```
# Only change the trimming conditions to switch between "1 or 4" to "NoFlood"
ThisIsNoFlood ← F
```

Estimating lending impacts using original 1600 households

February 18, 2019
19:42

Seiro Ito

Contents

```
setwd(path1234)
foldername ← list.dirs(path = ".", recursive = T, full.names = T)
fn ← list.files(path = foldername, pattern = ".dta$",
        recursive = T, full.names = T)
fn ← fn[!grepl("orking|Live.*p.dta", fn)]
fn ← unique(fn)
fnd ← tolower(gsub(" ", "\\_", gsub("^.*\\/(.*).dta", "\\1", fn)))
```

I Summary

I.1 Definitions

Traditional A cash loan of Tk. 560 with one year maturity.

Large A cash loan of Tk. 16800 with three year maturity.

Large Grace A cash loan of Tk. 16800 with a one year grace period and three year maturity.

Cow An in-kind loan of a cow worth Tk. 16800 with a one year grace period and three year maturity.

LargeSize An indicator variable takes the value of 1 if the arm is Large, Large Grace, or Cow.

WithGrace An indicator variable takes the value of 1 if the arm is Large Grace or Cow.

InKind Same as Cow.

When one uses covariates Large, Large Grace, Cow in estimation, their estimates represent each arm's characteristics relative to Traditional. When one uses covariates LargeSize, WithGrace, InKind, their estimates represent their labeled names.

I.2 Findings

Net saving and repayments Sample uses all administrative records available. Smaller net saving increments for traditional arm. Period of rd 2-3 saw a decline in net saving, even further for LargeGrace, but remain in positive values (Table 5). Table 6 reveals LargeSize have larger net saving changes while both WithGrace and NonCash hav smaller changes. Repayment changes are larger with LargeSize and WithGrace but smaller with NonCash in (4). Repayment is positively autocorrelated and is negatively correlated with previous net saving. Repayment is also positively correlated with other member's previous repayment, which can be explained by common shocks and/or strategic cooperative behaviours. The ultra poor repaid just as much as the moderately poor (Table 7). This is evidence against the popular belief that the ultra poor are riskier.

Schooling Enrollment changes are larger for primary school girls in Large and Cow arms for primary but smaller for junior in rd 1 vs rd 4 comparisons (Table 15). When seen by attributes in Table 16, LargeSize shows smaller changes especially for primary school boys. Primary school girls in LargeSize and NonCash show larger changes, while junior and high school girls in LargeSize show smaller changes than boys. This indicates that large sized arms have detrimetal impacts on older girls' schooling but promotional impacts on primary school aged girls. No decline in enrollment changes when repaying for the arms of WithGrace, despite the larger installments.

Assets Household assets increased in all arms. Initially increased then decreased. There might

have been liquidation of assets to repay the loans. Productive assets declined consecutively. Flood in rd 1 makes the increase in household assets smaller. Productive assets see a major decline among Large during rd 3-4 period (TABLE 21). Comparison by attributes (TABLE 22) or of rd 2 and rd 4 gives the same picture (TABLE 27). Comparison against the loan non-recipients shows that they also experience a similar, increase-increase-decrease pattern. This indicates that the pattern observed among the loan recipients may be a systemic pattern of the area, not necessarily reflecting the repayment burdern (TABLE 28).

Livestock Larger increases in holding values in rd 1-2, smaller increases in rd 2-3, no change in rd 3-4. Previous cow owners show a smaller increase in rd 1-2 while not rd 3-4 or rd 2-3 in the Cow arm (TABLE 29). Figures show that cow ownership increased for all arms but the traditional arm. TABLE 30 shows baseline trend is a large increse in rd 1-2, a small increase in rd 2-3, a small decline in rd 3-4, while LargeSize sees an even larger increase in rd 1-2 and similar trend as baseline afterwards. This shows that member who received a larger sized disbursement could hold on to its level of livestock accumulation. TABLE 31 shows, albeit at p values around 10%, the ultra poor has a larger increase relative to the moderately poor, which is another manifestation against popular notion that the ultra poor are riskier.

Total asset values Similar resulsts as assets.

Labour incomes Small sample. Increased during rd 2-3 in all arms (TABLE 41).

Consumption Increased during rd 2-3 in all arms, a decrese in rd 3-4 (TABLE 46). Another notable result is that NonCash reduced the consumption in rd 3-4 even further than the baseline loan (TABLE 47).

IGAs Multiple IGAs for Tradtional arm. Everyone else chose to invest in cows, suggesting entrepreneurship does not seem to matter in the uptake of loans. It is consistent with the presence of a poverty trap induced by a liquidity constraint and convexity in livestock production technology.

One sees changes in investment choices when one compares traditional and all other arms. However, consumption does not seem to differ. Repayments and asset holding are greater in all other arms. These are consistent with households are enforcing the repayment disciplines and reinvesting the proceeds rather than increasing consumption.

A more detailed summary:

Low repayment rates Repayment was poor. Net saving was forfeit for repayment. Mean raw loan recovery rate (counting only repayments) measured at the end of third year was 0.67 overall, and was lowest for traditional at 0.48. Counting also net saving, these numbers change to 0.85, 0.59, respectively.

Large-sized or grace period loans resulted in higher repayment rates Controlling for the loan size, larger initial lending resulted in larger repayment and net saving. As opposed to GUK's anxiety, lending was relatively less risky with large loans and loans with a grace period.

No difference in repayment risk by poverty status Raw loan recovery rates are 0.67, 0.67, respectively, for ultra poor and moderately poor. Also no statitically meaningful difference is found for cumulative repayment plus cumulative net saving.

No difference in household assets Household assets increased in rd 1 - 3, then reduced in rd 4 (possibly liquidating for repayment purpose), with the overall impact of increased household asset values yet no statistically significant difference between arms.

No difference in labour incomes, per member consumption, marriage rates Per member consumption increased in all arms with no difference between arms. Marriage rates do not difffer between arms. A greater swing in labour incomes for large.

I.3 Inference

- First-difference estimators are used. This can be seen as an extension of DID to multi-periods (although historically the latter precedes the former). FD is used also for a binary indicator such as schooling.
- All the standard errors are clustered at the group (char) level.
- To aid the understanding if the data is more suited to the assumption of first-difference rather than fixed-effects, I used a check suggested by Wooldridge 10.71. It is an AR(1) regression of FD residuals. Most of results show low autocorrelations which is consistent with an assumption of FD estimator.

II Read files

II.1 Read from a list

In reading raw files, I added ID information (./ID/ID_Updated_received_from_Abu.dta) to all pages. I will further add HH ID information from the admin file if possible.

```
sch1 ← readRDS(paste0(path1234, "schooling_Age6-18InRd1.rds"))
ZB ← readRDS(paste0(path1234, "data_read_in_a_list_with_baseline_patched.rds"))
# roster
ros ← ZB[[1]]
# relocation
loc ← ZB[[grep("relo", names(ZB))]]
#loc[, .(hhid, survey, IntDate, duration_year, current_loc)]
# poverty
pov ← ZB[[grep("poverty$", names(ZB))]]
pov ← ZB[[grep("pov.*up", names(ZB))]]
# shocks
shk ← ZB[[grep("shock", names(ZB))]]
# asset (HH and productive
ass ← ZB[[grep("Mer", names(ZB))]]
# livestock ownership
lvo ← ZB[[grep("liv.*own", names(ZB))]]
# labour income
lab ← ZB[[grep("la.*come", names(ZB))]]
# farm income
far ← ZB[[grep("fa.*ion", names(ZB))]]
# HH consumption
con ← ZB[[grep("hh.con", names(ZB))]]

xid ← readRDS(paste0(path1234, "ID.rds"))

# fill in original arm assignment of drop outs, forced drop outs
probgp ← fread(paste0(path0, "received/CharRandomization2012.prn"))
probgp[, randomization0 := randomization]
probgp[grepl("grace", randomization0), randomization0 := "large grace"]
probgp[grepl("credit$", randomization0), randomization0 := "large"]
probgp[grepl("con", randomization0), randomization0 := "traditional"]
probgp[grepl("pack", randomization0), randomization0 := "cow"]
```

```
probgp ← probgp[, .(group.id, randomization0, comment)]
xid[, ObsPattern := "1111"]
xid[grepl("^Fi", missing_followup), ObsPattern := "0111"]
xid[grepl("^Se", missing_followup), ObsPattern := "1011"]
xid[grepl("^En", missing_followup), ObsPattern := "1110"]
xid[grepl("^2nd and 4", missing_followup), ObsPattern := "1010"]
xid[grepl("^3rd and 4", missing_followup), ObsPattern := "1100"]
xid[grepl("^2.*3.*4", missing_followup), ObsPattern := "1000"]

ass ← ass[, .(gid, hhid, Mstatus, AssignRegression, AssignOriginal, survey, DistDate1, In
ros ← ros[, .(AssignRegression, AssignOriginal,
  gid, hhid, Mstatus, Mgroup, ObPattern, AttritIn,
  IntDate, year, survey,
  mid, rel_hhh, fmid, mmid, sex, Age_1, AgeComputed,
  current, marital, stay, nonstaym, reasons, literacy, edu,
  HeadLiteracy, HeadAge, HHsize, randomization)]
ros[, HeadLiteracy := as.numeric(HeadLiteracy)]
sch1[, groupid := as.integer(as.numeric(as.character(gid)))]
ros[, groupid := as.integer(as.numeric(as.character(gid)))]
ros[grepl("2004", IntDate), IntDate :=
  strptime(gsub("2004", "2014", as.character(IntDate)), format = "%Y-%m-%d")]
ros[grepl("2005", IntDate), IntDate :=
  strptime(gsub("2005", "2015", as.character(IntDate)), format = "%Y-%m-%d")]
ros[, Year := as.numeric(format(as.Date(IntDate), "%Y"))]
ros[Year ≤ 2010, Year := Year + 10]
ros[, Month := format(as.Date(IntDate), "%B")]
setorder(ros, gid, hhid, IntDate, -Age_1, mid)
ros[, ChildAgeOrderAtRd1 := as.integer(NA)]
ros[grepl("^son", rel_hhh), ChildAgeOrderAtRd1 := 1:.N, by = .(IntDate, hhid)]
# ChildAgeOrderAtRd1 is complete and no child is left unordered.
if (any(nrow(ros[is.na(ChildAgeOrderAtRd1) & Age_1 ≤ 18 & grepl("^son", rel_hhh)]) > 0))
  ros[is.na(ChildAgeOrderAtRd1) & Age_1 ≤ 18 & grepl("^son", rel_hhh)]
ros[, c("EldestSon", "EldestDaughter") := 0L]
ros[grepl("^son", rel_hhh) & ChildAgeOrderAtRd1 == 1 & sex == "Male", EldestSon := 1L]
ros[grepl("^son", rel_hhh) & ChildAgeOrderAtRd1 == 1 & sex == "Female", EldestDaughter :=
ros[, MarriedOff :=
  any(grepl("marr", .SD[, reasons])) &
  !any(grepl("dea|job", .SD[, reasons])),
  .SDcols = "reasons", by = .(hhid, mid)]
# Why below?
# drop head/spouse or adults (age > 18) but keep married off
#ros ← ros[MarriedOff | !(grepl("head|spo", rel_hhh) | Age_1 >18), ]
# drop married off
ros ← ros[!(MarriedOff), ]
# livestock
lvo ← lvo[, .(gid, hhid, survey, IntDate,
  dummyHadCows, NumCows, NumCowsOwnedAtRd1,
  sales_cow, sales_ox, sales_sheep, dead, born,
  nowned_cow, nowned_ox,
  LivestockCode, number_owned, mrkt_value, total_cost,
  TotalImputedValue, TotalSelfEvaluatedValue)]
# labour income
lab ← lab[, .(gid, hhid, survey, IntDate, mid,
  code_1, duration_1, income1, code_2, duration_2, income2,
  totalincome, TotalHHLabourIncome)]
# farm income
```

```
far ← far[, .(gid, hhid, survey, IntDate,
  area_1, crop_code_1, total_production_1, Revenue1,
  area_2, crop_code_2, total_production_2, Revenue2,
  area_3, crop_code_3, total_production_3, Revenue3, TotalRevenue)]
# HH consumption
con = copy(ZB[[grep("hh.con", names(ZB))]])
con ← a2b.data.table(con, NA, 0)
setnames(con, "pulse_total", "pulses_total")
setnames(con, "pgarlic_exp", "garlic_exp")
setnames(con, "bettel_total", "bettle_total")
setnames(con, grepout("other_pulse", colnames(con)),
  gsub("other\\_pu", "otherpu", grepout("other_pulse", colnames(con))))
setnames(con, grepout("chew_tob", colnames(con)),
  gsub("chew\\_to", "chewto", grepout("chew_tob", colnames(con))))
items ← unique(unlist(strsplit(grepout("bought", colnames(con)), "_")))
items ← items[!grepl("bought", items)]
for (i in items) {
  con[, paste0(i, "_UPrice") :=
    eval(parse(text = paste0(i, "_exp"))) / eval(parse(text = paste0(i, "_bought")))]
}
# Set time unit to annual.
TimeUnitForCon ← rep(7, length(items))
TimeUnitForCon[grep("oil", items):length(items)] ← 30
con[, paste0(items[TimeUnitForCon == 7], "_AnnTotal") :=
  eval(parse(text = paste0(items[TimeUnitForCon == 7], "_total"))) * 4.5 * 12]
con[, paste0(items[TimeUnitForCon == 30], "_AnnTotal") :=
  eval(parse(text = paste0(items[TimeUnitForCon == 30], "_total"))) * 12]
con[, paste0(items[TimeUnitForCon == 7], "_AnnBought") :=
  eval(parse(text = paste0(items[TimeUnitForCon == 7], "_bought"))) * 4.5 * 12]
con[, paste0(items[TimeUnitForCon == 30], "_AnnBought") :=
  eval(parse(text = paste0(items[TimeUnitForCon == 30], "_bought"))) * 12]
# Inf -> NA (so median price to stay finite)
con ← a2b.data.table(con, Inf, NA)
for (i in items) {
  con[, paste0(i, "_MedianUPrice") :=
    median(eval(parse(text = paste0(i, "_UPrice"))), na.rm = T), by = year]
  con[, paste0(i, "_ImputedValue") :=
    eval(parse(text = paste0(i, "_MedianUPrice"))) *
      eval(parse(text = paste0(i, "_AnnTotal")))]
  # errors: total < bought. => use bought as total.
  con[eval(parse(text = paste0(i, "_AnnTotal"))) < eval(parse(text = paste0(i, "_AnnBough
    paste0(i, "_ImputedValue") :=
      eval(parse(text = paste0(i, "_MedianUPrice"))) *
      eval(parse(text = paste0(i, "_AnnBought")))]
}
# NA -> 0 (so total becomes nonNA)
con ← a2b.data.table(con, NA, 0)
con[, HygieneExpenditure := cloth_exp + soap_exp + haircut_exp + cosmetic_exp]
con[, SocialExpenditure := fest_exp + mosque_exp + contra_exp + social_exp]
con[, EnergyExpenditure := fuel_wood_exp + transport_exp + communication_exp + other_exp]
items ← items[items != "tea"]
con[, FoodExpenditure :=
  eval(parse(text = paste(grepout("AnnTotal", colnames(con)), collapse = "+")))]
con ← con[, .(gid, hhid,
  IntDate, survey, FoodExpenditure, HygieneExpenditure,
```

```
  SocialExpenditure, EnergyExpenditure)]
# shocks
# shk[!is.na(code_1) | !is.na(code_2), .(hhid, survey, IntDate, code_1, damage_amount_1,
#   code_2, damage_amount_2)]
shk[, damage_amount_1 := as.numeric(damage_amount_1)]
shk[, damage_amount_2 := as.numeric(damage_amount_2)]
shkoverview ← shk[, .(Shock1 = round(sum(!is.na(code_1))/.N, 3),
  MedianD1 = median(damage_amount_1, na.rm = T),
  MeanD1 = round(mean(damage_amount_1, na.rm = T), 0),
  Shock2 = round(sum(!is.na(code_2))/.N, 3),
  MedianD2 = median(damage_amount_2, na.rm = T),
  MeanD2 = round(mean(damage_amount_2, na.rm = T), 0),
  AvgNumShocks = round((sum(!is.na(code_1)) + sum(!is.na(code_2)) +
    sum(!is.na(code_3)) + sum(!is.na(code_4)))/.N, 3)),
  by = .(survey, AssignOriginal)]
setkey(shkoverview, survey, AssignOriginal)
#shkoverview
#table0(shk[, .(survey, code_1)])
shk ← ZB[[grep("shock", names(ZB))]]
codecols ← grepout("code", colnames(shk))
shk[, (paste0("Code", 1:4)) := lapply(.SD, function(x) !is.na(x)), .SDcols = codecols]
shk[, (paste0("Code", 1:4)) := lapply(.SD, as.numeric), .SDcols = paste0("Code", 1:4)]
shk[, NumberOfShocks := eval(parse(text = paste(paste0("Code", 1:4), collapse = "+")))]
setkey(shk, hhid, survey)
shk[, FloodInRd1 := 0L]
shk[survey == 1, FloodInRd1 := as.integer(grepl("Fl", code_1))]
shk[, FloodInRd1 := FloodInRd1[1], by = hhid]
shk ← shk[, .(gid, hhid, survey, IntDate, Hhidyear, FloodInRd1, code_1, code_2,
  damage_amount_1, damage_amount_2, NumberOfShocks)]
```

Description of data:

ad Administrative data: Up to [-24, 48] months after first loan disbursement. This file has not been used in read_cleaned_data.rnw.

sch1 Schooling panel with attrition. Aged 6-18 in rd1. Enrolled={0,1} is defined for children aged 6-18 in rd1 by referencing to currently_enrolled and age information.

ros roster to condition the initial status prior to participation.

ass Assets. Household assets (houses, durables) and productive assets (machines, tools).

lvo Livestock holding. Rd 3 data is not entered yet.

lab Labour incomes.

far Farming revenues (no costs reported).

con Household consumption. Food expenditure asks both bought and consumed volumes and prices. We impute consumption values by using median prices. All quantity is set to annualised quantity.

shk Shocks.

