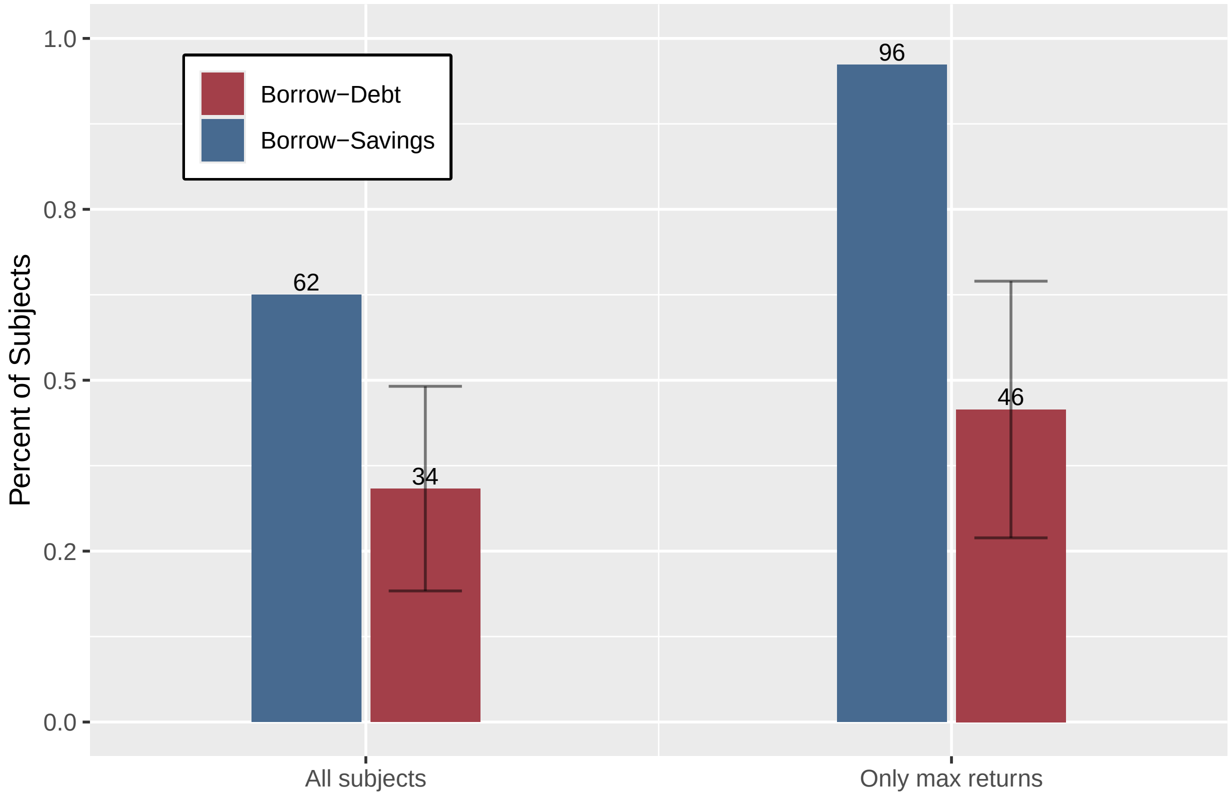
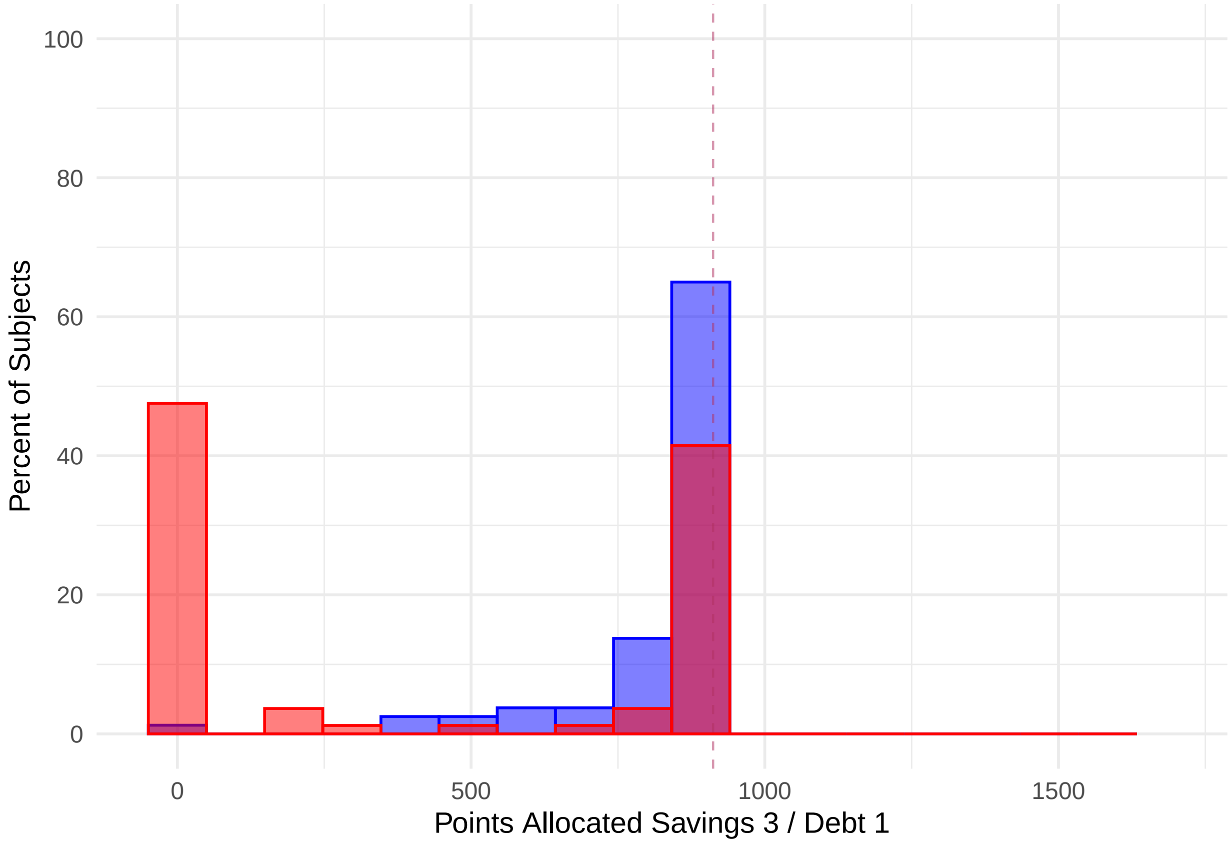


Figure 8 - Total Points Borrowed From Each Account

```
# Load the data
data <- read_dta("data/borrowing_work.dta")

# Obtain points borrowed from each account
data <- data %>%
  mutate(tot_account5_aux = ifelse(is.na(treatment), -50, ifelse(treatment == 0, total_borrowsaving5 - 5
         tot_account6_aux = ifelse(is.na(treatment), -50, ifelse(treatment == 0,total_borrowsaving6 - 50

# Panel A
ggplot(data = data, aes(x = tot_account5_aux, fill = factor(treatment), group = treatment)) +
  geom_histogram(data = filter(data, treatment == 0),
                 aes(x = tot_account5_aux, y = ..count../sum(..count..)*100),
                 binwidth = 99, fill = "blue", color = "blue", alpha = 0.5, position = "identity") +
  geom_histogram(data = filter(data, treatment == 1),
                 aes(x = tot_account5_aux, y = ..count../sum(..count..)*100),
                 binwidth = 99, fill = "red", color = "red", alpha = 0.5, position = "identity") +
  theme_minimal() +
  labs(y = "Percent of Subjects", x = "Points Allocated Savings 3 / Debt 1", fill = "Treatment") +
  theme(legend.position = "bottom") +
  scale_y_continuous(limits = c(0, 100), breaks = seq(0, 100, 20)) +
  scale_x_continuous(limits = c(-50, 1700), breaks = seq(0, 1500, 500)) +
  geom_vline(xintercept = 912, linetype = "dashed", color = "maroon", size = 0.4, alpha = 0.5)
```