II.2 Sample selection and treament assignment

II.2.1 Admin info

```
adw2 ← readRDS(paste0(path1234, "admin_data_wide2.rds"))
```

```
idfu ← readRDS(paste0(pathsave, "idfu.rds"))
```

Redefine arms to include DropOuts in original arms.

```
idfu[, ArmInidfu := unique(arm[!is.na(arm) & arm !="before intervention"]), by = hhid]
idfu ← unique(idfu[, .(hhid, ArmInidfu)])

setkey(idfu, hhid)
setkey(adw2, hhid)
adw3 ← idfu[adw2]
adw3[, MemNum := 1:.N, by = .(hhid, Year)]
#table0(adw3[MemNum==1, .(ArmInidfu, randomArm)])
adw3[, RArm := Arm]
adw3[grepl("^drop", Arm) & grepl("con", randomArm), RArm := "traditional"]
adw3[grepl("^drop", Arm) & grepl("^La.*t$", randomArm), RArm := "large"]
adw3[grepl("^drop", Arm) & grepl("^La.*gr", randomArm), RArm := "large grace"]
adw3[grepl("^drop", Arm) & grepl("^pack", randomArm), RArm := "cow"]
ad0 ← adw3[,
  .(RArm, Arm, randomArm, groupid, hhid, TradGroup,
    creditstatus, Mem, povertystatus,
    Date, Year, Month, DisDate1, MonthsElapsed, MonthsRepaid, LoanYear,
    EffectiveRepayment, value.repay, value.NetSaving, value.missw,
    OtherRepaid, OtherNetSaving, OtherMisses, CumOtherMisses,
    CumRepaid, CumEffectiveRepayment, CumNetSaving, CumPlannedInstallment,
    CumOtherRepaid, CumOtherNetSaving, CumMisses, EffectivelyFullyRepaid,
    CumRepaidRate, CumEffectiveRepaidRate)]

#table0(ad0[, .(Arm, MonthsElapsedNA = is.na(MonthsElapsed))])
if (nrow(ad0[is.na(EffectiveRepayment)]) > 0) ad0[is.na(EffectiveRepayment)]
if (nrow(ad0[CumPlannedInstallment != 0L & is.na(CumEffectiveRepaidRate)]) > 0)
  ad0[is.na(CumEffectiveRepaidRate)]
ad0[, c("CumRepaidRate", "CumEffectiveRepaidRate") :=
  .(round(CumRepaid/CumPlannedInstallment, 3),
    round(CumEffectiveRepayment/CumPlannedInstallment, 3))]
ad0[CumPlannedInstallment == 0L, c("CumRepaidRate", "CumEffectiveRepaidRate") := NA]
ad0[, MeanYearlyCERR := mean(CumEffectiveRepaidRate, na.rm = T), by = .(hhid, LoanYear)]

# add rolling means
library(zoo)
```

```
Warning: package 'zoo' was built under R version 3.5.2
```

```

Attaching package: 'zoo'
```

```
The following objects are masked from 'package:base':

    as.Date, as.Date.numeric
```

```
rollvars ← c("value.missw", "value.repay", "value.NetSaving", "OtherNetSaving", "OtherRe
ad0[, (paste0("RM", rollvars)) := lapply(.SD, rollmean, k = 6, na.pad = TRUE),
   by = hhid, .SDcols = rollvars]
  # lag rolling means by 3 months to get previous 6 month averages
ad0[, (paste0("RM", rollvars)) := shift(.SD, n=3, type = "lag"),
   by = hhid, .SDcols = paste0("RM", rollvars)]
ad0[, RMvalue.repay := RMvalue.repay/1000]
```

```
ad0[, RMvalue.NetSaving := RMvalue.NetSaving/1000]
ad0[, RMOtherRepaid := RMOtherRepaid/1000]
ad0[, RMOtherNetSaving := RMOtherNetSaving/1000]
#ad ← ad0[MonthsElapsed == 12 | MonthsElapsed == 24 | MonthsElapsed == 36 | MonthsElapsed
ad0[, c("EffectiveRepayment", "value.repay", "value.NetSaving", "value.missw") := NULL]
```

II.2.2 Merge admin and roster files

How I combined between pages: First, merge time-invariant portion of admin data adbase with roster data ros with hhid as a key. Then it is merged with time-variant portion of admin data adrest with hhid, Year, Month as keys. Second, merge adbase+adrest+ros with other data sch1, ass, ...

By merging in this way, I have RArm information for each HH in survey 1:

```
table0(ar.0[, .(teenum =1:.N, RArm), by = .(hhid, survey)][
  survey == 1 & teenum == 1, RArm])
```

```
traditional       large large grace         cow        <NA>
        485         464         467         487         220
```

```
table0(ar.1[, .(Arm, AssignOriginal)])
```

```
Error in table0(ar.1[, .(Arm, AssignOriginal)]): object 'ar.1' not found
```

Observations with no povertystatus are drop outs and rejecters.

```
table0(ar.0[, povertystatus])
```

```
   Ultra Poor Moderate Poor          <NA>
        21203          9255          2765
```

```
table0(ar.0[is.na(povertystatus), .(Mstatus, survey)])
```

```
              survey
Mstatus          1   2   3   4
  gErosion     344 229 233   0
  gRejection   560 487 466   0
  iRejection     0   0   0 446
  iReplacement   0   0   0   0
  newGroup       0   0   0   0
  oldMember      0   0   0   0
```

```
summary(ar.0[hhid %in% hhid[is.na(povertystatus)],
  .(hhid, Mstatus, survey, creditstatus)])
```

```
      hhid                 Mstatus         survey              creditstatus
 Min.   : 7020501   gErosion    : 806   Min.   :1.00   Yes             :   0
 1st Qu.: 7031914   gRejection  :1513   1st Qu.:1.00   No              :   0
 Median : 7085811   iRejection  : 446   Median :2.00   Replaced Member:   0
 Mean   :13884824   iReplacement:   0   Mean   :2.25   NA's            :2765
 3rd Qu.: 8148314   newGroup    :   0   3rd Qu.:3.00
 Max.   :81710220   oldMember   :   0   Max.   :4.00
```

There are 46 members (newGroup in Mstatus) who did not borrow but only saved.

```
summary(ar.1[is.na(DisDate1) & survey == 1 & MemNum == 1,
  .(survey, DisDate1, creditstatus, Mstatus)] )
```

```
    survey      DisDate1            creditstatus         Mstatus
Min.   :1   Min.   :NA    Yes             :  0   gErosion    : 80
1st Qu.:1   1st Qu.:NA    No              :208   gRejection  :140
Median :1   Median :NA    Replaced Member:  0   iRejection  :159
Mean   :1   Mean   :NA    NA's            :220   iReplacement:  3
3rd Qu.:1   3rd Qu.:NA                           newGroup    : 20
Max.   :1   Max.   :NA                           oldMember   : 26
            NA's   :428
```

So are the same with 104 oldMember in Mstatus:

```
summary(ar.1[is.na(DisDate1) & MemNum == 1 & grepl("old", Mstatus),
  .(groupid = factor(groupid), survey, DisDate1, creditstatus,
    Mstatus, CumRepaid, CumNetSaving, Arm)])
```

```
 groupid       survey        DisDate1            creditstatus
70425:20   Min.   :1.00   Min.   :NA    Yes             :  0
70650:12   1st Qu.:1.75   1st Qu.:NA    No              :104
70861:28   Median :2.50   Median :NA    Replaced Member:  0
71166: 8   Mean   :2.50   Mean   :NA
71372:12   3rd Qu.:3.25   3rd Qu.:NA
81693:24   Max.   :4.00   Max.   :NA
                          NA's   :104
        Mstatus      CumRepaid      CumNetSaving            Arm
gErosion    :  0   Min.   :    0   Min.   :-2780   traditional:104
gRejection  :  0   1st Qu.:    0   1st Qu.:    0   large       :  0
iRejection  :  0   Median :    0   Median :  462   large grace:  0
iReplacement:  0   Mean   :  844   Mean   :  487   cow         :  0
newGroup    :  0   3rd Qu.:    0   3rd Qu.:  958
oldMember   :104   Max.   :16800   Max.   : 1804
                   NA's   :26      NA's   :26
```

There are 12 members (iReplacement in Mstatus) who did not borrow but only saved.

```
summary(ar.1[is.na(DisDate1) & MemNum == 1 & grepl("Rep", Mstatus),
  .(groupid = factor(groupid), survey, DisDate1, creditstatus,
    Mstatus, CumRepaid, CumNetSaving, Arm)])
```

```
 groupid       survey        DisDate1            creditstatus         Mstatus
70650:12   Min.   :1.00   Min.   :NA    Yes             : 0    gErosion    : 0
           1st Qu.:1.75   1st Qu.:NA    No              :12    gRejection  : 0
           Median :2.50   Median :NA    Replaced Member: 0    iRejection  : 0
           Mean   :2.50   Mean   :NA                          iReplacement:12
           3rd Qu.:3.25   3rd Qu.:NA                          newGroup    : 0
           Max.   :4.00   Max.   :NA                          oldMember   : 0
                          NA's   :12
  CumRepaid  CumNetSaving          Arm
Min.   :0   Min.   :  60   traditional:12
1st Qu.:0   1st Qu.: 150   large       : 0
Median :0   Median : 220   large grace: 0
Mean   :0   Mean   : 481   cow         : 0
3rd Qu.:0   3rd Qu.: 585
Max.   :0   Max.   :1415
```

Create BorrowerStatus to indicate these guys.

```
ar.1[, BorrowerStatus := "borrower"]
ar.1[is.na(DisDate1) & MemNum == 1 & grepl("old|new|Rep", Mstatus),
  BorrowerStatus := "pure saver"]
ar.1[, BorrowerStatus := factor(BorrowerStatus)]
```

Set No in creditstatus if NA in DisDate1.

```
ar.1[is.na(DisDate1), creditstatus := "No"]
summary(ar.1[is.na(DisDate1) & survey == 1 & MemNum == 1,
  .(survey, DisDate1, creditstatus, Mstatus, BorrowerStatus)] )
```

```
     survey      DisDate1            creditstatus          Mstatus
 Min.   :1   Min.   :NA    Yes             :  0   gErosion    : 80
 1st Qu.:1   1st Qu.:NA    No              :428   gRejection  :140
 Median :1   Median :NA    Replaced Member:  0   iRejection  :159
 Mean   :1   Mean   :NA                          iReplacement:  3
 3rd Qu.:1   3rd Qu.:NA                          newGroup    : 20
 Max.   :1   Max.   :NA                          oldMember   : 26
             NA's   :428
    BorrowerStatus
 borrower  :379
 pure saver: 49
```

```
ar.1[, YearMonthOfIntDate := paste0(Year, "-", Month)]
ar.1[, YearMonthOfIntDate := factor(YearMonthOfIntDate,
  levels = unique(YearMonthOfIntDate[order(IntDate)]), ordered = T)]
YearMonthMatchTable ← table(ros[, paste0(hhid, "-", Year, "-", Month)] %in%
    ad0[, paste0(hhid, "-", Year, "-", Month)])
```

Need to merge in 2 steps: Merge admin (time-invariant) with roster with hhid as a key, then merge to admin (time-variant [e.g., OtherRepaid, OtherNetSaving, OtherMisses, CumOtherMisses, CumRepaid, CumEffectiveRepayment, CumNetSaving, CumPlannedInstallment, CumOtherRepaid, CumOtherNetSaving, CumMisses, CumRepaidRate, CumEffectiveRepaidRate, RMOtherNetSaving, RMOtherRepaid]) with hhid, Year, Month as keys. This is because there are 8398 non-matching cases if we merge using Year, Month of IntDate in roster data and Year, Month of Date in admin data. This is inevitable because survey precedes the first meeting of borrowers: The admin data starts from 2013-05-01 while survey data starts from 2011-10-09 and rd 1 ends at 2013-10-12 for oldMembers with the median date 2012-10-20. Below gives Year, Month in roster data in rd 1 with no match in admin data.

```
setkey(ros, groupid, hhid, Year, Month)
setkey(ad0, groupid, hhid, Year, Month)
ar00 ← ad0[ros]
ar00[, MemNum := 1:.N, by = .(hhid, Date)]
ar00[, YearMonthOfIntDate := paste0(Year, "-", Month)]
ar00[, YearMonthOfIntDate := factor(YearMonthOfIntDate,
  levels = unique(YearMonthOfIntDate[order(IntDate)]), ordered = T)]
table0(ar00[is.na(MonthsElapsed) & MemNum == 1,
  YearMonthOfIntDate])
```

```
 2011-October  2011-November   2012-January   2012-October  2012-November
            6               1             19           1146            327
2012-December 2013-September   2013-October   2014-January   2014-October
           79               6             19             12             83
2014-November  2014-December  2015-November  2015-December   2016-January
           43              36            111             40             26
 2017-January  2017-February     2017-March     2017-April          NA-NA
           44              97             17             17             21
```

After 2014, it is mostly drop out members who do not match with admin data because they do not attend the meeting.

```
table0(ar00[is.na(MonthsElapsed) & MemNum == 1 & Year ≥ 2014,
  Mgroup])
```

```
   continued    drop outs    new group replacements
          78           381           58            9
```

No additional match if matching only with Year.

```
ros[, MemNum := 1:.N, by = .(hhid, IntDate)]
rbind(YearMonthMatch = table(ros[MemNum == 1, paste0(hhid, "-", Year, "-", Month)] %in%
    ad0[, paste0(hhid, "-", Year, "-", Month)]),
  YearMatch = table(ros[MemNum == 1, paste0(hhid, "-", Year)] %in%
    ad0[, paste0(hhid, "-", Year)]))
```

```
               FALSE TRUE
YearMonthMatch  2055 5958
YearMatch       2055 5958
```

```
# iiNotInAdminData ← !(ros[, paste0(hhid, "-", Year, "-", Month)] %in%
#   ad0[, paste0(hhid, "-", Year, "-", Month)])
# iiNotInAdminData ← ros[(iiNotInAdminData), hhid]
# UiiNotInAdminData ← unique(iiNotInAdminData)
#table(ros[hhid %in% iiNotInAdminData & MemNum == 1,
#  .(survey, AssignRegression)])
setorder(ar.1, hhid, survey, IntDate, mid)
ar.1[, MemNum := 1:.N, by = .(hhid, survey, IntDate)]
```

In roster + admin (base: roster): Tabulate hhid observations by survey round and RArm before supplementing with AssignOriginal and VArm. Note: 220 observations with NA are also pointed in read_cleaned_data.rnw and are going to be dealt with in the next subsection.

```
ar.1[, YearMonthOfIntDate := NULL]
table0(ar.1[MemNum == 1, .(survey, RArm)])
```

```
      RArm
survey traditional large large grace cow <NA>
     1         485   464         467 487  220
     2         472   445         447 446  173
     3         472   448         452 453  168
     4         465   444         447 444  114
```

```
table0(ar.1[MemNum == 1, .(survey, AssignOriginal)])
```

```
      AssignOriginal
survey traditional large large grace cow <NA>
     1         485   464         467 487  220
     2         472   445         447 446  173
     3         472   448         452 453  168
     4         465   444         447 444  114
```

```
ar.1[, MemNum := NULL]
# droplevels do not work... it does not copy NAs.
#ar.1[, RArm := droplevels(RArm)]
```

II.2.3 Merge village level info

```
library(readstata13)
vr ← read.dta13(paste0(pathcleaned, "RCT_village.dta"),
```

```
  generate.factors = T, nonint.factors = T)
vr ← data.table(vr)
vr[, GroupStatus := "accepted"]
vr[grepl("De", comment), GroupStatus := "group rejection"]
vr[grepl("Ero", comment), GroupStatus := "erosion"]
setnames(vr, c("comment", "randomization"), c("GroupComment", "VArm"))

vr[grepl("con", VArm), VArm := "traditional"]
vr[grepl("lar.*t$", VArm), VArm := "large"]
vr[grepl("Lar", VArm), VArm := "large grace"]
vr[grepl("pac", VArm), VArm := "cow"]
vr[, VArm := factor(VArm, levels = c("traditional", "large", "large grace", "cow"))]
vr ← vr[, .(groupid, VArm, GroupStatus, GroupComment)]

setkey(vr, groupid)
setkey(ar.1, groupid)
ar ← vr[ar.1]
# individual replacing members: GroupStatus: NA => accepted
ar[grepl("Rep", Mstatus), GroupStatus := "accepted"]
```

Tabulation of AssignOriginal against VArm. It shows complementarity so I can use one variable to fill in NAs in another.

```
setorder(ar, hhid, survey, IntDate, mid)
ar[, MemNum := 1:.N, by = .(hhid, survey, IntDate)]
table0(ar[MemNum == 1, .(AssignOriginal, VArm)])
```

```
              VArm
AssignOriginal traditional large large grace  cow <NA>
   traditional        1244     0           0    0  650
   large                 0  1423           0    0  378
   large grace           0     0        1437    0  376
   cow                   0     0           0 1631  199
   <NA>                418   158          40   59    0
```

Tabulation of RArm after supplementing with AssignOriginal and VArm.

```
ar[is.na(RArm) & !is.na(AssignOriginal), RArm := AssignOriginal]
ar[is.na(RArm) & !is.na(VArm), RArm := VArm]

table0(ar[MemNum == 1, .(survey, RArm)])
```

```
      RArm
survey traditional large large grace cow
     1         605   504         507 507
     2         585   485         447 466
     3         582   487         452 472
     4         540   483         447 444
```

Below is what is supplemented from VArm of village level information to the 220 NAs.

```
#table0(ar[MemNum == 1 & survey == 1 & is.na(AssignOriginal), RArm])
ar[MemNum == 1 & survey == 1 & is.na(AssignOriginal),
  BorrowerStatus := "quit membership"]
table0(ar[MemNum == 1 & survey == 1 & is.na(AssignOriginal),
  .(BorrowerStatus, RArm)])
```

```
                RArm
BorrowerStatus    traditional large large grace cow
  borrower                  0     0           0   0
  pure saver                0     0           0   0
  quit membership         120    40          40  20
```

II.3 Merge admin-roster with other files

II.3.1 Choosing sample in admin-roster

Tabulation of RArm when dropping twice, double in traditional arm.

```
tb ← table0(ar[MemNum == 1 & !grepl("tw|dou", TradGroup), .(survey, RArm)])
cbind(tb, total = apply(tb, 1, sum))
```

```
  traditional large large grace cow total
1         441   504         507 507  1959
2         319   485         447 466  1717
3         316   487         452 472  1727
4         278   483         447 444  1652
```

Tabulation of RArm when dropping twice in traditional arm. This may make most sense but a large attrition between rd 1 and 2.

```
tb ← table0(ar[MemNum == 1 & !grepl("tw", TradGroup), .(survey, RArm)])
cbind(tb, total = apply(tb, 1, sum))
```

```
  traditional large large grace cow total
1         505   504         507 507  2023
2         430   485         447 466  1828
3         426   487         452 472  1837
4         388   483         447 444  1762
```

Tabulation of RArm when dropping dirbursement after 2015-01-01. This has less attrition but includes heterogenous treatment among traditional.

```
tb ← table0(ar[MemNum == 1 & as.Date(DisDate1) < as.Date("2015-01-01") , .(survey, RArm)])
cbind(tb, total = apply(tb, 1, sum))
```

```
  traditional large large grace cow total
1         328   385         359 328  1400
2         323   371         350 316  1360
3         323   372         349 318  1362
4         321   370         345 312  1348
```

```
#table0(ar[MemNum == 1, .(Arm, RArm)])
#summary(ar[MemNum == 1 & grepl("rop", Arm), ])
#summary(ar[is.na(RArm), 1:10, with = F])
```

In roster + admin 1: Tabulate observations after keeping only observations used in estimation: Keep if Mstatus includes strings old, iRej, gEro, gRej, & DisDate1 is before 2015-01-01, & TradGroup does not include strings tw.

```
tb ← table0(ar[grepl("old|iRej|^g", Mstatus)
  & as.Date(DisDate1) < as.Date("2015-01-01") & !grepl("tw", TradGroup)
  & MemNum == 1, .(survey, RArm)])
cbind(tb, total = apply(tb, 1, sum))
```

```
  traditional large large grace cow total
1         170   296         278 248   992
2         137   285         270 240   932
3         137   286         270 239   932
4         136   284         266 235   921
```

In roster + admin 2: Keep if Mstatus includes strings old, iRej, gEro, gRej, & TradGroup does not include strings tw (relaxing DisDate1 is before 2015-01-01). This the data used in this note. This also shows a lower attrition rate for large arm.

```
cbind(table0(ar[grepl("old|iRej|^g", Mstatus) &
  !grepl("tw", TradGroup) & MemNum == 1, .(survey, RArm)]),
  total = apply(table0(ar[grepl("old|iRej|^g", Mstatus) &
    !grepl("tw", TradGroup) & MemNum == 1, .(survey, RArm)]), 1, sum))
```

```
  traditional large large grace cow total
1         400   400         400 400  1600
2         327   384         342 366  1419
3         324   386         348 366  1424
4         287   382         343 342  1354
```

```
ar[, o1600 := 0L]
ar[grepl("old|iRej|^g", Mstatus) & !grepl("tw|dou", TradGroup),
  o1600 := 1L]
```

Create o1600 to indicate the original 1600 HHs.

```
# tabulation of total by o1600 and round
table0(ar[, .(o1600, survey)])
```

```
     survey
o1600    1    2    3    4
    0 2101 2510 2543 2457
    1 6532 5817 5843 5420
```

```
# tabulation of 1 obs per HH by o1600 and round. o1600 == 0 is added HHs through newGroup
table0(ar[MemNum==1, .(o1600, survey)])
```

```
     survey
o1600    1    2    3    4
    0  523  611  616  607
    1 1600 1372 1377 1307
```

```
ar[, c("BeforeJan2015", "Year2015", "Year2016", "AfterJan2017") :=
   .(as.Date(DisDate1) < as.Date("2015-01-01"),
     as.Date(DisDate1) ≥ as.Date("2015-01-01") &
       as.Date(DisDate1) < as.Date("2016-01-01"),
     as.Date(DisDate1) ≥ as.Date("2016-01-01") &
       as.Date(DisDate1) < as.Date("2017-01-01"),
    as.Date(DisDate1) ≥ as.Date("2017-01-01"))]
ar[, FirstDisPeriod := as.character(NA)]
ar[as.Date(DisDate1) < as.Date("2015-01-01"),
  FirstDisPeriod := "BeforeJan2015"]
ar[as.Date(DisDate1) ≥ as.Date("2015-01-01") &
    as.Date(DisDate1) < as.Date("2016-01-01"),
  FirstDisPeriod := "Year2015"]
ar[as.Date(DisDate1) ≥ as.Date("2016-01-01") &
```

```
    as.Date(DisDate1) < as.Date("2017-01-01"),
  FirstDisPeriod := "Year2016"]
ar[as.Date(DisDate1) ≥ as.Date("2017-01-01"),
  FirstDisPeriod := "After2017"]
```

Tabulate observations without disbursement date info. Note: iReplacement are borrower in BorrowerStatus. (Did they remain as a member?)

```
summary(ar[is.na(FirstDisPeriod) & survey == 1 & MemNum == 1,
  .(survey, DisDate1, creditstatus, Mstatus, BorrowerStatus)] )
```

```
     survey     DisDate1             creditstatus         Mstatus
 Min.   :1   Min.   :NA    Yes             :  0   gErosion    : 80
 1st Qu.:1   1st Qu.:NA    No              :428   gRejection  :140
 Median :1   Median :NA    Replaced Member:  0   iRejection  :159
 Mean   :1   Mean   :NA                          iReplacement:  3
 3rd Qu.:1   3rd Qu.:NA                          newGroup    : 20
 Max.   :1   Max.   :NA                          oldMember   : 26
             NA's   :428
         BorrowerStatus
 borrower       :159
 pure saver     : 49
 quit membership:220
```

These are people who rejected loans. Add RejectedLoans to FirstDisPeriod.

```
ar[is.na(FirstDisPeriod), FirstDisPeriod := "RejectedLoans"]
ar[, FirstDisPeriod := factor(FirstDisPeriod, levels =
  c("BeforeJan2015", "Year2015", "Year2016", "AfterJan2017", "RejectedLoans"))]
summary(ar[survey == 1 & MemNum == 1,
  .(survey, DisDate1, FirstDisPeriod, creditstatus, Mstatus, BorrowerStatus)] )
```

```
     survey     DisDate1                       FirstDisPeriod
 Min.   :1   Min.   :2013-05-01 00:00:00   BeforeJan2015:1400
 1st Qu.:1   1st Qu.:2013-07-01 00:00:00   Year2015     : 295
 Median :1   Median :2013-11-01 00:00:00   Year2016     :   0
 Mean   :1   Mean   :2014-03-23 17:07:57   AfterJan2017 :   0
 3rd Qu.:1   3rd Qu.:2014-12-01 00:00:00   RejectedLoans: 428
 Max.   :1   Max.   :2015-12-01 00:00:00
             NA's   :428
          creditstatus          Mstatus             BorrowerStatus
 Yes             :1695   gErosion    :  80   borrower       :1854
 No              : 428   gRejection  : 140   pure saver     :  49
 Replaced Member:   0   iRejection  : 160   quit membership: 220
                        iReplacement: 115
                        newGroup    : 408
                        oldMember   :1220
```

```
table0(ar[is.na(FirstDisPeriod) & MemNum == 1 & survey == 1, .(DisDate1, creditstatus)])
```

Breakdown of first disbursement by RArm at rd 1 in roster + admin 2.

```
tb ← table0(ar[grepl("old|iRej|^g", Mstatus)
  & !grepl("tw|dou", TradGroup) & survey == 1 & MemNum == 1,
  .(FirstDisPeriod, RArm)])
rbind(tb, total = apply(tb, 2, sum))
```

```
              traditional large large grace cow
BeforeJan2015         170   296         278 248
Year2015               31    52          60  60
Year2016                0     0           0   0
```

```
AfterJan2017            0     0           0   0
RejectedLoans         199    52          62  92
total                 400   400         400 400
```

```
table0(ar[survey == 1 & MemNum == 1,  .(FirstDisPeriod, RArm)])
```

Tabulation of membership status against GroupStatus from "RCT_village.dta".

```
ar[grepl("new", Mstatus), GroupStatus := "accepted"]
table0(ar[MemNum == 1, .(Mstatus, GroupStatus)])
```

```
             GroupStatus
Mstatus       accepted erosion group rejection
  gErosion           0     189               0
  gRejection         0       0             372
  iRejection       543       0             114
  iReplacement     445       0               0
  newGroup        1603       0               0
  oldMember       4747       0               0
```

There are 114 cases of group rejections in GroupStatus classified as individual rejections in Mstatus. Overwrite Mstatus with GroupStatus in these cases.

```
ar[grepl("iR", Mstatus) & grepl("rej", GroupStatus), Mstatus := "gRejection"]
table0(ar[MemNum == 1, .(Mstatus, GroupStatus)])
```

```
             GroupStatus
Mstatus       accepted erosion group rejection
  gErosion           0     189               0
  gRejection         0       0             486
  iRejection       543       0               0
  iReplacement     445       0               0
  newGroup        1603       0               0
  oldMember       4747       0               0
```

```
tb ← table0(ar[MemNum == 1, .(GroupStatus, RArm)])
cbind(tb, total = apply(tb, 1, sum))
```

```
               traditional large large grace  cow total
accepted              1894  1801        1813 1830  7338
erosion                110     0          20   59   189
group rejection        308   158          20    0   486
```

As one can see below, gRejection is more frequent in traditional and large, while there is none in cow. traditional, cow have more frequent iRejection. So traditional was disliked both at group and individual levels, large was disliked as a group, cow was disliked at an individual level, and large grace were well received at both group and individual levels. This indicates attractiveness of a grace period at least at the group level, and a large cash form (over small cash or in-kind) at the individual level.

```
tb ← table0(ar[MemNum == 1 & survey == 1, .(Mstatus, RArm)])
tb
```

```
             RArm
Mstatus       traditional large large grace cow
  gErosion             40     0          20  20
  gRejection           80    40          20   0
  iRejection           54    12          22  72
  iReplacement         39     8          11  57
  newGroup            166    96          96  50
  oldMember           226   348         338 308
```

```
round((tb/apply(tb, 2, sum))*1, 2)
```

```
              RArm
Mstatus        traditional large large grace  cow
  gErosion            0.07  0.00        0.03 0.04
  gRejection          0.16  0.08        0.04 0.00
  iRejection          0.11  0.02        0.04 0.12
  iReplacement        0.08  0.02        0.02 0.11
  newGroup            0.27  0.19        0.16 0.10
  oldMember           0.45  0.69        0.67 0.61
```

```
ar[, RArm := RArm[!is.na(RArm)][1], by = groupid]
```

Create time-invariant HHinfo from ar.

```
HHinfo ← ar[, c("hhid", "IntDate", "Mstatus", "BorrowerStatus", "Mgroup",
  adbasevars), with = F]
for (i in c("IntDate", "Mstatus", "BorrowerStatus", "Mgroup",
  adbasevars))
  HHinfo[, (i) := eval(parse(text=
      paste0(i, "[!is.na(", i, ")][1]")
    )), by = hhid]
HHinfo ← HHinfo[!duplicated(HHinfo[, c("hhid",
  "RArm", "Arm", "randomArm",
  "Mstatus", "BorrowerStatus", "Mgroup", "creditstatus", "Mem", "povertystatus")]), ]
```

Create roster member total RosterMemTotal.

```
ar[, RosterMemTotal := .N, by = .(hhid, survey, IntDate)]
# HH member orders
table0(ar[, .(MemNum, survey)])
```

```
      survey
MemNum    1    2    3    4
    1  2123 1983 1993 1914
    2  2061 1930 1930 1841
    3  1874 1781 1782 1691
    4  1414 1408 1415 1324
    5   744  778  803  734
    6   290  302  311  260
    7    88   96   98   79
    8    32   38   40   29
    9     6   10   10    4
    10    1    1    3    1
    11    0    0    1    0
```

```
# HH size distribution
table0(ar[MemNum == RosterMemTotal, .(MemNum, survey)])
```

```
      survey
MemNum   1   2   3   4
    1   62  53  63  73
    2  187 149 148 150
    3  460 373 367 367
    4  670 630 612 590
    5  454 476 492 474
    6  202 206 213 181
    7   56  58  58  50
    8   26  28  30  25
    9    5   9   7   3
```

```
    10   1   1   2   1
    11   0   0   1   0
```

```
# single member HHs
ar[hhid %in% hhid[RosterMemTotal == 1],
  .(hhid, mid, survey, IntDate, sex, Age_1, marital, HeadAge)]
```

```
            hhid mid survey    IntDate    sex Age_1  marital HeadAge
  1:     7020405   1      1 2012-10-07 Female    55  widowed      55
  2:     7020405   1      2 2014-10-14 Female    55        3      55
  3:     7020405   1      3 2015-12-31 Female    55        3      55
  4:     7020405   1      4 2017-04-26 Female    55  widowed      55
  5:     7020413   1      1 2012-10-10 Female    55  widowed      55
 ---
485: 99081912103   1      4 2017-03-30 Female    20  married      20
486: 99081912103   2      4 2017-03-30   Male    24  married      20
487: 99081912406   1      1 2013-09-08 Female    50 divorced      50
488: 99081912406   1      3 2016-01-11 Female    50        3      50
489: 99081912406   1      4 2017-04-05 Female    50  widowed      50
```

Save roster-admin data.

```
saveRDS(ar, paste0(pathsaveOriginal1600, "RosterAdminData.rds"))
fwrite(ar, paste0(pathsaveOriginal1600, "RosterAdminData.prn"), sep = "\t", quote = F)
```

Schooling.

```
sch1[, Spattern := paste(as.character(.SD[, Enrolled]), collapse = ""),
  by = .(hhid, mid), .SDcols = "Enrolled"]
sch1[, EnrollPattern := Spattern]
sch1[, en := 1:.N, by = .(hhid, mid)]
sch1[, Attrit := paste(as.character(.SD[, en]), collapse = ""),
  by = .(hhid, mid), .SDcols = "en"]
sch1[Attrit == "123", c("Spattern", "EnrollPattern") :=
  .(paste0(Spattern, "n"), paste0(Spattern, "0"))]
sch1[Attrit == "124", c("Spattern", "EnrollPattern") :=
  .(paste0(substr(Spattern, 1, 2), "n", substr(Spattern, 1, 3)),
    paste0(substr(Spattern, 1, 2), "0", substr(Spattern, 1, 3)))]
sch1[Attrit == "12", c("Spattern", "EnrollPattern") :=
  .(paste0(Spattern, "nn"), paste0(Spattern, "00"))]
sch1[Attrit == "13", c("Spattern", "EnrollPattern") :=
  .(paste0(substr(Spattern, 1, 1), "n", substr(Spattern, 2, 2), "n"),
    paste0(substr(Spattern, 1, 1), "0", substr(Spattern, 2, 2), "0"))]
sch1[Attrit == "14", c("Spattern", "EnrollPattern") :=
  .(paste0(substr(Spattern, 1, 3), "n"),
    paste0(substr(Spattern, 1, 3), "0"))]
sch1[Attrit == "23", c("Spattern", "EnrollPattern") :=
  .(paste0("n", Spattern, "n"),
    paste0("0", Spattern, "0"))]
sch1[Attrit == "24", c("Spattern", "EnrollPattern") :=
  .(paste0("n", substr(Spattern, 1, 1), "n", substr(Spattern, 2, 2)),
    paste0("0", substr(Spattern, 1, 1), "0", substr(Spattern, 2, 2)))]
sch1[Attrit == "1", c("Spattern", "EnrollPattern") :=
  .(paste0(Spattern, "nnn"),
    paste0(Spattern, "000"))]
sch1[, Attrit := factor(Attrit)]
sch1[, Spattern := factor(Spattern)]
sch1[, EnrollPattern := factor(EnrollPattern)]
```

Schooling pattern in sch1.

```
table(sch1[, .(Spattern)])
```

```
0000 0001 000n 0011 001n 00nn 0100 0101 010n 0111 011n 01nn 0nnn 1000 1001 100n
 208   36  216  152   33  192   16    4    9  840  105   70  316   64    8   45
1011 101n 10nn 1100 1101 110n 1110 1111 111n 11nn 1nnn
  56   24   86   48   16   84   28 5172  654  326  199
```

```
setkey(ar, groupid, hhid, mid, sex, AgeComputed, year)
setkey(sch1, groupid, hhid, mid, sex, AgeComputed, year)
s1 ← ar[sch1]
s1[, Tee := 1:.N, by = .(hhid, mid)]
s1[, Year := format(as.yearmon(IntDate), "%Y")]
```

In sch1: Number of unique hhids by year (original entry) or Year (extracted from IntDate).

```
s1[, SVYHH := 1:.N, by = .(hhid, survey)]
table0(s1[SVYHH == 1, .(year, Year)])
```

```
      Year
year   2011 2012 2013 2014 2015 2016 2017 <NA>
  2012    4 1069    1    0    0    0    0  168
  2013    0    0  359    0    0    0    0  100
  2014    0    0    0 1251    0    0    0    0
  2015    0    0    0    1  849  358    0    2
  2017    0    0    0    0    0    1 1118    8
```