```
## Warning: Removed 2 rows containing missing values or values outside the scale range
## (`geom_bar()`).
## Removed 2 rows containing missing values or values outside the scale range
## (`geom_bar()`).
```



```r
# Panel B
ggplot(data, aes(x = tot_account6_aux, fill = factor(treatment))) +
  geom_histogram(data = filter(data, treatment == 0),
                 aes(x = tot_account6_aux, y = ..count../sum(..count..)*100),
                 binwidth = 99, fill = "blue", color = "blue", alpha = 0.5, position = "identity") +
  geom_histogram(data = filter(data, treatment == 1),
                 aes(x = tot_account6_aux, y = ..count../sum(..count..)*100),
                 binwidth = 99, fill = "red", color = "red", alpha = 0.5, position = "identity") +
  theme_minimal() +
  labs(y = "Percent of Subjects", x = "Points Allocated Savings 3 / Debt 1", fill = "Treatment") +
  theme(legend.position = "bottom") +
  scale_y_continuous(limits = c(0, 80), breaks = seq(0, 100, 20)) +
  scale_x_continuous(limits = c(-50, 1700), breaks = seq(0, 1500, 500)) +
  geom_vline(xintercept = 1500, linetype = "dashed", color = "maroon", size = 0.4, alpha = 0.5)
```

```
## Warning: Removed 2 rows containing missing values or values outside the scale range
## (`geom_bar()`).
## Removed 2 rows containing missing values or values outside the scale range
## (`geom_bar()`).
```

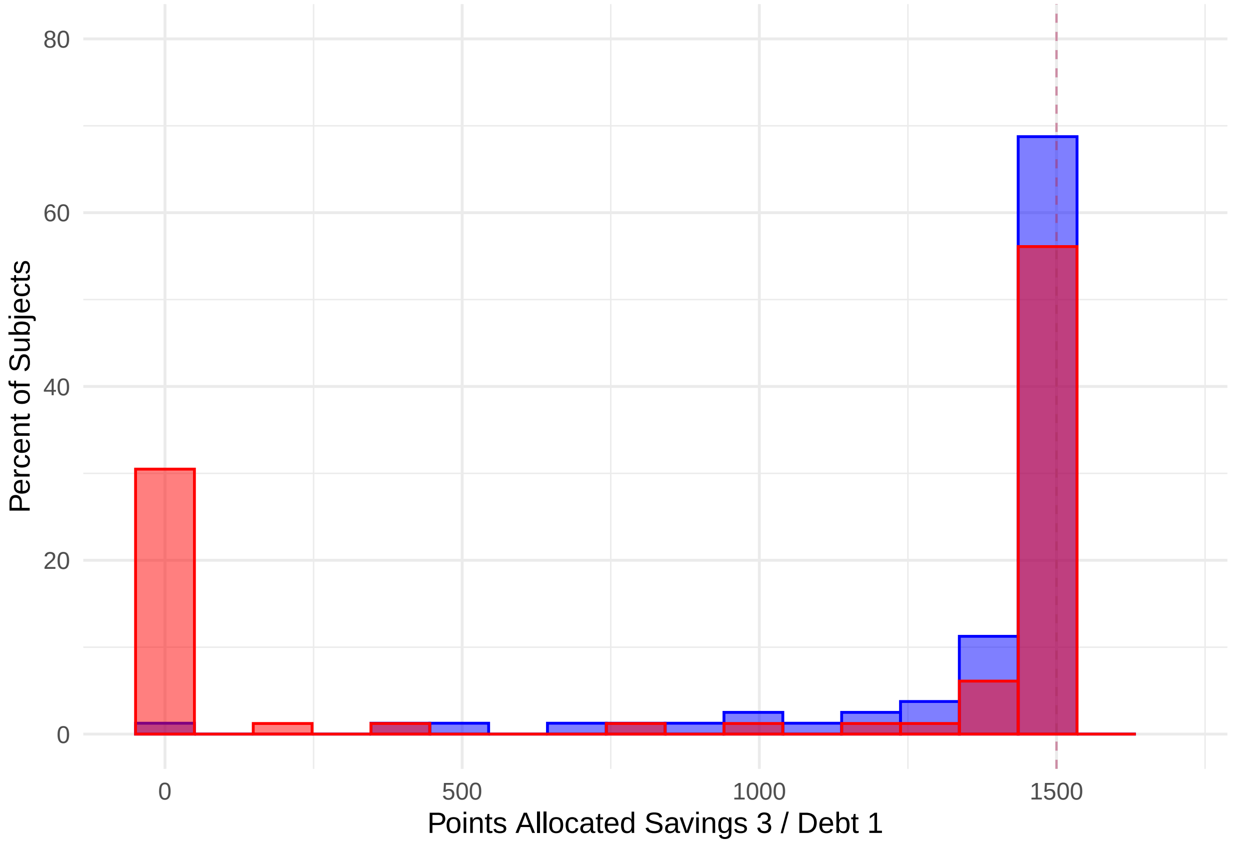


Table 6 - Borrowing Treatments: Return and Payment Estimation Output

```
# Load the data
data <- read_dta("data/borrowing_work.dta")

data$treatment = as.factor(data$treatment)
data$demo_age_median = as.factor(data$demo_age_median)
data$demo_sex = as.factor(data$demo_sex)
data$demo_white = as.factor(data$demo_white)
data$demo_collegeplus = as.factor(data$demo_collegeplus)
data$demo_studentloan = as.factor(data$demo_studentloan)
data$demo_holddebt = as.factor(data$demo_holddebt)
data$demo_covid = as.factor(data$demo_covid)
data$batch = as.factor(data$batch)

# Cumulative returns
data <- data %>%
  arrange(idturk, day) %>%
  group_by(idturk) %>%
  mutate(cum_returns = sum(returns, na.rm = TRUE),
         ln_cum_returns = log(cum_returns))

# All subjects [1]
borrow1 <- feols(ln_cum_returns ~ treatment + demo_age_median + demo_sex + demo_white + demo_collegeplus
```

Table 2: Table 6 - Borrowing Treatments: Return and Payment Estimation Output

	All subjects	Max returns
	(1)	(2)
Mean of dep.var.	8.618	8.682
	(0.078)	(0.086)
Borrow-Debt	−0.054	−0.087
	(0.027)	(0.033)
Borrow Max		
Num.Obs.	162	61

Notes: Results from a linear regression with robust standard errors in parentheses. The dependent variable is the log of th

```
# Max returns [2]
borrow2 <- feols(ln_cum_returns ~ treatment + demo_age_median + demo_sex + demo_white + demo_collegeplu

# All subjects [3]
borrow3 <- feols(ln_cum_returns ~ treatment + borrow_max_both + demo_age_median + demo_sex + demo_white

modelsummary(
  list("(1)" = borrow1, "(2)" = borrow2, "(3)" = borrow3),
  output = "kableExtra",
  statistic = "std.error",
  coef_omit = 3:18,
  gof_omit = "A|B|S|R",
  coef_rename = c("(Intercept)" = "Mean of dep.var.", "treatment1" = "Borrow-Debt", "borrow_max_both" =
  title = "Table 6 - Borrowing Treatments: Return and Payment Estimation Output",
  notes = "Notes: Results from a linear regression with robust standard errors in parentheses. The deper