In sch1: Number of observations tabulated by year (original entry) and round (survey).

```
table(s1[, .(year, survey)])
```

```
      survey
year      1    2    3    4
  2012 1931    0    0    0
  2013  651    0    0    0
  2014    0 2059    0    0
  2015    0    0 1911    0
  2017    0    0    0 1696
```

In sch1: RoundOrder is 1 if individual is observed for the first time in data, 2 if for the second time, ...

```
table(s1[, .(year, RoundOrder = Tee)])
```

```
      RoundOrder
year      1    2    3    4
  2012 2098    0    0    0
  2013  806    0    0    0
  2014    0 2282    0    0
  2015    0   79 1945    0
  2017    0   28  107 1662
```

In sch1: Number of observations tabulated by year (original entry) and age (AgeComputed).

```
table(s1[, .(year, AgeComputed)])
```

```
      AgeComputed
year     6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23
  2012 168 264 279 114 333  77 237 109 104 173 103  43  94   0   0   0   0   0
  2013  48  93  90  61 118  60  79  55  46  58  46  14  38   0   0   0   0   0
```

```
  2014    0  43 222 317 298 211 346 131 234 121 124 152  62  15   6   0   0   0
  2015    0   0  42 225 311 291 198 302 118 192 100  93  95  38  11   8   0   0
  2017    0   0   0   0  40 218 289 279 186 272 110 171  90  64  51  22   4   1
```

II.3.2 Attach variables from admin-roster to other files

Attach RArm, Arm, TradGroup, Mem, ObPattern, AttritIn, o1600, Mstatus, BorrowerStatus, creditstatus, povertystatus, RMvalue.repay, RMvalue.NetSaving, RMOtherNetSaving, RMOtherRepaid, HHsize, HeadLiteracy, IntDate, DisDate1 from ar.

```
ar ← readRDS(paste0(pathsaveOriginal1600, "RosterAdminData.rds"))
ar0 ← ar[, c("groupid", "hhid", "survey", vartoattach), with= F]
for (i in 2:4) {
  ar0[, paste0("Time.", i) := 0L ]
  ar0[grepl(i, survey), paste0("Time.", i) := 1L ]
}
ar0[, num := 1:.N, by = .(hhid, survey)]
ar0 ← ar0[num == 1, ]
ar0[, num := NULL]
ar0[, Year :=  as.numeric(format(as.Date(IntDate), "%Y"))]
ar0[, Month := as.character(format(as.Date(IntDate), "%B"))]
setkey(ar0, groupid, hhid, survey, Year, Month)
setkey(ar0, groupid, hhid, survey)
```

```
vartoattach ← c("RArm", "Arm", "TradGroup", "Mem",
  "ObPattern", "AttritIn", "o1600", "Mstatus", "BorrowerStatus",
  "creditstatus", "povertystatus", "RMvalue.repay",
  "RMvalue.NetSaving", "RMOtherNetSaving", "RMOtherRepaid",
  "HHsize", "HeadLiteracy", "IntDate", "DisDate1")
dfiles ← c("ass", "s1", "lvo", "lab", "far", "con", "shk")
for (j in 1:length(dfiles)) {
  dd ← get(dfiles[j])
  dd[, groupid := as.integer(as.numeric(as.character(gid)))]
  dd[, gid := NULL]
  dd[, Year :=  as.numeric(format(as.Date(IntDate), "%Y"))]
  dd[, Month := as.character(format(as.Date(IntDate), "%B"))]
  dd[Year ≤ 2010, Year := Year + 10]
  # drop all variables in each page before copying from ar0
  dd[, (vartoattach) := NULL]
  setorder(dd, groupid, hhid, survey, Year, Month)
  setkey(dd, groupid, hhid, survey)
  if (j < length(dfiles)) dd ← ar0[dd]
  assign(dfiles[j], dd)
}
```

Create Arm*HadCows, Arm*HadCows*Time interactions in lvo.

```
lvo[, .Arm := paste0(toupper(substr(RArm, 1, 1)), substr(RArm, 2, 100))]
lvo[, .Arm := gsub(" g", "G", .Arm)]
lvo[grepl("NA", .Arm), .Arm := NA]
lvo[, .Arm := factor(.Arm, levels = c("Traditional", "Large", "LargeGrace", "Cow", NA))]
lvo[,
  c(paste0("dummyHadCows.Time", 3:4),
      paste0("dummy", levels(lvo[, .Arm]), ".dummyHadCows"),
      paste0("dummy", levels(lvo[, .Arm]), ".dummyHadCows.Time3"),
      paste0("dummy", levels(lvo[, .Arm]), ".dummyHadCows.Time4")) := as.integer(0L)]
```

```
set(lvo, i = which(lvo[["dummyHadCows"]] == 1L & lvo[["Time.3"]] == 1L),
  j = grep("^dummyHadCows.*3", colnames(lvo)), value = 1L)
set(lvo, i = which(lvo[["dummyHadCows"]] == 1L & lvo[["Time.4"]] == 1L),
  j = grep("^dummyHadCows.*4", colnames(lvo)), value = 1L)
for (a in levels(lvo[, .Arm])) {
  # dummyHadCows*Arm
  set(lvo, i = which(lvo[["dummyHadCows"]] == 1L & grepl(a, lvo[[".Arm"]])),
    j = grep(paste0(a, ".dummyHadCows$"), colnames(lvo)),
    value = 1L)
  # dummyHadCows*Arm*Time3
  set(lvo, i = which(lvo[["dummyHadCows"]] == 1L & grepl(a, lvo[[".Arm"]]) & lvo[["Time.3"
    j = grep(paste0(a, ".dummyHadCows.*3"), colnames(lvo)),
    value = 1L)
  # dummyHadCows*Arm*Time4
  set(lvo, i = which(lvo[["dummyHadCows"]] == 1L & grepl(a, lvo[[".Arm"]]) & lvo[["Time.4"
    j = grep(paste0(a, ".dummyHadCows.*4"), colnames(lvo)),
    value = 1L)
}
#grepout("Had", colnames(lvo))
```

Check number of HHs in assets by o1600:

```
table(ass[, .(creditstatus, survey, o1600)])
```

```
, , o1600 = 0

                 survey
creditstatus        1    2    3    4
  Yes             478  588  593  586
  No               23   23   23   21
  Replaced Member   0    0    0    0

, , o1600 = 1

                 survey
creditstatus        1    2    3    4
  Yes            1192 1047 1054 1039
  No              403  323  323  268
  Replaced Member   0    0    0    0
```

```
#table0(ass[o1600 == 0L, .(creditstatus, survey)])
```

Save all data.

```
saveRDS(s1, paste0(pathsaveOriginal1600, "RosterAdminSchoolingData.rds"))
saveRDS(ass, paste0(pathsaveOriginal1600, "AssetAdminData.rds"))
saveRDS(lvo, paste0(pathsaveOriginal1600, "LivestockAdminData.rds"))
saveRDS(lab, paste0(pathsaveOriginal1600, "LabourIncomeAdminData.rds"))
saveRDS(far, paste0(pathsaveOriginal1600, "FarmRevenueAdminData.rds"))
saveRDS(con, paste0(pathsaveOriginal1600, "ConsumptionAdminData.rds"))
saveRDS(shk, paste0(pathsaveOriginal1600, "Shocks.rds"))
```

```
fwrite(s1, paste0(pathsaveOriginal1600, "RosterAdminSchoolingData.prn"), sep = "\t", quote
fwrite(ass, paste0(pathsaveOriginal1600, "AssetAdminData.prn"), sep = "\t", quote = F)
fwrite(lvo, paste0(pathsaveOriginal1600, "LivestockAdminData.prn"), sep = "\t", quote = F)
fwrite(lab, paste0(pathsaveOriginal1600, "LabourIncomeAdminData.prn"), sep = "\t", quote =
fwrite(far, paste0(pathsaveOriginal1600, "FarmRevenueAdminData.prn"), sep = "\t", quote =
fwrite(con, paste0(pathsaveOriginal1600, "ConsumptionAdminData.prn"), sep = "\t", quote =
fwrite(shk, paste0(pathsaveOriginal1600, "Shocks.prn"), sep = "\t", quote = F)
```

```
flnames ← c("Roster", "Asset", "Livestock", "LabourIncome", "FarmRevenue", "Consumption"
```

Further data preparations (trimming, adding shocks, round numbering, creating dummy vectors, interaction terms) for estimation. Produces files: RosterAdminDataUsedForEstimation.prn, AssetAdminDataUsedForEstimation.prn, LivestockAdminDataUsedForEstimation.prn, LabourIncomeAdminDataUsedForEstimation.prn, FarmRevenueAdminDataUsedForEstimation.prn, ConsumptionAdminDataUsedForEstimation.prn, ShocksAdminDataUsedForEstimation.prn.

```
# Name it as sch1, sch2 rather than s1, s2 (as in other files) to display "s1" in Trimming
# Following files are created in ImpactEstimatin_body1.rnw using paste0(path1234, "data_re
sch1 ← readRDS(paste0(pathsaveOriginal1600, "RosterAdminSchoolingData.rds"))
ar ← readRDS(paste0(pathsaveOriginal1600, "RosterAdminData.rds"))
ass ← readRDS(paste0(pathsaveOriginal1600, "AssetAdminData.rds"))
lvo ← readRDS(paste0(pathsaveOriginal1600, "LivestockAdminData.rds"))
lab ← readRDS(paste0(pathsaveOriginal1600, "LabourIncomeAdminData.rds"))
far ← readRDS(paste0(pathsaveOriginal1600, "FarmRevenueAdminData.rds"))
con ← readRDS(paste0(pathsaveOriginal1600, "ConsumptionAdminData.rds"))
shk ← readRDS(paste0(pathsaveOriginal1600, "Shocks.rds"))
flnames ← c("RosterSchooling", "Roster", "Asset",
  "Livestock", "LabourIncome", "FarmRevenue", "Consumption")
dfiles ← c("sch1", "ar", "ass", "lvo", "lab", "far", "con")
interterms ← c("Time.2", "Time.3", "Time.4")
Arms ← c("Traditional", "Large", "LargeGrace", "Cow")
povertystatus ← c("UltraPoor", "ModeratelyPoor")
Obs ← NULL
shk ← shk[survey == 1, ]
shk[, grepout("gid|Dat|Ye|Mo|surv|code", colnames(shk)) := NULL]
setkey(shk, groupid, hhid)
if (ThisIsNoFlood)
  pathsaveHere ← pathsaveNoFlood else
  pathsaveHere ← pathsaveOriginal1600
# shk[, Month := factor(Month, levels =
#   c("January", "February", "March", "April",
#   #"May", "June", "July",
#   "August", "September", "November", "October",   "December"))]
dimchange ← dimchangeRd1 ← NULL
for (j in 1:length(dfiles)) {
#  if (j == 1) print0(paste("old|iRej|^g in Mstatus", "==>", "con|^dro|^rep in Mgroup", "=
  dd ← get(dfiles[j])
  if (!any(grepl("^tee$", colnames(dd)))) dd[, tee := 1:.N, by = hhid]
  # show trimming results
  dimchange ← rbind(dimchange, paste(dfiles[j], ":", nrow(dd),
    "==>",
    nrow(dd[grepl("old|iRej|^g", Mstatus), ]),
#    "==>",
#    nrow(dd[grepl("old|iRej|^g", Mstatus), ][grepl("con|dro", Mgroup), ]),
    "==>",
    nrow(dd[grepl("old|iRej|^g", Mstatus), ][!grepl("tw|dou", TradGroup), ])
    ))
  dimchangeRd1 ← rbind(dimchangeRd1, paste(dfiles[j], ":", nrow(dd[tee == 1, ]),
    "==>",
    nrow(dd[tee == 1 & grepl("old|iRej|^g", Mstatus), ]),
#    "==>",
#    nrow(dd[grepl("old|iRej|^g", Mstatus), ][grepl("con|dro", Mgroup), ]),
    "==>",
    nrow(dd[tee == 1 & grepl("old|iRej|^g", Mstatus), ][!grepl("tw|dou", TradGroup), ])
```

```
    ))
}
dmch ← gsub("==>", " & $\\\\Rightarrow$ &", dimchange)
dmch ← gsub(":", " & ", dmch)
#dmch ← rbind("file & & old$|$iRej$|$\\^{}g in \\textsf{Mstatus} && con$|$dro in \\textsf
dmch ← rbind("file & & old$|$iRej$|$\\^{}g in \\textsf{Mstatus} && No tw$|$dou in \\texts
  "\\makebox[1.5cm]{\\footnotesize all rounds}&&&&&",
  dmch)
dmch ← gsub("$", " \\\\\\\\\ ", dmch)

dmchRd1 ← gsub("==>", " & $\\\\Rightarrow$ &", dimchangeRd1)
dmchRd1 ← gsub(":", " & ", dmchRd1)
dmchRd1 ← rbind("\\makebox[1.5cm]{\\footnotesize round 1 only}&&&&&",
  dmchRd1)
#dmchRd1 ← rbind("file & & old$|$iRej$|$\\^{}g in \\textsf{Mstatus} && No tw$|$dou in \\t
dmchRd1 ← gsub("$", " \\\\\\\\\ ", dmchRd1)

hleft = c("\\sf", c(rbind(rep("\\hfill", 2), rep("\\hfil", 2)), "\\hfill"))
hcenter = c(1.5, c(rbind(rep(1, 2), rep(1.5, 2)), 1))
write.tablev(
  rbind(paste("\\begin{tabular}{",
    paste(paste0(">{\\footnotesize ", hleft, "}", "p{", hcenter, "cm}", "<{}"), collapse =
  dmch,
  dmchRd1,
  "\\end{tabular}"),
  paste0(pathsaveHere, "TrimmingNumObsTable.tex"), colnamestrue = F)
#print0(rbind(paste("(old|iRej|^g in Mstatus)", "==>", "(con|^dro|^rep in Mgroup)", "==>",
for (j in 1:length(dfiles)) {
  dd ← get(dfiles[j])
  setkey(dd, hhid, Year, Month)
  if (!any(grepl("^tee$", colnames(dd)))) dd[, tee := 1:.N, by = hhid]
  dd[, Arm := droplevels(Arm)]
  dd[, Year :=  as.integer(strftime(IntDate, format = "%Y"))]
  # 1. Keep only membership = 1 or 4, which corresponds to
  # Mstatus old, iRej, gR, gE
  dd ← dd[grepl("old|iRej|^g", Mstatus), ]
  # 2. Keep only continuing, dropouts members in Mgroup.
  #dd ← dd[grepl("con|dro", Mgroup), ]
  # Rejecters do not receive loans. So I need to relax creditstatus = yes condition.
  # Remark out the following:
  # dd ← dd[grepl("Yes", creditstatus), ]
  #  dd ← dd[as.Date(DisDate1) < as.Date("2015-01-01"), ]
  dd ← dd[!grepl("tw|dou", TradGroup), ]
#grepl("es", creditstatus) & as.Date(DisDate1) ≤ as.Date("2015-01-01") & !grepl("tw|dou",
  setkey(dd, groupid, hhid)
  # merge shock module
  dd ← shk[dd]
  dd[, c("en") := NULL]
  dd[, teeyr := 1]
  dd[Year == 2014, teeyr := 2]
  dd[Year == 2015, teeyr := 3]
  dd[Year == 2016, teeyr := 3]
  dd[Year == 2017, teeyr := 4]
  dd[, Time := teeyr]
  setkey(dd, hhid, Year, teeyr)
```

```
# Replace Arm with RArm
dd[, ArmUsedPreviously := Arm]; dd[, Arm := RArm]
dd ← data.table(dd,
  makeDummyFromFactor(dd[, Arm], reference = NULL))
if (any(grepl("dummyLarge grace", colnames(dd))))
  setnames(dd, grepout("dummyLarge grace", colnames(dd)),
    gsub("dummyLarge g", "dummyLargeG",
      grepout("dummyLarge grace", colnames(dd))))
if (any(grepl("dummyNANA", colnames(dd))))
  dd[, dummyNANA := NULL]
#dd[, dummyDropOuts := NULL]
dd ← data.table(dd,
  makeDummyFromFactor(dd[, povertystatus], reference = NULL))
setnames(dd, c("dummyUltra Poor", "dummyModerate Poor"),
  c("dummyUltraPoor", "dummyModeratelyPoor"))
dd[, c("Size", "Grace", "InKind") := .("SmallSize", "WithoutGrace", "Cash")]
dd[!grepl("tra", Arm), Size := "LargeSize"]
dd[grepl("gr|cow", Arm), Grace := "WithGrace"]
dd[grepl("cow", Arm), InKind := "NonCash"]
dd[, c("Grace", "Size", "InKind") :=
  .(factor(Grace), factor(Size, levels = c("LargeSize", "SmallSize")),
    factor(InKind))]
dd ← data.table(dd,
  makeDummyFromFactor(dd[, Size], reference = NULL),
  makeDummyFromFactor(dd[, Grace], reference = NULL),
  makeDummyFromFactor(dd[, InKind], reference = NULL))
# create demeaned dummies
tobe.interacted ← c(Arms, povertystatus,
  c("SmallSize", "LargeSize", "WithoutGrace", "WithGrace", "Cash", "NonCash"))
for (k in tobe.interacted)
  dd[, paste0("DemeanedDummy", k) :=
    eval(parse(text =
      paste0("dummy", k)
    )) -
    mean(
      eval(parse(text =
        paste0("dummy", k)
      ))
      , na.rm = T)
  ]
for (i in interterms) {
  i1 ← unlist(strsplit(i, "\\."))
  i2 ← i1[2]; i1 ← i1[1]
  i0 ← gsub("\\.", "", i)
  dd[, (i) := as.numeric(eval(parse(text=i1)) == i2)]
  dd[, paste0("Demeaned", i0) :=
    eval(parse(text=i)) - mean(eval(parse(text=i)), na.rm = T)]
  for (k in tobe.interacted)
    dd[, paste0("dummy", k, ".", i0) :=
      eval(parse(text=paste0("Demeaned", i0))) *
      eval(parse(text=paste0("DemeanedDummy", k)))]
  # undemeand (UD) interactions
  for (k in tobe.interacted)
    dd[, paste0("UDdummy", k, ".", i0) :=
      eval(parse(text=i)) *
```

```
        eval(parse(text = paste0("dummy", k)))]
  }
  # Only for livestock to create demeand Arm*HadCows, Arm*HadCows*Time interactions
  if (grepl("lvo", dfiles[j])) {
    # demean HadCows
    dd[, "demeanedHadCows" := dummyHadCows - mean(dummyHadCows)]
    dd[, paste0("dummyHadCows.", "dummy", levels(dd[, .Arm])) := 0L]
    dd[, paste0(rep(paste0("dummyHadCows.", "dummy", levels(dd[, .Arm])), 2),
      rep(paste0(".Time", 3:4), each = 4)) := 0L]
    for (a in levels(dd[, .Arm])) {
      dd[, paste0("dummyHadCows.dummy", a) :=
        eval(parse(text=paste0("DemeanedDummy", a))) * demeanedHadCows]
      dd[, paste0("dummyHadCows.dummy", a, ".Time", 3:4) :=
        .(eval(parse(text = paste0("dummyHadCows.dummy", a))) * DemeanedTime3,
          eval(parse(text = paste0("dummyHadCows.dummy", a))) * DemeanedTime4)]
    }
  }
  dd[, grepout("Demea|demeanedHad", colnames(dd)) := NULL]
  Obs ← rbind(Obs, cbind(dfiles[j], dd[, .(obs = .N), by = .(Arm, tee)]))
  assign(dfiles[j], dd)
  saveRDS(dd, paste0(pathsaveHere, flnames[j], "AdminDataUsedForEstimation.rds"))
  fwrite(dd, paste0(pathsaveHere, flnames[j], "AdminDataUsedForEstimation.prn"),
    sep = "\t", quote = F)
}
```

TABLE 1: DATA TRIMMING RESULTS

file	old|iRej|^g in Mstatus		No tw|dou in TradGroup		
all rounds					
sch1	9007	⇒	6013	⇒	5781
ar	33223	⇒	24806	⇒	23612
ass	7989	⇒	5958	⇒	5649
lvo	7989	⇒	5953	⇒	5645
lab	16004	⇒	12102	⇒	11723
far	589	⇒	411	⇒	393
con	5888	⇒	4360	⇒	4051
round 1 only					
sch1	2904	⇒	1931	⇒	1931
ar	2123	⇒	1600	⇒	1600
ass	2121	⇒	1596	⇒	1596
lvo	2121	⇒	1574	⇒	1574
lab	2121	⇒	1596	⇒	1596
far	336	⇒	236	⇒	226
con	2022	⇒	1505	⇒	1401

Source: GUK survey data.

Notes: 1. Top panel is observations for all rounds. Bottom panel is observations for round 1 only. We aim for ITT estimates and need to retain original sampled individuals. old|iRej|^g in Mstatus are strings for old members, individual rejecters, group rejecters, group erosion. con|^dro|^rep in Mgroup indicates continuing, dropouts, replacing members. tw|dou in TradGroup are members who received loans twice and double amount in the 2nd loans. They are omitted from analysis because they are under a different treatment arm.

2.

Number of observations after trimming: 1. Keep only membership = 1 or 4, which corresponds to Mstatus old, iRej, gR, gE; 2. Keep only continuing, dropouts members in Mgroup.

```
setnames(Obs, "V1", "file")
Obs[, Arm := factor(Arm, levels = c("traditional", "large", "large grace", "cow"))]
# from long to wide: Arm1, Arm2, ... with rows in fileX * teeY
Obs ← reshape(Obs, direction = "wide", idvar = c("file", "tee"),
  timevar = "Arm", v.names = "obs")
setnames(Obs, grepout("obs", colnames(Obs)),
  gsub("obs.", "", grepout("obs", colnames(Obs))))
setcolorder(Obs, c("file", "tee", "traditional", "large", "large grace", "cow"))
```

```
setkey(Obs, file , tee)
Obs
```

	file	tee	traditional	large	large grace	cow
1:	ar	1	400	400	400	400
2:	ar	2	398	400	400	398
3:	ar	3	379	399	398	394
4:	ar	4	347	395	389	387
5:	ar	5	307	378	369	370
6:	ar	6	289	376	355	369
7:	ar	7	270	374	340	360
8:	ar	8	267	371	337	359
9:	ar	9	248	351	317	335
10:	ar	10	241	350	316	330
11:	ar	11	232	338	311	322
12:	ar	12	225	334	300	318
13:	ar	13	187	287	254	269
14:	ar	14	183	283	250	267
15:	ar	15	173	274	234	251
16:	ar	16	156	250	217	229
17:	ar	17	99	169	147	166
18:	ar	18	94	162	142	159
19:	ar	19	86	146	126	138
20:	ar	20	77	131	110	120
21:	ar	21	41	65	64	61
22:	ar	22	39	64	60	57
23:	ar	23	33	55	50	44
24:	ar	24	28	48	39	39
25:	ar	25	12	25	18	18
26:	ar	26	11	25	14	16
27:	ar	27	9	24	13	10
28:	ar	28	8	19	12	8
29:	ar	29	5	12	8	2
30:	ar	30	5	12	7	1
31:	ar	31	4	8	6	NA
32:	ar	32	4	6	4	NA
33:	ar	33	2	2	2	NA
34:	ar	34	2	2	2	NA
35:	ar	35	1	1	1	NA
36:	ar	36	1	NA	NA	NA
37:	ar	37	1	NA	NA	NA
38:	ar	38	1	NA	NA	NA
39:	ar	39	1	NA	NA	NA
40:	ar	40	1	NA	NA	NA
41:	ass	1	398	400	399	399
42:	ass	2	283	389	353	378
43:	ass	3	276	384	349	365
44:	ass	4	238	378	330	330
45:	con	1	283	388	352	378
46:	con	2	276	383	349	365
47:	con	3	238	377	331	331
48:	far	1	21	96	52	57
49:	far	2	5	51	28	27
50:	far	3	2	22	17	12
51:	far	4	NA	2	NA	1
52:	lab	1	398	400	399	399
53:	lab	2	396	400	400	397
54:	lab	3	378	399	398	394
55:	lab	4	351	394	387	385
56:	lab	5	305	374	366	363
57:	lab	6	258	347	327	332

```
58:  lab   7          191   283          250 271
59:  lab   8          119   187          173 170
60:  lab   9           71   121          104 100
61:  lab  10           39    86           67  64
62:  lab  11           29    57           44  45
63:  lab  12           21    40           27  29
64:  lab  13           14    21           19  18
65:  lab  14            9    13           15   8
66:  lab  15            8    10            9   6
67:  lab  16            5     8            5   3
68:  lab  17            3     3            3   1
69:  lab  18            1     1            1  NA
70:  lab  19            1    NA            1  NA
71:  lab  20            1    NA            1  NA
72:  lvo   1          398   399          379 398
73:  lvo   2          283   390          373 379
74:  lvo   3          276   384          348 365
75:  lvo   4          238   377          330 328
76: sch1   1          460   479          505 487
77: sch1   2          300   396          369 403
78: sch1   3          266   356          340 351
79: sch1   4          204   306          282 277
    file tee traditional large large grace cow
```

```
s1 ← readRDS(paste0(pathsaveOriginal1600, "RosterAdminSchoolingData.rds"))
s2 ← readRDS(paste0(pathsaveOriginal1600, "RosterAdminSchoolingAugmentedData.rds"))
ass ← readRDS(paste0(pathsaveOriginal1600, "AssetAdminData.rds"))
lvo ← readRDS(paste0(pathsaveOriginal1600, "LivestockAdminData.rds"))
lab ← readRDS(paste0(pathsaveOriginal1600, "LabourIncomeAdminData.rds"))
far ← readRDS(paste0(pathsaveOriginal1600, "FarmRevenueAdminData.rds"))
con ← readRDS(paste0(pathsaveOriginal1600, "ConsumptionAdminData.rds"))
shk ← readRDS(paste0(pathsaveOriginal1600, "Shocks.rds"))
ar ← readRDS(paste0(pathsaveOriginal1600, "RosterAdminData.rds"))
ar[, teenum := 1:.N, by = .(hhid, survey)]
lab[, teenum := 1:.N, by = .(hhid, survey)]
con[, tee := (1:.N)+1, by = hhid]
datafiles ← c("s1", "s2", "ar", "ass", "lvo", "lab", "far", "con")
armtabs ← armtabs.o1600 ← NULL
for (i in 1:length(datafiles[-2])) {
  dx ← get(datafiles[-2][i])
  setorder(dx, hhid, survey, Year, Month)
  if (!any(grepl("^tee$", colnames(dx)))) dx[, tee := 1:.N, by = hhid]
  dx ← dx[tee < AttritIn, ]
  if (i != grep("con", datafiles[-2])) {
    for (j in 1:4) {
      armtabs ← rbind(armtabs,
         table0(dx[tee == j, RArm]))
      armtabs.o1600 ← rbind(armtabs.o1600,
         table0(dx[tee == j & o1600 == 1L, RArm]))
     }
  } else
    for (j in 2:4) {
      armtabs ← rbind(armtabs,
         table0(dx[tee == j & AttritIn != 2, RArm]))
      armtabs.o1600 ← rbind(armtabs.o1600,
         table0(dx[tee == j & AttritIn != 2 & o1600 == 1L, RArm]))
    }
```

```
}
armtabs ← data.table(armtabs)
armtabs[, total := rowSums(armtabs)]
armtabs ← data.table(
  files =
    paste0("\\makebox[1cm]{\\scriptsize ",
      c(rep(datafiles[-c(2, grep("con", datafiles))], each = 4),
        rep("con", each = 3)),
      "}")
  ,
  rounds =
    c(rep(1:4, length(datafiles)-2), 2:4)
  , armtabs)
armtabs[-seq(1, nrow(armtabs), 4), files := ""]
armtabs.o1600 ← data.table(armtabs.o1600)
armtabs.o1600[, total := rowSums(armtabs.o1600)]
armtabs.o1600 ← data.table(
  files =
    paste0("\\makebox[1cm]{\\scriptsize ",
      c(rep(datafiles[-c(2, grep("con", datafiles))], each = 4),
        rep("con", each = 3)),
      "}")
  ,
  rounds =
    c(rep(1:4, length(datafiles)-2), 2:4)
  , armtabs.o1600)
armtabs.o1600[-seq(1, nrow(armtabs.o1600), 4), files := ""]
amt ← latextab(as.matrix(armtabs),
  hleft = "\\scriptsize\\hfil$", hcenter = c(1, rep(1.5, ncol(armtabs)-1)), hright = "$",
  headercolor = "gray80", adjustlineskip = "-.4ex", delimiterline= NULL,
  alternatecolor = "gray90")
amt.o1600 ← latextab(as.matrix(armtabs.o1600),
  hleft = "\\scriptsize\\hfil$", hcenter = c(1, rep(1.5, ncol(armtabs.o1600)-1)), hright =
  headercolor = "gray80", adjustlineskip = "-.4ex", delimiterline= NULL,
  alternatecolor = "gray90")
write.tablev(amt,  paste0(pathsaveHere, "NumObsOriginalHHs_all.tex"),
  colnamestrue = F)
write.tablev(amt.o1600,  paste0(pathsaveHere, "NumObsOriginalHHs_o1600.tex"),
  colnamestrue = F)
```

TABLE 2: NUMBER OF OBSERVATIONS IN EACH FILE AT ROUND 1 FROM HHS WITH SINGLE TREATMENT

files	rounds	traditional	large	large grace	cow	total
s1	1	728	622	618	614	2582
	2	630	523	471	522	2146
	3	560	473	438	453	1924
	4	463	406	369	358	1596
ar	1	605	504	507	507	2123
	2	590	491	457	485	2023
	3	583	487	453	473	1996
	4	539	482	447	442	1910
ass	1	603	504	507	507	2121
	2	590	491	457	484	2022
	3	581	485	453	467	1986
	4	528	478	431	418	1855
lvo	1	603	504	507	507	2121
	2	590	491	457	484	2022
	3	581	485	452	466	1984
	4	528	477	412	416	1833
lab	1	601	504	507	507	2119
	2	588	491	457	485	2021
	3	581	487	453	472	1993
	4	534	481	443	433	1891
far	1	78	123	70	64	335
	2	35	68	39	30	172
	3	13	27	25	12	77
	4	2	1	2	1	6
con	2	590	490	457	484	2021
	3	581	484	453	470	1988
	4	536	477	435	428	1876

Source: Estimated with GUK administrative and survey data.

Notes: 1. Sample is all households: Original 1600 and added households through new groups and individuals replacing opt-out members. All households in traditional arm who received more than one loan are excluded.

2.

TABLE 3: NUMBER OF OBSERVATIONS IN EACH FILE AT ROUND 1 FROM ORIGINAL 1600 HHS

files	rounds	traditional	large	large grace	cow	total
s1	1	460	479	505	487	1931
	2	300	396	369	403	1468
	3	266	356	340	351	1313
	4	204	306	282	277	1069
ar	1	400	400	400	400	1600
	2	385	389	352	379	1505
	3	363	386	349	367	1465
	4	299	382	343	341	1365
ass	1	398	400	400	400	1598
	2	283	389	352	378	1402
	3	276	384	349	365	1374
	4	238	378	330	329	1275
lvo	1	398	400	400	400	1598
	2	283	389	352	378	1402
	3	276	384	348	365	1373
	4	238	377	330	327	1272
lab	1	398	400	400	400	1598
	2	385	389	352	379	1505
	3	364	386	349	367	1466
	4	303	381	342	340	1366
far	1	21	96	52	57	226
	2	5	51	28	27	111
	3	2	22	17	12	53
	4	2	1	2	1	6
con	2	283	388	352	378	1401
	3	276	383	349	365	1373
	4	238	377	331	331	1277

Source: Estimated with GUK administrative and survey data.

Notes: 1. Sample is original 1600 households who agree to join the group. This includes households who later dropped out due to flood, group rejections, and individual rejections. All original 1600 households are tracked but some attrit from the sample.

2.

III Descriptive statistics of original 1600 HHs

```
# Following files are created in ImpactEstimatin_body1.rnw using paste0(path1234, "data_re
# All are in long format with time dummies.
s1 ← readRDS(paste0(pathsaveHere, "RosterSchoolingAdminDataUsedForEstimation.rds"))
ar ← readRDS(paste0(pathsaveHere, "RosterAdminDataUsedForEstimation.rds"))
ass ← readRDS(paste0(pathsaveHere, "AssetAdminDataUsedForEstimation.rds"))
lvo ← readRDS(paste0(pathsaveHere, "LivestockAdminDataUsedForEstimation.rds"))
lab ← readRDS(paste0(pathsaveHere, "LabourIncomeAdminDataUsedForEstimation.rds"))
far ← readRDS(paste0(pathsaveHere, "FarmRevenueAdminDataUsedForEstimation.rds"))
con ← readRDS(paste0(pathsaveHere, "ConsumptionAdminDataUsedForEstimation.rds"))
# what to do with errors like below?
#ass[hhid == 7043715, .(hhid, survey, tee)]
```

c continuing members.

d drop out members.

a absence.

n members of a new group.

r replacing members.

```
table0(xid[survey == 1, .(ObPattern, Mpattern)])
```

```
         Mpattern
ObPattern caaa caca cacc ccaa ccac ccca cccc daaa dada dadd ddaa ddda dddd naaa
     0111    0    0   14    0    0    0    0    0    0   13    0    0    0    0
     1000   25    0    0    0    0    0    0   68    0    0    0    0    0    5
     1010    0    4    0    0    0    0    0    0    1    0    0    0    0    0
     1011    0    0    0    0    1    0    0    0    0    0    0    0    0    0
     1100    0    0    0   11    0    0    0    0    0    0   14    0    0    0
     1110    0    0    0    0    0   13    0    0    0    0    0   54    0    0
     1111    0    0    0    0    0    0 1153    0    0    0    0    0  229    0
         Mpattern
ObPattern nann nnaa nnna nnnn raaa rara rarr rraa rrra rrrr
     0111    4    0    0    0    0    0    5    0    0    0
     1000    0    0    0    0    2    0    0    0    0    0
     1010    0    0    0    0    0    1    0    0    0    0
     1011    0    0    0    0    0    0    0    0    0    0
     1100    0    2    0    0    0    0    0    1    0    0
     1110    0    0    9    0    0    0    0    0    6    0
     1111    0    0    0  440    0    0    0    0    0  144
```

```
xid[, AttritIn := 9L]
xid[grepl("^En|^2nd and 4", missing_followup), AttritIn := 4L]
xid[grepl("^3rd and 4", missing_followup), AttritIn := 3L]
xid[grepl("^2.*3.*4", missing_followup), AttritIn := 2L]
```