  col_names = c("", "(1)", "(2)", "(3)")
) %>%
  add_header_above(c("", "All subjects", "Max returns", "All subjects"))
```

Table 7 - Estimates of Representative Lambda

```
################################ No Debt

# Load the data
data_control <- read_delim("structural/lambdaMatrixControl.txt", delim = "\t")
```

```
## Rows: 54 Columns: 2
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl (2): lambda, threshold
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
# Lambda at maximum threshold
max_threshold <- max(data_control$threshold)
lambda_max <- data_control %>% filter(threshold == max_threshold) %>% pull(lambda)
lambda_at_max_threshold <- 1 + lambda_max
```

```
# Noise adjusted lambda
data_control_noise_adjusted <- data_control %>% filter(threshold <= 0.054)
max_threshold_noise <- max(data_control_noise_adjusted$threshold)
lambda_noise_adjusted <- data_control_noise_adjusted %>% filter(threshold == max_threshold_noise) %>% pu
lambda_at_noise_threshold <- 1 + lambda_noise_adjusted

lambda.1 = lambda_max - 1
lambda.adj.1 = lambda_noise_adjusted - 1

################################ Low Debt

# Load the data
data_low_debt <- read_delim("structural/lambdaMatrix.txt", delim = "\t")
```

```
## Rows: 73 Columns: 2
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl (2): lambda, threshold
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
# Lambda at maximum threshold
max_threshold <- max(data_low_debt$threshold)
lambda_max <- data_low_debt %>% filter(threshold == max_threshold) %>% pull(lambda)
lambda_at_max_threshold <- 1 + lambda_max

# Noise adjusted lambda
data_low_debt_noise_adjusted <- data_low_debt %>% filter(threshold <= 0.054)
max_threshold_noise <- max(data_low_debt_noise_adjusted$threshold)
lambda_noise_adjusted <- data_low_debt_noise_adjusted %>% filter(threshold == max_threshold_noise) %>% p
lambda_at_noise_threshold <- 1 + lambda_noise_adjusted

lambda.2 = lambda_max - 1
lambda.adj.2 = lambda_noise_adjusted - 1

################################ Borrow Control

# Load the data
data_borrow_control <- read_delim("structural/lambdaMatrixborrowControl.txt", delim = "\t")
```

```
## Rows: 59 Columns: 2
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl (2): lambda, threshold
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
# Lambda at maximum threshold
max_threshold <- max(data_borrow_control$threshold)
lambda_max <- data_borrow_control %>% filter(threshold == max_threshold) %>% pull(lambda)
lambda_at_max_threshold <- 1 + lambda_max

# Noise adjusted lambda
```

```r
data_borrow_control_noise_adjusted <- data_borrow_control %>% filter(threshold <= 0.054)
max_threshold_noise <- max(data_borrow_control_noise_adjusted$threshold)
lambda_noise_adjusted <- data_borrow_control_noise_adjusted %>% filter(threshold == max_threshold_noise
lambda_at_noise_threshold <- 1 + lambda_noise_adjusted

lambda.3 = lambda_max - 1
lambda.adj.3 = lambda_noise_adjusted - 1

################################ Borrow Debt

# Load the data
data_borrow_debt <- read_delim("structural/lambdaMatrixborrowDebt.txt", delim = "\t")
```

```
## Rows: 54 Columns: 2
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl (2): lambda, threshold
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
# Lambda at maximum threshold
max_threshold <- max(data_borrow_debt$threshold)