AttritIn: Attrition round. 9 is nonattriting members.

```
table0(xid[, AttritIn])
```

```
   2    3    4    9
 100   56  258 7975
```

```
table0(xid[survey == 1, .(AttritIn, ObPattern)])
```

```
         ObPattern
AttritIn 0111 1000 1010 1011 1100 1110 1111
       2    0  100    0    0    0    0    0
       3    0    0    0    0   28    0    0
       4    0    0    6    0    0   82    0
       9   36    0    0    1    0    0 1966
```

```
table0(xid[, .(AttritIn, survey)])
```

```
         survey
AttritIn    1    2    3    4
       2  100    0    0    0
       3   28   28    0    0
       4   88   82   88    0
       9 2003 1967 2002 2003
```

```
xid ← xid[, .(AssignOriginal, randomization, groupid, hhid,
  survey, year, AttritIn, ObPattern, Mstatus, Mgroup,
  creditstatus, IntDate, DistDate1)]
xid[, group.id := as.numeric(substr(hhid, 1, 5))]
xid[group.id == 81710, group.id := as.numeric(substr(hhid, 1, 6))]
xid ← merge(xid, probgp, by = "group.id", all.x = T)
xid[is.na(randomization), AssignOriginal := randomization0]
hhido ← unique(xid[hhid %in% hhid[!grepl("new|Rep", Mstatus) & survey == 1],
   hhid])
hhidor ← unique(xid[hhid %in% hhid[!grepl("new", Mstatus) & survey == 1],
   hhid])
```

Mstatus changes for some groupids. Correct Mstatus by checking comment for dropping out (taken from CharRandomization2012.prn).

```
xid[, dM := length(unique(Mstatus)) > 1, by = hhid]
table(xid[(dM), .(Mstatus, survey)])
```

```
              survey
Mstatus          1   2   3   4
  gErosion       0   0   0   0
  gRejection   114 114 114   0
  iRejection     1   1   1 114
  iReplacement   0   0   0   0
  newGroup       0   0   0   0
  oldMember      0   0   0   1
```

See how Mstatus changes at rd 4: This suggests iRejection needs to change to gRejection, and iRejection to oldMember.

```
table0(xid[groupid %in% groupid[(dM)], .(Mstatus, survey)])
```

```
              survey
Mstatus          1   2   3   4
  gErosion      80  55  54   0
  gRejection   140 118 114   0
  iRejection     7   7   5 118
  iReplacement   6   6   6   6
  newGroup       0   0   0   0
  oldMember     13  13  13  14
```

```
#table0(xid[(dM), .(group.id, survey)])
```

group.id (created from first characters of hhid) and their reasons for dropping out.

```
table0(xid[(dM) & survey == 1, .(group.id, comment)])
```

```
        comment
group.id denial <NA>
   70317     19    0
   70319     20    0
   70539     16    0
   70858     20    0
   71372      0    1
   81483     20    0
   81697     19    0
```

Correct Mstatus in rd 4 from iRejection to gRejection if denial is the comment.

```
xid[(dM) & grepl("denial", comment) & survey == 4, Mstatus := "gRejection"]
table0(xid[(dM), .(Mstatus, survey)])
```

```
              survey
Mstatus          1   2   3   4
  gErosion       0   0   0   0
  gRejection   114 114 114 114
  iRejection     1   1   1   0
  iReplacement   0   0   0   0
  newGroup       0   0   0   0
  oldMember      0   0   0   1
```

```
xid[, dM2 := length(unique(Mstatus)) > 1, by = hhid]
```

Correct Mstatus in rd 1-3 from iRejection to oldMember if NA is the comment.

```
xid[(dM2), .(hhid, Mstatus, survey, creditstatus)]
```

```
      hhid    Mstatus survey creditstatus
1: 7137220 iRejection      1          Yes
2: 7137220 iRejection      2          Yes
3: 7137220 iRejection      3          Yes
4: 7137220  oldMember      4          Yes
```

```
table0(xid[(dM2), .(Mstatus, survey)])
```

```
              survey
Mstatus        1 2 3 4
  gErosion     0 0 0 0
  gRejection   0 0 0 0
  iRejection   1 1 1 0
  iReplacement 0 0 0 0
  newGroup     0 0 0 0
  oldMember    0 0 0 1
```

```
xid[(dM2) & is.na(comment) & survey < 4, Mstatus := "oldMember"]
table0(xid[(dM2), .(Mstatus, survey)])
```

```
              survey
Mstatus        1 2 3 4
  gErosion     0 0 0 0
  gRejection   0 0 0 0
  iRejection   0 0 0 0
```

```
  iReplacement 0 0 0 0
  newGroup     0 0 0 0
  oldMember    1 1 1 1
```

```
xid[, dM3 := length(unique(Mstatus)) > 1, by = hhid]
if (!any(xid[, dM3])) xid[, dM3 := NULL]
xid[, c("dM", "dM2") := NULL]
```

Original 1600 HHs (original sample) by arm and membership status.

```
table0(xid[survey==1 & hhid %in% hhido, .(Mstatus, AssignOriginal)])
```

```
              AssignOriginal
Mstatus        traditional large large grace cow
  gErosion              40     0          20  20
  gRejection            80    40          20   0
  iRejection            53    12          22  72
  iReplacement           0     0           0   0
  newGroup               0     0           0   0
  oldMember            227   348         338 308
```

Including r or individually replacing HHs (replacing sample): 1759

```
table0(xid[survey==1 & hhid %in% hhidor, .(Mstatus, AssignOriginal)])
```

```
              AssignOriginal
Mstatus        traditional large large grace cow
  gErosion              40     0          20  20
  gRejection            80    40          20   0
  iRejection            53    12          22  72
  iReplacement          53    12          22  72
  newGroup               0     0           0   0
  oldMember            227   348         338 308
```

First disbursement year of individual and replacing samples. We have about 100+ in 2013 for replacing sample.

```
rbind(
  original = table0(year(xid[survey==1 & hhid %in% hhido, DistDate1])),
  replacing = table0(year(xid[survey==1 & hhid %in% hhidor, DistDate1])))
```

```
          2013 2014 2015 <NA>
original   679  313  203  405
replacing  771  348  232  408
```

Use original sample.

```
# By reshaping wide, I force all obs to have 4 round of data.
# Use only hhid as idvar, because AssignOriginal has NAs.
# If including AssignOriginal in idvar, rows with AssignOriginal = NA
# will be dropped in widened data.
xidW ← reshape(xid, direction = "wide",
  # idvar = c("Mstatus", "groupid", "AssignOriginal", "hhid"),
  idvar = "hhid",
  timevar = "survey", v.names = grepout("yea|Date", colnames(xid)))
# keep only original HHs
xidW ← xidW[hhid %in% hhido, ]
# force mechanical reshape long by stripping reshapeWide attributes
attributes(xidW)$reshapeWide ← NULL
xid ← reshape(xidW, direction = "long",
```

```
  idvar = "hhid",
  varying = grepout("yea|Date", colnames(xidW)))
# rename survey to tee
setnames(xid, "time", "tee")
```

Attrition.

```
xid[, WillAttrit := 1L]
xid[hhid %in% hhid[AttritIn>4L], WillAttrit := 0L]
table0(xid[, .(tee, WillAttrit)])
```

```
   WillAttrit
tee    0    1
  1 1410  190
  2 1410  190
  3 1410  190
  4 1410  190
```

```
xid[, Rejected := 0L]
xid[grepl("gR|iR", Mstatus), Rejected := 1L]
```

Merge xid with other files. Keep all==T.

```
xid[, Fromxid := T]
datafiles ← c("s1", "ar", "ass", "lvo", "lab", "far", "con")
Datafiles ← c("S1", "Ar", "Ass", "Lvo", "Lab", "Far", "Con")
DataFileNames ← c(
  "Schooling", "Repayment", "Asset", "Livestock",
  "LabourIncome", "FarmIncome", "Consumption")
#lapply(datafiles, function(x)
#  grepout("Assign0|^Arm$|groupi|hhid|tee", colnames(get(x))))
# use only rd 1 characteristics
xid[, c("year") := NULL]
setkey(xid, AssignOriginal, groupid, hhid, tee)
# tee numbering is not in line with survey. This causes multiple matches per hhid-tee belo
corrtee ← c("ar", "ass", "lvo")
for (i in corrtee) {
  this ← get(i)
  setkey(this, hhid, survey)
  this[, tee := NULL]
  this[, tee := 1:.N, by = hhid]
  assign(i, this)
}
for (i in 1:length(datafiles)) {
  X ← get(datafiles[i])
  X[, FromFile := 1L]
  # files up to livestock do not have AssignOriginal
  if (i ≥ 4)
    xx ← merge(xid, X, by = key(xid)[-1], all = T,
      suffixes = c("", paste0("From", Datafiles[i]))) else
    xx ← merge(xid, X, by = key(xid), all = T,
      suffixes = c("", paste0("From", Datafiles[i])))
  xx[is.na(FromFile), FromFile := 0L]
  assign(paste0(datafiles[i], "x"), xx)
  saveRDS(xx, paste0(pathsaveHere, "Roster", DataFileNames[i],
    "AdminOriginalHHsDataUsedForEstimation.rds"))
}
```

```
arx[, en := .N, by = .(hhid, tee)]
arx[hhid %in% hhid[en>1], ]
```

```
table0(assx[tee == 1, .(Mstatus, WillAttrit)])
```

Membership status in schooling: Schooling files have multiple observations per household.

```
table0(s1x[Fromxid & tee == 1, Mstatus])
```

```
  gErosion gRejection iRejection  oldMember
        80         140         234        1872
```

```
s1x[, teenum := 1:.N, by = .(hhid, tee)]
```

Number of obs per survey round in the schooling file:

```
table0(s1x[, .(teenum, tee)])
```

```
      tee
teenum    1    2    3    4
     1 1600 1600 1600 1600
     2  682  511  446  322
     3  248  150  120   83
     4   50   26   17   11
     5   13    3    2    2
     6    2    0    0    0
```

Assets: Original arm assignment by membership status in rd 1: 1820 households.

```
table0(assx[tee == 1, .(Mstatus, AssignOriginal)])
```

```
              AssignOriginal
Mstatus        traditional large large grace cow <NA>
  gErosion              40     0          20  20    0
  gRejection            80    40          20   0    0
  iRejection            53    12          22  72    0
  iReplacement           0     0           0   0    0
  newGroup               0     0           0   0    0
  oldMember            227   348         338 308    0
  <NA>                   0     0           0   0  220
```

```
arx[, teenum := 1:.N, by = .(hhid, tee)]
labx[, teenum := 1:.N, by = .(hhid, tee)]
datafiles ← c("s1", "ar", "ass", "lvo", "lab", "far", "con")
armtabs ← NULL
for (i in 1:length(datafiles[-2])) {
  dx ← get(paste0(datafiles[-2][i], "x"))
  dx ← dx[tee < AttritIn & FromFile == 1L, ]
  if (i != grep("con", datafiles[-2])) {
    for (j in 1:4)
      armtabs ←
      #data.table(
      rbind(armtabs,
        table0(dx[Fromxid & tee == j, AssignOriginal]))
      #  )
  } else
    for (j in 2:4)
      armtabs ←
```

```
      #data.table(
      rbind(armtabs,
        table0(conx[Fromxid & tee == j & AttritIn != 2, AssignOriginal]))
      #  )
}
# armtabs ← data.table(rbind(
#     table0(s1x[Fromxid & tee == 1, AssignOriginal]),
#     table0(arx[Fromxid & tee == 1, AssignOriginal]),
#     table0(assx[Fromxid & tee == 1, AssignOriginal]),
#     table0(lvox[Fromxid & tee == 1, AssignOriginal]),
#     table0(labx[Fromxid & tee == 1, AssignOriginal]),
#     table0(farx[Fromxid & tee == 1, AssignOriginal]),
#     table0(conx[Fromxid & tee == 2 & AttritIn != 2, AssignOriginal])))
    # consumption is not asked in rd 1
armtabs ← data.table(armtabs)
armtabs[, total := rowSums(armtabs)]
armtabs ← data.table(
  files =
    paste0("\\makebox[1cm]{\\scriptsize ",
      c(rep(datafiles[-c(2, grep("con", datafiles))], each = 4),
        rep("con", each = 3)),
      "}")
  ,
  rounds =
    c(rep(1:4, length(datafiles)-2), 2:4)
  , armtabs)
armtabs[-seq(1, nrow(armtabs), 4), files := ""]
amt ← latextab(as.matrix(armtabs),
  hleft = "\\scriptsize\\hfil$", hcenter = c(1, rep(1.5, ncol(armtabs)-1)), hright = "$",
  headercolor = "gray80", adjustlineskip = "-.2ex", delimiterline= NULL,
  alternatecolor = "gray90")
write.tablev(amt,  paste0(pathsaveHere, "NumObsOriginalHHs.tex"),
  colnamestrue = F)
```

Table 4: Number of observations from original 1600 HHs in round 1

files	rounds	traditional	large	large grace	cow	total
s1	1	306	449	441	466	1662
	2	171	373	369	383	1296
	3	152	336	340	333	1161
	4	128	289	282	277	976
ass	1	278	360	360	380	1378
	2	169	349	352	358	1228
	3	167	345	349	346	1207
	4	163	339	330	329	1161
lvo	1	278	360	360	380	1378
	2	169	349	352	358	1228
	3	167	345	348	346	1206
	4	163	339	330	327	1159
lab	1	278	360	360	379	1377
	2	271	349	352	358	1330
	3	254	347	349	348	1298
	4	228	342	342	340	1252
far	1	14	80	52	57	203
	2	4	46	28	27	105
	3	2	20	17	12	51
	4	2	1	2	1	6
con	2	387	389	352	379	1507
	3	387	389	352	379	1507
	4	387	389	352	379	1507

Source: Estimated with GUK administrative and survey data.

Notes: 1.

2.

IV Estimation using original 1600 HHs

IV.1 Repayment and net saving

```
ar ← readRDS(paste0(pathsaveHere, "RosterRepaymentAdminOriginalHHsDataUsedForEstimation.r
ar[survey == 2, Time.2 := 1L]
ar[, Mid := 1:.N, by = .(hhid, survey)]
#ar ← ar[Mid == 1, ]
ar[, Mid := NULL]
ar[, CumSave := CumNetSaving - CumRepaid]
ar[, CumEffectiveRepayment := CumNetSaving + CumRepaid]
ar[, Arm := droplevels(Arm)]
ar[, HeadLiteracy := HeadLiteracy + 0]
source("c:/dropbox/settings/Rsetting/panel_estimator_functions.R")
setorder(ar, hhid, IntDate)
ar[, grepout("LoanY|^Time$", colnames(ar)) := NULL]
ar1 ← ar[,
  #grepout("groupid|^hhid|tee|RArm|^dummy[A-Z]|^dummy.*[a-z]$|Time|CumRepaid$|CumE.*t$|Cum
  grepout("groupid|^hhid|tee|^dummy[A-Z]|^dummy.*[a-z]$|Time|CumRepaid$|CumE.*t$|CumNet|RI
  colnames(ar)), with = F]
ar1[, grepout("UD|[mM]issw|^Time$|Small|^Size", colnames(ar1)) := NULL]
#  hhid == 7096302, 3 have round 1 observation which corresponds to pre disbursement date.
# dar1 ← prepFDData(ar1[!((hhid == 7096302 & tee == 1) | (hhid == 7096303 & tee == 1)), ]
#   Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
#   LevelCovariates = "^dumm.*[a-z]$|RAr|Floo|^Time\\..$|HeadL|HeadA|LoanY",
```

```
#   drop.if.NA.in.differencing = T, LevelPeriodToKeep = "last",
#   use.var.name.for.dummy.prefix = F, print.messages = F)
# dar2 ← prepFDData(ar1, Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
#   LevelCovariates = "^dumm.*[a-z]$|RAr|Floo|^Time\\..$|HeadL|HeadA|LoanY",
#   drop.if.NA.in.differencing = T, LevelPeriodToKeep = "last",
#   use.var.name.for.dummy.prefix = F, print.messages = F)
dl ← FirstDiffPanelData(X = ar1,
  Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
  LevelCovariates = "^dummy|Head|^Time\\..$|Female$|Floo|Eldest|^Arm|^cred.*s$|xid$|Sch.*
```

```
Dropped 10938 obs due to NA.
```

```
dard ← dl$diff
dard[, grepout("^en$|Arm", colnames(dard)) := NULL]
datas ← "dard"
for (i in 1:length(datas)) {
  dat ← get(datas[i])
  dat[, grepout("Time.?2", colnames(dat)) := NULL]
  assign(datas[i], dat)
}
dard[, Tee := .N, by = hhid]
table(dard[, Tee])
```

```
   1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16
  13   82   42  284   80  108 1106  104  504  610 2574  348  871 3150  345  528
  17   18   19   20   21   22   23   24   26   29
1581  126  133  440  105  110  276   48   52   29
```

```
dard ← dard[Tee > 1, ]
```

Repayment started in round 2. So taking a first-difference leaves us with period 2-3 and period 3-4. After first-differencing, ar has 13630 rows with 1, 64, 17, 158, 13, 56, 61, 234, 29, 67, 225, 23, 33, 93, 7, 7, 22, 5, 5, 12, 2, 2, 1 individuals with repeatedly observed for 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 30 times, respectively.

Note all binary interaction terms are demeaned and then interacted.

```
ar ← readRDS(paste0(pathsaveHere, "RosterAdminDataUsedForEstimation.rds"))
ar[, tee := survey]
ar[, Mid := 1:.N, by = .(hhid, survey)]
ar ← ar[Mid == 1, ]
ar[, Mid := NULL]
ar[, CumSave := CumNetSaving - CumRepaid]
ar[, CumEffectiveRepayment := CumNetSaving + CumRepaid]
ar[, Arm := droplevels(Arm)]
ar[, HeadLiteracy := HeadLiteracy + 0]
source("c:/dropbox/settings/Rsetting/panel_estimator_functions.R")
setorder(ar, hhid, IntDate)
ar[, grepout("LoanY|^Time$", colnames(ar)) := NULL]
#ar[, c("dummyForcedDropOuts") := NULL]
table0(ar[, .(tee, RArm)])
```

```
   RArm
tee traditional large large grace cow
  1         400   400         400 400
  2         280   384         342 366
  3         277   386         348 366
  4         240   382         343 342
```

Figure 1: Cumulative weekly net saving

NAs in CumRepaid.

```
table0(ar[is.na(CumRepaid), .(tee, Arm)])
```

```
   Arm
tee traditional large large grace cow
  1         398   400          398 400
  2         113    41            0  20
  3         110    39            0  19
  4          75    39            0   0
```

Tabulation at rd 1:

```
table0(ar[survey == 1, .(Mstatus, RArm)])
```

```
             RArm
Mstatus       traditional large large grace cow
  gErosion              40     0          20  20
  gRejection            80    40          20   0
  iRejection            54    12          22  72
  iReplacement           0     0           0   0
  newGroup               0     0           0   0
  oldMember            226   348         338 308
```

```
library(ggplot2)
ggplot(ar[!is.na(Date), .(Arm, hhid, Date, MonthsElapsed, CumNetSaving)],
  aes(x = MonthsElapsed, y = CumNetSaving, colour = Arm, group = Arm)) +
  geom_point(aes(colour = Arm), size = .1, position = position_dodge(width = .5)) +
  geom_smooth(span = .5, aes(colour = Arm, group = Arm)) +
  theme(legend.position="none", legend.key = element_rect(fill = "white")) +
  scale_y_continuous() +
  scale_x_continuous(limits = c(-12, 48), breaks = seq(-12, 48, 12)) +
  xlab("Months since 1st loan disbursement") + ylab("Normalised repayment amount") +
  facet_grid(. ~ Arm, scales = "free_y")
```

```
ar ← readRDS(paste0(pathsaveHere, "RosterRepaymentAdminOriginalHHsDataUsedForEstimation.r
ar[survey == 2, Time.2 := 1L]
ar[, Mid := 1:.N, by = .(hhid, survey)]
#ar ← ar[Mid == 1, ]
ar[, Mid := NULL]
ar[, CumSave := CumNetSaving - CumRepaid]
ar[, CumEffectiveRepayment := CumNetSaving + CumRepaid]
ar[, Arm := droplevels(Arm)]
```

```
ar[, HeadLiteracy := HeadLiteracy + 0]
source("c:/dropbox/settings/Rsetting/panel_estimator_functions.R")
setorder(ar, hhid, IntDate)
ar[, grepout("LoanY|^Time$", colnames(ar)) := NULL]
ar1 ← ar[,
  #grepout("groupid|^hhid|tee|RArm|^dummy[A-Z]|^dummy.*[a-z]$|Time|CumRepaid$|CumE.*t$|Cum
  grepout("groupid|^hhid|tee|^dummy[A-Z]|^dummy.*[a-z]$|Time|CumRepaid$|CumE.*t$|CumNet|RI
  colnames(ar)), with = F]
ar1[, grepout("UD|[mM]issw|^Time$|Small|^Size", colnames(ar1)) := NULL]
#  hhid == 7096302, 3 have round 1 observation which corresponds to pre disbursement date.
# dar1 ← prepFDData(ar1[!((hhid == 7096302 & tee == 1) | (hhid == 7096303 & tee == 1)), ]
#   Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
#   LevelCovariates = "^dumm.*[a-z]$|RAr|Floo|^Time\\..$|HeadL|HeadA|LoanY",
#   drop.if.NA.in.differencing = T, LevelPeriodToKeep = "last",
#   use.var.name.for.dummy.prefix = F, print.messages = F)
# dar2 ← prepFDData(ar1, Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
#   LevelCovariates = "^dumm.*[a-z]$|RAr|Floo|^Time\\..$|HeadL|HeadA|LoanY",
#   drop.if.NA.in.differencing = T, LevelPeriodToKeep = "last",
#   use.var.name.for.dummy.prefix = F, print.messages = F)
dl ← FirstDiffPanelData(X = ar1,
  Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
  LevelCovariates = "^dummy|Head|^Time\\..$|Female$|Floo|Eldest|^Arm|^cred.*s$|xid$|Sch.*I
```

```
Dropped 10938 obs due to NA.
```

```
dard ← dl$diff
dard[, grepout("^en$|Arm", colnames(dard)) := NULL]
datas ← "dard"
for (i in 1:length(datas)) {
  dat ← get(datas[i])
  dat[, grepout("Time.?2", colnames(dat)) := NULL]
  assign(datas[i], dat)
}
dard[, Tee := .N, by = hhid]
table(dard[, Tee])
```

```
   1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16
  13   82   42  284   80  108 1106  104  504  610 2574  348  871 3150  345  528
  17   18   19   20   21   22   23   24   26   29
1581  126  133  440  105  110  276   48   52   29
```

```
dard ← dard[Tee > 1, ]
```

```
FileName ← "Saving"
FileNameHeader ← paste0(c("", "Grace", "PovertyStatus", "Size", "Attributes"),
  "OriginalHHs")
arsuffixes ← c("", "g", "p", "s", "a")
listheader ← paste0("sv", arsuffixes)
Regressands ←  c(rep("CumNetSaving", 2), rep("CumRepaid", 3),
  rep("CumEffectiveRepayment", 3))
DataToUse1 ← DataToUse2 ← rep("dard", 8)
Addseparatingcols = c(2,5); Separatingcolwidth = rep(.2, 2)
Separatingcoltitle = c("Cumulative net saving", "Cumulative repayment",
   "Cumulative net saving + cumulative repayment")
```

```
source(paste0(pathprogram, "RepaymentCovariateSelection.R"))
```

```
exclheader ← paste0("excl", arsuffixes)
source(paste0(pathprogram, "FDEstimationFile.R"))
```

```
Loading required package: sandwich
```

```
Warning: package 'sandwich' was built under R version 3.5.2
```

```
Loading required package: lmtest
```

```
# svX ← sv12$data[, .(tee,
#   T2 = dummyTraditional.Time2 > 0, L2 = dummyLarge.Time2 > 0,
#   G2 = dummyLargeGrace.Time2 > 0, C2 = dummyCow.Time2 > 0,
#   T3 = dummyTraditional.Time3 > 0, L3 = dummyLarge.Time3 > 0,
#   G3 = dummyLargeGrace.Time3 > 0, C3 = dummyCow.Time3 > 0,
#   T4 = dummyTraditional.Time4 > 0, L4 = dummyLarge.Time4 > 0,
#   G4 = dummyLargeGrace.Time4 > 0, C4 = dummyCow.Time4 > 0 )]
# svX ← sv12$data[, .(
#   dummyTraditional.Time2 , dummyLarge.Time2 ,
#   dummyLargeGrace.Time2 , dummyCow.Time2 ,
#   dummyTraditional.Time3 , dummyLarge.Time3 ,
#   dummyLargeGrace.Time3 , dummyCow.Time3 ,
#   dummyTraditional.Time4 , dummyLarge.Time4 ,
#   dummyLargeGrace.Time4 , dummyCow.Time4 )]
LinDependent ← function(z, ShowMostDependent = F, ReturnColNames = F)
#  From CrossVal: https://stats.stackexchange.com/questions/16327/testing-for-linear-deper
#  The weakness of this function is that it does not specify which columns are jointly lir
#  ShowMostDependent: if T, returns column that is least linearly independent, if F, retur
{
  if (!is.matrix(z)) z ← as.matrix(z)
  rankofz ← qr(z)$rank
  if (rankofz == ncol(z)) message("Full rank.") else
  {
    rankifremoved ← sapply(1:ncol(z), function (x) qr(z[, -x])$rank)
    if (ReturnColNames) {
      if (ShowMostDependent)
        this ← colnames(z)[rankifremoved == max(rankifremoved)] else
        this ← colnames(z)[rankifremoved == ncol(z) - 1]
    } else {
      if (!ShowMostDependent)
        this ← which(rankifremoved == max(rankifremoved)) else
        this ← which(rankifremoved == ncol(z) - 1)
    }
    return(this)
  }
}
# svX ← as.matrix(sv12$data[, .(
#   Time.2, dummyLarge.Time2,
#   dummyLargeGrace.Time2, dummyCow.Time2,
#   Time.3 , dummyLarge.Time3 ,
#   dummyLargeGrace.Time3 , dummyCow.Time3 ,
#   Time.4 , dummyLarge.Time4 ,
#   dummyLargeGrace.Time4, dummyCow.Time4 )])
#LinDependent(svX, F, T)
```

```
arsv ← ar[, .(Arm, groupid, hhid, tee = as.factor(tee))]
svDatalist ← list(arsv, arsv, arsv, arsv, arsv, arsv, arsv, arsv)

InTermsSV ← lapply(svDatalist, function(x)
  interactXY(
    makeDummyFromFactor(x[, Arm], NULL),
    makeDummyFromFactor(x[, tee], NULL)
    ))
InTermsSV ← rbindlist(lapply(InTermsSV, function(x) {
  z ← data.table(t(c(nrow(x), unlist(lapply(1:ncol(x), function(i) sum(x[, i, with = F])
  setnames(z, gsub(" ", "", gsub("dummy", "", c("total", colnames(x)))))
  z
}))
InTermsSV ← InTermsSV[, which(unlist(lapply(InTermsSV, function(x) !all(is.na(x) | x ==
InTermsSV ← t(InTermsSV)
colnames(InTermsSV) ← paste0("(", 1:ncol(InTermsSV), ")")
InTermsSV ← InTermsSV[c(grep("Tra", rownames(InTermsSV)),
  grep("Large[^g]", rownames(InTermsSV)),
  grep("Largeg", rownames(InTermsSV)),
  grep("Cow", rownames(InTermsSV)),
  grep("total", rownames(InTermsSV))
  ), ]
# reorder within a group
rn.j ← rownames(InTermsSV)
newroworder ← NULL
for (j in c("Tra", "Large[^g]", "Largeg", "Cow"))
  newroworder ← c(newroworder,
    c(grep(paste0(j, ".*ale$"), rn.j), grep(paste0(j, ".*P"), rn.j),
      grep(paste0(j, ".*J"), rn.j), grep(paste0(j, ".*H"), rn.j)))
InTermsSV ← InTermsSV[c(newroworder, nrow(InTermsSV)), ]

#dummy chunk
```

Table 5: FD estimation of cumulative net saving and repayment

	Cumulative net saving		Cumulative repayment			Cumulative net saving + cumulative repayment		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	40.6***	33.9***	316.9***	122.4***	136.7*	357.5***	156.3***	171.5**
	(8.4)	(8.5)	(61.3)	(39.7)	(78.2)	(63.8)	(43.7)	(86.7)
Large	81.1***	76.2***	361.5***	307.7***	407.7***	442.6***	383.9***	492.2***
	(11.5)	(11.5)	(65.0)	(47.7)	(70.3)	(68.5)	(51.7)	(83.7)
LargeGrace	36.7***	39.3***	445.6***	401.0***	290.8***	482.3***	440.3***	319.7***
	(9.2)	(9.4)	(71.0)	(56.2)	(77.0)	(74.3)	(60.4)	(91.1)
Cow	24.5**	25.7**	350.5***	303.2***	169.3**	375.0***	328.9***	179.9*
	(10.3)	(10.6)	(81.9)	(64.2)	(82.7)	(86.1)	(69.4)	(96.5)
rd 3 - 4		19.3***		641.1***	496.9***		660.4***	505.9***
		(4.2)		(46.3)	(54.3)		(48.4)	(60.2)
Large × rd 3 - 4		36.3***		403.5**	144.6		439.9***	171.3
		(12.3)		(162.6)	(119.5)		(168.6)	(131.8)
LargeGrace × rd 3 - 4		−19.2		346.3**	442.5***		327.2*	445.6***
		(12.7)		(169.6)	(126.4)		(176.5)	(140.5)
Cow × rd 3 - 4		−8.2		369.9**	612.6***		361.7*	640.7***
		(13.5)		(180.7)	(124.0)		(186.1)	(144.9)
FloodInRd1					−174.2***			−190.4***
					(35.0)			(38.3)
Head literate					32.9			43.9
					(33.5)			(36.0)
Head age					−1.2			−1.4
					(1.2)			(1.3)
6M repayment					2962.5***			3359.5***
					(546.7)			(510.9)
6M net saving					−9379.1***			−7610.0***
					(2071.6)			(2172.6)
6M other member net saving					−35925.1***			−41339.2***
					(6116.1)			(6745.3)
6M other member Repaid					6354.4***			6936.6***
					(979.8)			(1188.8)
$\bar{R}^2$	0.01	0.012	0.005	0.036	0.325	0.006	0.033	0.318
$\hat{\rho}$	−0.112	−0.128	−0.122	−0.092	−0.065	−0.127	−0.112	−0.076
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	13636	13636	13636	13636	13513	13636	13636	13513

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates using rd 2 - rd 4 data. First-differenced ($\Delta x_{t+1} \equiv x_{t+1} - x_t$) regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 6: FD estimation of cumulative net saving and repayment by attributes

	Cumulative net saving		Cumulative repayment			Cumulative net saving + cumulative repayment		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	40.6*** (8.4)	33.9*** (8.5)	316.9*** (61.3)	122.4*** (39.7)	136.7* (78.2)	357.5*** (63.8)	156.3*** (43.7)	171.5** (86.7)
WithGrace	−44.4*** (8.8)	−36.9*** (8.8)	84.1** (41.9)	93.3** (38.9)	−117.0** (46.3)	39.7 (45.6)	56.4 (42.1)	−172.5*** (53.4)
LargeSize	81.1*** (11.5)	76.2*** (11.5)	361.5*** (65.0)	307.7*** (47.7)	407.7*** (70.3)	442.6*** (68.5)	383.9*** (51.7)	492.2*** (83.7)
NonCash	−12.1* (7.2)	−13.6* (7.7)	−95.1 (65.2)	−97.8* (57.9)	−121.4* (64.7)	−107.2 (69.3)	−111.4* (62.5)	−139.8* (71.5)
rd 3 - 4		19.3*** (4.2)		641.1*** (46.3)	496.9*** (54.3)		660.4*** (48.4)	505.9*** (60.2)
LargeSize × rd 3 - 4		36.3*** (12.3)		403.5** (162.6)	144.6 (119.5)		439.9*** (168.6)	171.3 (131.8)
WithGrace × rd 3 - 4		−55.5*** (10.4)		−57.2 (87.2)	297.9** (143.6)		−112.7 (94.8)	274.3* (158.6)
NonCash × rd 3 - 4		11.0 (11.8)		23.6 (117.7)	170.1 (145.3)		34.5 (123.3)	195.1 (161.9)
FloodInRd1					−174.2*** (35.0)			−190.4*** (38.3)
Head literate					32.9 (33.5)			43.9 (36.0)
Head age					−1.2 (1.2)			−1.4 (1.3)
6M repayment					2962.5*** (546.7)			3359.5*** (510.9)
6M net saving					−9379.1*** (2071.6)			−7610.0*** (2172.6)
6M other member net saving					−35925.1*** (6116.1)			−41339.2*** (6745.3)
6M other member Repaid					6354.4*** (979.8)			6936.6*** (1188.8)
$\bar{R}^2$	0.01	0.012	0.005	0.036	0.325	0.006	0.033	0.318
$\hat{\rho}$	−0.112	−0.128	−0.122	−0.092	−0.065	−0.127	−0.112	−0.076
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	13636	13636	13636	13636	13513	13636	13636	13513

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates using rd 2 - rd 4 data. First-differenced ($\Delta x_{t+1} \equiv x_{t+1} - x_t$) regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 7: FD estimation of net cumulative saving and repayment, ultra poor vs. moderately poor

	Cumulative net saving		Cumulative repayment			Cumulative net saving + cumulative repayment		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	81.4***	74.4***	625.3***	388.5***	353.9***	706.7***	462.9***	417.9***
	(6.6)	(6.4)	(30.5)	(27.1)	(65.2)	(34.2)	(30.8)	(73.9)
UltraPoor	0.6	0.7	35.3	29.2	34.7*	35.9	29.8	36.5*
	(4.1)	(4.2)	(22.7)	(20.3)	(19.6)	(25.0)	(22.5)	(21.8)
rd 3 - 4		19.1***		661.0***	523.1***		680.2***	533.7***
		(5.1)		(43.4)	(59.9)		(46.0)	(66.3)
UltraPoor × rd 3 - 4		0.3		59.3	41.3		59.6	40.1
		(4.6)		(36.8)	(26.5)		(38.7)	(28.1)
FloodInRd1					−184.1***			−197.0***
					(39.6)			(44.7)
Head literate					31.9			43.2
					(36.9)			(41.1)
Head age					−1.0			−1.0
					(1.2)			(1.4)
6M repayment					2959.0***			3354.8***
					(547.4)			(511.4)
6M net saving					−9429.2***			−7664.8***
					(2066.4)			(2167.1)
6M other member net saving					−35590.4***			−40928.2***
					(6194.5)			(6833.4)
6M other member Repaid					6193.9***			6755.6***
					(1008.3)			(1212.8)
$\bar{R}^2$	0	0.001	0	0.03	0.316	0	0.027	0.309
$\hat{\rho}$	−0.087	−0.139	−0.110	−0.133	−0.062	−0.103	−0.150	−0.075
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	13636	13636	13636	13636	13513	13636	13636	13513

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates using rd 2 - rd 4 data. First-differenced ($\Delta x_{t+1} \equiv x_{t+1} - x_t$) regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 8: FD estimation of net cumulative saving and repayment, with vs. without a grace period