lambda_max <- data_borrow_debt %>% filter(threshold == max_threshold) %>% pull(lambda)
lambda_at_max_threshold <- 1 + lambda_max

# Noise adjusted lambda
data_borrow_debt_noise_adjusted <- data_borrow_debt %>% filter(threshold <= 0.054)
max_threshold_noise <- max(data_borrow_debt_noise_adjusted$threshold)
lambda_noise_adjusted <- data_borrow_debt_noise_adjusted %>% filter(threshold == max_threshold_noise) %
lambda_at_noise_threshold <- 1 + lambda_noise_adjusted

lambda.4 = lambda_max - 1
lambda.adj.4 = lambda_noise_adjusted - 1

################################ Redistribution Control

# Load the data
data_redistribution_control <- read_delim("structural/lambdaMatrixRedistributionNoDebt.txt", delim = "\
```

```
## Rows: 54 Columns: 2
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl (2): lambda, threshold
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
# Lambda at maximum threshold
max_threshold <- max(data_redistribution_control$threshold)
lambda_max <- data_redistribution_control %>% filter(threshold == max_threshold) %>% pull(lambda)
lambda_at_max_threshold <- 1 + lambda_max

# Noise adjusted lambda
data_redistribution_control_noise_adjusted <- data_redistribution_control %>% filter(threshold <= 0.054
max_threshold_noise <- max(data_redistribution_control_noise_adjusted$threshold)
lambda_noise_adjusted <- data_redistribution_control_noise_adjusted %>% filter(threshold == max_threshol
lambda_at_noise_threshold <- 1 + lambda_noise_adjusted

lambda.5 = lambda_max - 1
lambda.adj.5 = lambda_noise_adjusted - 1

################################ Redistribution Debt

# Load the data
data_redistribution_debt <- read_delim("structural/lambdaMatrixRedistributionDebt.txt", delim = "\t")
```

```
## Rows: 64 Columns: 2
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl (2): lambda, threshold
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
# Lambda at maximum threshold
max_threshold <- max(data_redistribution_debt$threshold)
lambda_max <- data_redistribution_debt %>% filter(threshold == max_threshold) %>% pull(lambda)
lambda_at_max_threshold <- 1 + lambda_max

# Noise adjusted lambda
data_redistribution_debt_noise_adjusted <- data_redistribution_debt %>% filter(threshold <= 0.054)
max_threshold_noise <- max(data_redistribution_debt_noise_adjusted$threshold)
lambda_noise_adjusted <- data_redistribution_debt_noise_adjusted %>% filter(threshold == max_threshold_n
lambda_at_noise_threshold <- 1 + lambda_noise_adjusted

lambda.6 = lambda_max - 1
lambda.adj.6 = lambda_noise_adjusted - 1

################################ High Debt

# Load the data
data_high_debt <- read_delim("structural/lambdaMatrixHighDebt.txt", delim = "\t")
```

```
## Rows: 57 Columns: 2
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl (2): lambda, threshold
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
# Lambda at maximum threshold
max_threshold <- max(data_high_debt$threshold)
lambda_max <- data_high_debt %>% filter(threshold == max_threshold) %>% pull(lambda)
lambda_at_max_threshold <- 1 + lambda_max

# Noise adjusted lambda
data_high_debt_noise_adjusted <- data_high_debt %>% filter(threshold <= 0.054)
max_threshold_noise <- max(data_high_debt_noise_adjusted$threshold)
```

```
lambda_noise_adjusted <- data_high_debt_noise_adjusted %>% filter(threshold == max_threshold_noise) %>%
lambda_at_noise_threshold <- 1 + lambda_noise_adjusted

lambda.7 = lambda_max - 1
lambda.adj.7 = lambda_noise_adjusted - 1

################################ One Shot

# Load the data
data_one_shot <- read_delim("structural/lambdaMatrixOneShot.txt", delim = "\t")
```

```
## Rows: 37 Columns: 2
## -- Column specification --------------------------------------------------------
## Delimiter: "\t"
## dbl (2): lambda, threshold
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
# Lambda at maximum threshold
max_threshold <- max(data_one_shot$threshold)
lambda_max <- data_one_shot %>% filter(threshold == max_threshold) %>% pull(lambda)
lambda_at_max_threshold <- 1 + lambda_max

# Noise adjusted lambda
data_one_shot_noise_adjusted <- data_one_shot %>% filter(threshold <= 0.054)
max_threshold_noise <- max(data_one_shot_noise_adjusted$threshold)
lambda_noise_adjusted <- data_one_shot_noise_adjusted %>% filter(threshold == max_threshold_noise) %>% p
lambda_at_noise_threshold <- 1 + lambda_noise_adjusted

lambda.8 = lambda_max - 1
lambda.adj.8 = lambda_noise_adjusted - 1

table.7 = data.frame(c(lambda.1, lambda.2, lambda.3, lambda.4, lambda.5, lambda.6, lambda.7, lambda.8),
                     c(lambda.adj.1, lambda.adj.2, lambda.adj.3, lambda.adj.4, lambda.adj.5, lambda.adj
  round(digits = 3)

colnames(table.7) = c("Avg. Lambda", "Avg. Lambda Noise Adjusted")

table.7
```

```
##   Avg. Lambda Avg. Lambda Noise Adjusted
## 1       0.021                      0.000
## 2       0.043                      0.034
## 3       0.047                      0.010
## 4       0.075                      0.067
## 5       0.033                      0.001
## 6       0.048                      0.025
## 7       0.014                      0.014
## 8       0.029                      0.026
```

```
lambda.1 = round(lambda.1, 3)
lambda.2 = round(lambda.2, 3)
lambda.3 = round(lambda.3, 3)
lambda.4 = round(lambda.4, 3)
```

```r
lambda.5 = round(lambda.5, 3)
lambda.6 = round(lambda.6, 3)
lambda.7 = round(lambda.7, 3)
lambda.8 = round(lambda.8, 3)

lambda.adj.1 = round(lambda.adj.1, 3)
lambda.adj.2 = round(lambda.adj.2, 3)
lambda.adj.3 = round(lambda.adj.3, 3)
lambda.adj.4 = round(lambda.adj.4, 3)
lambda.adj.5 = round(lambda.adj.5, 3)
lambda.adj.6 = round(lambda.adj.6, 3)
lambda.adj.7 = round(lambda.adj.7, 3)
lambda.adj.8 = round(lambda.adj.8, 3)

# Data for the table
table7 <- data.frame(
  ` ` = c("Panel A. Main treatments", "No-Debt", "Low-Debt",
          "Panel B. Borrowing treatments", "Borrow-Control", "Borrow-Debt",
          "Panel C. Redistribution treatments", "Redistribution Control", "Redistribution Debt",
          "Panel D. Other treatments", "High-Debt", "One-Shot"),
  `Average Lambda` = c("", lambda.1, lambda.2, "", lambda.3, lambda.4, "", lambda.5, lambda.6, "", lamb
  `Average Lambda (noise adjusted)` = c("", lambda.adj.1, lambda.adj.2, "", lambda.adj.3, lambda.adj.4,
)

# Create table
kable(table7,
      col.names = c("", "Average Lambda", "Average Lambda (noise adjusted)"),
      align = 'c', escape = FALSE) %>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed", "responsive")) %>%
  add_header_above(c(" " = 1, "Table 7 - Estimates of Representative Lambda" = 2)) %>%
  footnote(general = "Notes: Noise adjusted corresponds to the average Lambda restricted to participants
```

	Average Lambda
Panel A. Main treatments	
No-Debt	0.021
Low-Debt	0.043
Panel B. Borrowing treatments	
Borrow-Control	0.047
Borrow-Debt	0.075
Panel C. Redistribution treatments	
Redistribution Control	0.033
Redistribution Debt	0.048
Panel D. Other treatments	
High-Debt	0.014
One-Shot	0.029

Note:

Notes: Noise adjusted corresponds to the average Lambda restricted to participants with an MSE no larger than 0.054. T

Table 8 - Examples of Borrowing Decisions

```
library(readxl)
library(dplyr)

# Function to replicate the Final Table from Excel
replicate_final_table <- function(file_path) {
  # Load data from Excel sheets
  sheet2 <- read_excel(file_path, sheet = "Example 1 Charcoal Cookstove In")
  sheet3 <- read_excel(file_path, sheet = "Example 2 -Consumption")

  # Helper function to safely convert to numeric
  safe_as_numeric <- function(x) {
    as.numeric(gsub("[^0-9.-]", "", x))
  }

  # Extract parameters from Sheet 2
  delta <- safe_as_numeric(sheet2[3, 3])
  beta <- safe_as_numeric(sheet2[4, 3])
  debt_interest <- safe_as_numeric(sheet2[5, 3])

  # Calculate lambda values, ensuring conversion is handled safely
  lambda_values <- sapply(sheet2[2, 6:ncol(sheet2)], safe_as_numeric)

  # Example 1 calculations (Cost-Benefit for Charcoal Cookstove)
  cost_loan <- sapply(sheet2[10:14, 4:ncol(sheet2)], safe_as_numeric)
  monthly_benefit <- sapply(sheet2[11:14, 3:ncol(sheet2)], safe_as_numeric)

  # Check if values are correctly converted
  print("Cost Loan Values:")
  print(cost_loan)
  print("Monthly Benefit Values:")
  print(monthly_benefit)

  # Discount benefits and costs (using beta and delta)
  discounted_benefits <- sapply(monthly_benefit, function(benefit) benefit / (1 + delta))
  discounted_costs <- sapply(cost_loan, function(cost) cost / (1 + delta))

  # Example 2 calculations (Payday loan example)
  delta_monthly <- safe_as_numeric(sheet3[3, 3])
  beta_example2 <- safe_as_numeric(sheet3[4, 3])
  debt_interest_example2 <- safe_as_numeric(sheet3[5, 3])

  # Compute APR or other metrics based on Sheet 3 data
  apr_calculation <- function(interest, period) {
    return((1 + interest)^(1/period) - 1) * 100  # Example formula for APR
  }

  # Result Table (similar to Final Table)
  final_result <- data.frame(
    Parameter = c("Discounted Benefits", "Discounted Costs", "APR Calculation"),
    Example1_Charcoal = c(sum(discounted_benefits, na.rm = TRUE),
                          sum(discounted_costs, na.rm = TRUE),
                          NA),
    Example2_PaydayLoan = c(NA, NA, apr_calculation(debt_interest_example2, 12))
  )

  return(final_result)
}

# Example usage
final_table <- replicate_final_table("discussion/Calibration Exercise.xlsx")
```

```
## New names:
## New names:
## * `` -> `...2`
## * `` -> `...3`
## * `` -> `...4`
## * `` -> `...5`
## * `` -> `...6`
## * `` -> `...7`
## * `` -> `...8`
## * `` -> `...9`
## * `` -> `...10`
## * `` -> `...11`
## * `` -> `...12`
## * `` -> `...13`
## * `` -> `...14`
## * `` -> `...15`
## * `` -> `...16`
## * `` -> `...17`
## * `` -> `...18`
## * `` -> `...19`
## * `` -> `...20`
## * `` -> `...21`
## * `` -> `...22`
## * `` -> `...23`
## * `` -> `...24`
## * `` -> `...25`
## * `` -> `...26`
## * `` -> `...27`
## * `` -> `...28`
## * `` -> `...29`
## * `` -> `...30`
## * `` -> `...31`
## * `` -> `...32`
```

```
## [1] "Cost Loan Values:"
##           ...4      ...5     ...6     ...7     ...8     ...9    ...10    ...11
## [1,] 13.650000 13.650000       NA       NA       NA       NA       NA       NA
## [2,]  9.916667  9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [3,]        NA        NA       NA       NA       NA       NA       NA       NA
## [4,]  9.916667  9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [5,] 13.650000 13.650000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
##         ...12    ...13    ...14    ...15    ...16    ...17    ...18    ...19
## [1,]       NA       NA       NA       NA       NA       NA       NA       NA
## [2,] 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [3,]       NA       NA       NA       NA       NA       NA       NA       NA
## [4,] 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [5,] 0.000000 0.000000 0.000000       NA       NA       NA       NA       NA
##         ...20    ...21    ...22    ...23    ...24    ...25    ...26  ...27
## [1,]       NA       NA       NA       NA       NA       NA       NA  40.95
## [2,] 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 238.00
## [3,]       NA       NA       NA       NA       NA       NA       NA     NA
## [4,] 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 238.00
## [5,]       NA       NA       NA       NA       NA       NA       NA  40.95
##      ...28  ...29 ...30    ...31 ...32
## [1,]    NA  40.95    NA 2.905983    NA
## [2,]    NA 238.00    NA 2.975000    NA
## [3,]    NA     NA    NA       NA    NA
## [4,]    NA 238.00    NA 2.905983    NA
## [5,]    NA  40.95    NA 2.975000    NA
## [1] "Monthly Benefit Values:"
##           ...3      ...4      ...5     ...6     ...7     ...8     ...9    ...10
## [1,]  9.916667  9.916667  9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [2,]        NA        NA        NA       NA       NA       NA       NA       NA
## [3,]  9.916667  9.916667  9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [4,] 13.650000 13.650000 13.650000 0.000000 0.000000 0.000000 0.000000 0.000000
##         ...11    ...12    ...13    ...14    ...15    ...16    ...17    ...18
## [1,] 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [2,]       NA       NA       NA       NA       NA       NA       NA       NA
## [3,] 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [4,] 0.000000 0.000000 0.000000 0.000000       NA       NA       NA       NA
##         ...19    ...20    ...21    ...22    ...23    ...24    ...25    ...26
## [1,] 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [2,]       NA       NA       NA       NA       NA       NA       NA       NA
## [3,] 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667 9.916667
## [4,]       NA       NA       NA       NA       NA       NA       NA       NA
##       ...27 ...28  ...29 ...30    ...31 ...32
## [1,] 238.00    NA 238.00    NA 2.975000    NA
## [2,]     NA    NA     NA    NA       NA    NA
## [3,] 238.00    NA 238.00    NA 2.905983    NA
## [4,]  40.95    NA  40.95    NA 2.975000    NA
```

```
print(final_table)
```

```
##             Parameter Example1_Charcoal Example2_PaydayLoan
## 1 Discounted Benefits          779.8530                  NA
## 2    Discounted Costs          819.1643                  NA
## 3     APR Calculation                NA           0.6089673
```