	Cumulative net saving		Cumulative repayment			Cumulative net saving + cumulative repayment		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	95.9***	85.5***	563.8***	327.7***	408.6***	659.7***	413.2***	499.5***
	(9.0)	(8.5)	(37.3)	(27.3)	(71.4)	(43.8)	(33.2)	(80.6)
WithGrace	−24.8**	−19.5**	151.2***	142.1***	−48.7	126.4**	122.5**	−86.6
	(9.8)	(9.6)	(50.2)	(43.1)	(55.8)	(56.6)	(49.4)	(65.9)
rd 3 - 4		21.1***		662.0***	502.7***		683.1***	512.7***
		(4.5)		(44.5)	(58.4)		(47.1)	(65.0)
WithGrace × rd 3 - 4		−38.3***		83.6	429.4***		45.3	426.9***
		(9.0)		(89.4)	(100.2)		(94.6)	(113.4)
FloodInRd1					−183.7***			−201.6***
					(40.9)			(45.6)
Head literate					30.7			41.6
					(36.6)			(40.6)
Head age					−1.0			−1.0
					(1.2)			(1.4)
6M repayment					2966.9***			3364.6***
					(546.5)			(510.7)
6M net saving					−9414.8***			−7652.0***
					(2069.5)			(2169.8)
6M other member net saving					−35976.0***			−41404.8***
					(6123.5)			(6758.4)
6M other member Repaid					6275.5***			6841.6***
					(1019.3)			(1234.1)
$\bar{R}^2$	0.002	0.004	0.002	0.032	0.319	0.001	0.027	0.312
$\hat{\rho}$	−0.113	−0.139	−0.127	−0.112	−0.063	−0.120	−0.125	−0.076
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	13636	13636	13636	13636	13513	13636	13636	13513

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates using rd 2 - rd 4 data. First-differenced ($\Delta x_{t+1} \equiv x_{t+1} - x_t$) regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 9: FD ESTIMATION OF NET CUMULATIVE SAVING AND REPAYMENT, SMALL SIZE VS. LARGE SIZE

	Cumulative net saving		Cumulative repayment			Cumulative net saving + cumulative repayment		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	40.6*** (8.4)	34.0*** (8.6)	316.9*** (61.3)	122.5*** (39.7)	91.9 (68.5)	357.5*** (63.8)	156.5*** (43.7)	159.4* (85.4)
LargeSize	47.7*** (9.7)	47.3*** (9.6)	385.7*** (65.6)	337.1*** (49.1)	289.1*** (71.0)	433.4*** (68.5)	384.4*** (52.8)	333.4*** (84.7)
rd 3 - 4		19.0*** (5.0)		640.6*** (46.5)	502.0*** (55.2)		659.7*** (48.8)	512.5*** (61.3)
LargeSize × rd 3 - 4		3.4 (11.6)		373.5** (160.0)	398.1*** (89.6)		376.9** (165.4)	420.8*** (102.4)
FloodInRd1					−170.1*** (38.9)			−177.5*** (42.7)
6M repayment					2947.9*** (546.9)			3354.0*** (510.6)
6M net saving					−9435.3*** (2086.6)			−7584.5*** (2165.0)
6M other member net saving					−34758.9*** (6140.4)			−40395.3*** (6795.9)
6M other member Repaid					6263.2*** (953.6)			6849.9*** (1167.0)
Head literate								36.9 (38.8)
Head age								−1.2 (1.3)
$\bar{R}^2$	0.003	0.004	0.005	0.036	0.32	0.005	0.033	0.315
$\hat{\rho}$	−0.060	−0.153	−0.038	−0.193	−0.061	−0.028	−0.205	−0.073
Pr[$\hat{\rho} = 0$]	0.014	0.000	0.129	0.000	0.000	0.276	0.000	0.000
N	13636	13636	13636	13636	13608	13636	13636	13513

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates using rd 2 - rd 4 data. First-differenced ($\Delta x_{t+1} \equiv x_{t+1} - x_t$) regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Finding IV.1 TABLE 5 (1) shows net saving increases, (2) shows that initially a larger then a smaller extent in the later rounds. This reduction may reflect the use of saving for repayment. traditional arm has the lowest repayment rates. Ultra poor and moderately poor have similar repayment rates as indicated in TABLE 7. TABLE 8 (2) shows having a grace period increases the repayment amount while reduces net saving in later rounds. (4) and (5) show cumulative repayment is greater for with grace because each installment is larger. These are all by design that they do not repay in rd 1 so saving increases then they tap in these saving for repayment.

IV.2 Schooling

```
source(paste0(pathprogram, "ReadTrimSchoolingOriginalHHsFDData2.R"))
```

```
Warning in `[.data.table`(s1xR, , `:=`(c("Age_1", grepout("Primary", colnames(s1xR))), : A
```

```
Dropped 1721 obs due to NA.
Dropped 1721 obs due to NA.
Dropped 399 obs due to T<2.
Dropped 1136 obs due to NA.
```

Enrollment pattern in original schooling panel. 'n' indicates NA (either attrition or not reported).

```
table0(s.1x[tee == 1, .(ObPattern, SchPattern)])
```

```
          SchPattern
ObPattern 0000 0001 000n 0011 001n 00nn 0100 010n 0111 011n 01nn 0nnn 1000 1001
     0111    0    0    0    0    0    0    0    0    0    2    2    6    0    0
```

```
      1000     0     0     0     0     0     0     0     0     0     0     0    63     0     0
      1010     0     0     0     0     0     1     0     0     0     0     0     4     0     0
      1011     0     0     0     0     0     0     0     0     0     0     0     0     0     0
      1100     0     0     0     0     0     2     0     0     0     0     5     2     0     0
      1110     0     0     7     0     2     2     0     0     0     8     0     3     0     0
      1111    40     7    41    25     4    50     2     2   173    15    11   182    13     2
          SchPattern
ObPattern  100n 1011  101n  10nn 1100 1101  110n 1110 1111  111n 11n1 11nn 1nnn
      0111     0     0     0     1     0     0     0     0     0    12     0     0     5
      1000     0     0     0     0     0     0     0     0     0     0     0     0    56
      1010     0     0     0     0     0     0     0     0     0     0     0     1     4
      1011     0     0     0     0     0     0     0     0     0     0     0     1     0
      1100     0     0     0     0     0     0     0     0     0     0     0    12     3
      1110     2     0     1     0     0     0     1     0     0    42     0     5     0
      1111     9     9     4    17    11     1    16     4   781    77     1    44   135
```

Left panel is before dropping nnn, right panel is after: Original panel.

```
cbind(table0(s.1x[, .(tee, RArm)]),
  table0(s1x[, .(tee, RArm)]))
```

```
  traditional large large grace cow traditional large large grace cow
1         460   479         505 487         300   396         369 403
2         300   396         369 403         300   396         369 403
3         266   356         340 351         266   356         340 351
4         204   306         282 277         204   306         282 277
```

If using s1x, retain only the complete portion of panel. sch1 has 5781 rows. Drop 463 observations in sch1 with nnn in SchPattern.

```
#s.1 ← s.1[!grepl("1001", EnrollPattern), ]
s1x[, Enrolled := as.numeric(Enrolled)]
s1x[, Fromxid := NULL]
s1x[, Tee := .N, by = HHMid]
ds1xd[, Tee := .N, by = HHMid]
```

With OLS, 154, 246, 1068 individuals are repeatedly observed for 2, 3, 4 times, respectively. With FD, s1x is reduced to 3597 rows after first-differencing with 140, 231, 993 individuals with repeatedly observed for 2, 3, 4 times, respectively. Individuals with NAs in Enrolled. 0 obs for s1x. Check missingness in schooling level information.

```
table0(apply(s1x[, .(dummyJunior, dummyHigh)], 1, sum))
```

```
   0    1
3065 2253
```

Check missingness in arm information.

```
table0(apply(s1x[, .(dummyTraditional, dummyLarge, dummyLargeGrace, dummyCow)], 1, sum))
```

```
   1
5318
```

Drop 3065 obs without school level information.

```
s1x ← s1x[apply(s1x[, .(dummyJunior, dummyHigh)], 1, sum) == 1, ]
ds1xd[, grepout("^Tee$", colnames(ds1xd)) := NULL]
```

An example of dummy interactions: dummyNonCash.dummyPrimary.Time.2, dummyCash.dummyPrimary.Time.2, dummyNonCash.dummyJunior.Time.2, dummyCash.dummyJunior.Time.2, dummyNonCash.dummyHigh.Time.2,

dummyCash.dummyHigh.Time.2, dummyNonCash.dummyPrimary.Time.3, dummyCash.dummyPrimary.Time.3, dummyNonCash.dummyJunior.Time.3, dummyCash.dummyJunior.Time.3, dummyNonCash.dummyHigh.Time.3, dummyCash.dummyHigh.Time.3, dummyNonCash.dummyPrimary.Time.4, dummyCash.dummyPrimary.Time.4, dummyNonCash.dummyJunior.Time.4, dummyCash.dummyJunior.Time.4, dummyNonCash.dummyHigh.Time.4, dummyCash.dummyHigh.Time.4. Obs for s1x.

```
table(ds1xd[, tee])
```

```
   2    3    4
1364 1228 1005
```

Obs for s1x and admin repayment data.

```
table(ds1xRd[, tee])
```

```
   2    3    4
1364 1228 1005
```

```
source(paste0(pathprogram, "ReadTrimSchoolingOriginalHHsFDData2.R"))
```

```
Warning in `[.data.table`(s1xR, , `:=`(c("Age_1", grepout("Primary", colnames(s1xR))), : A
```

```
Dropped 1721 obs due to NA.
Dropped 1721 obs due to NA.
Dropped 399 obs due to T<2.
Dropped 1136 obs due to NA.
```

```
FileName ← "Schooling"
Regressands ← rep("Enrolled", 4)
Addseparatingcols = NULL; Separatingcolwidth = NULL
Separatingcoltitle = NULL

Scsuffixes ← c("", "g", "p", "s", "a", "T", "Tg", "Ts", "D", "Dg", "Da")
exclheader ← paste0("excl", Scsuffixes)
source(paste0(pathprogram, "SchoolingCovariateSelection.R"))

# Need to place ED14Diff after k > 5.
FileNameHeaderSchooling ← c("", "Grace", "PovertyStatus", "Size", "Attributes",
  "Rd14Diff", "Rd14DiffGrace", "Rd14DiffAttributes")
FileNameHeader ← paste0(FileNameHeaderSchooling, "OriginalHHs")
Scsuffixes ← c("", "g", "p", "s", "a", "D", "Dg", "Da")
listheader ← paste0("sc", Scsuffixes)
exclheader ← paste0("excl", Scsuffixes)
DataToUse1 ← rep("ds1xd", 4)
DataToUse2 ← rep("ds1x34d", 4)
source(paste0(pathprogram, "FDEstimationFile.R"))

FileNameHeaderSchooling ← c("TInt", "TIntGrace", "TIntSize")
FileNameHeader ← paste0(FileNameHeaderSchooling, "OriginalHHs")
Scsuffixes ← c("T", "Tg", "Ts")
exclheader ← paste0("excl", Scsuffixes)
listheader ← paste0("sc", Scsuffixes)
source(paste0(pathprogram, "FDEstimationFileSchooling.R"))

#dummy chunk
```

TABLE 10: FD ESTIMATION OF SCHOOL ENROLLMENT

covariates	(1)	(2)	(3)	(4)
(Intercept)	0.13***	0.05	0.08*	0.08*
	(0.02)	(0.03)	(0.04)	(0.04)
Junior	−0.11***	−0.13***	−0.13***	−0.13***
	(0.01)	(0.02)	(0.02)	(0.02)
High	−0.13***	−0.17***	−0.17***	−0.17***
	(0.01)	(0.03)	(0.03)	(0.03)
Large	−0.03**	−0.04**	−0.04**	−0.04**
	(0.02)	(0.02)	(0.02)	(0.02)
LargeGrace	−0.03	−0.04*	−0.04*	−0.04*
	(0.02)	(0.02)	(0.02)	(0.02)
Cow	−0.02	−0.03	−0.03	−0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Large × Junior		0.03	0.03	0.03
		(0.03)	(0.03)	(0.03)
LargeGrace × Junior		0.01	0.01	0.01
		(0.03)	(0.03)	(0.03)
Cow × Junior		0.02	0.02	0.02
		(0.03)	(0.03)	(0.03)
Large × High		0.05	0.05	0.05
		(0.04)	(0.04)	(0.04)
LargeGrace × High		0.07*	0.07*	0.07*
		(0.04)	(0.04)	(0.04)
Cow × High		0.05	0.06*	0.06*
		(0.03)	(0.03)	(0.03)
Female		− 0.00	0.01	0.01
		(0.02)	(0.02)	(0.02)
Junior × Female		−0.03	−0.02	−0.02
		(0.04)	(0.04)	(0.04)
High × Female		0.04	0.05	0.05
		(0.06)	(0.06)	(0.06)
Large × Female		0.00	0.00	0.00
		(0.03)	(0.03)	(0.03)
LargeGrace × Female		0.01	0.01	0.01
		(0.02)	(0.02)	(0.02)
Cow × Female		0.02	0.02	0.02
		(0.02)	(0.02)	(0.02)
Large × Junior × Female		0.00	− 0.00	− 0.00
		(0.05)	(0.05)	(0.05)
LargeGrace × Junior × Female		0.08*	0.08*	0.08*
		(0.05)	(0.05)	(0.05)
Cow × Junior × Female		0.08	0.08	0.08
		(0.06)	(0.06)	(0.06)
Large × High × Female		0.00	0.01	0.01
		(0.07)	(0.07)	(0.07)
LargeGrace × High × Female		0.03	0.04	0.04
		(0.07)	(0.07)	(0.07)
Cow × High × Female		0.03	0.03	0.03
		(0.07)	(0.07)	(0.07)
FloodInRd1			− 0.00	− 0.00
			(0.01)	(0.01)
Head literate			− 0.00	− 0.00
			(0.02)	(0.02)
Head age			− 0.00	− 0.00
			(0.00)	(0.00)
EldestSon			0.00	0.00
			(0.01)	(0.01)
EldestDaughter			−0.02	−0.02
			(0.01)	(0.01)
AgeComputed		0.06***	0.06***	0.06***
		(0.01)	(0.01)	(0.01)
ChildAgeOrderAtRd1		−0.04*	−0.04*	−0.04*
		(0.02)	(0.02)	(0.02)
$T = 2$	148	148	147	147
$T = 3$	235	235	230	230
$T \geq 4$	993	993	992	992
$\bar{R}^2$	0.038	0.047	0.047	0.047
$\hat{\rho}$	−0.029	−0.031	−0.031	−0.031
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000
N	3597	3597	3583	3583

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 11: FD ESTIMATION OF SCHOOL ENROLLMENT BY ATTRIBUTES

covariates	(1)	(2)	(3)	(4)
(Intercept)	0.06***	0.05	0.08*	0.08*
	(0.02)	(0.03)	(0.04)	(0.04)
Junior		−0.13***	−0.13***	−0.13***
		(0.02)	(0.02)	(0.02)
High		−0.17***	−0.17***	−0.17***
		(0.03)	(0.03)	(0.03)
WithGrace	0.00	0.00	0.00	0.00
	(0.01)	(0.02)	(0.02)	(0.02)
LargeSize	−0.03*	−0.04**	−0.04**	−0.04**
	(0.02)	(0.02)	(0.02)	(0.02)
NonCash	0.01	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
WithGrace × Junior		−0.02	−0.02	−0.02
		(0.03)	(0.03)	(0.03)
WithGrace × High		0.02	0.02	0.02
		(0.03)	(0.03)	(0.03)
LargeSize × Junior		0.03	0.03	0.03
		(0.03)	(0.03)	(0.03)
LargeSize × High		0.05	0.05	0.05
		(0.04)	(0.04)	(0.04)
NonCash × Junior		0.01	0.01	0.01
		(0.03)	(0.03)	(0.03)
NonCash × High		−0.02	−0.01	−0.01
		(0.03)	(0.03)	(0.03)
Female		− 0.00	0.01	0.01
		(0.02)	(0.02)	(0.02)
Junior × Female		−0.03	−0.02	−0.02
		(0.04)	(0.04)	(0.04)
High × Female		0.04	0.05	0.05
		(0.06)	(0.06)	(0.06)
WithGrace × Female		0.00	0.01	0.01
		(0.02)	(0.02)	(0.02)
LargeSize × Female		0.00	0.00	0.00
		(0.03)	(0.03)	(0.03)
NonCash × Female		0.01	0.02	0.02
		(0.02)	(0.02)	(0.02)
WithGrace × Junior × Female		0.08*	0.09**	0.09**
		(0.04)	(0.04)	(0.04)
WithGrace × High × Female		0.03	0.03	0.03
		(0.06)	(0.06)	(0.06)
LargeSize × Junior × Female		0.00	− 0.00	− 0.00
		(0.05)	(0.05)	(0.05)
LargeSize × High × Female		0.00	0.01	0.01
		(0.07)	(0.07)	(0.07)
NonCash × Junior × Female		0.00	0.00	0.00
		(0.05)	(0.05)	(0.05)
NonCash × High × Female		−0.01	−0.01	−0.01
		(0.06)	(0.06)	(0.06)
FloodInRd1			− 0.00	− 0.00
			(0.01)	(0.01)
Head literate			− 0.00	− 0.00
			(0.02)	(0.02)
Head age			− 0.00	− 0.00
			(0.00)	(0.00)
EldestSon			0.00	0.00
			(0.01)	(0.01)
EldestDaughter			−0.02	−0.02
			(0.01)	(0.01)
AgeComputed		0.06***	0.06***	0.06***
		(0.01)	(0.01)	(0.01)
ChildAgeOrderAtRd1		−0.04*	−0.04*	−0.04*
		(0.02)	(0.02)	(0.02)
$T = 2$	148	148	147	147
$T = 3$	235	235	230	230
$T \geq 4$	993	993	992	992
$\bar{R}^2$	0	0.047	0.047	0.047
$\hat{\rho}$	−0.026	−0.031	−0.031	−0.031
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000
N	3597	3597	3583	3583

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 12: FD ESTIMATION OF NET SCHOOL ENROLLMENT, ULTRA POOR VS. MODERATELY POOR

covariates	(1)	(2)	(3)	(4)
(Intercept)	0.11***	0.02	0.06	0.06
	(0.01)	(0.02)	(0.04)	(0.04)
Junior	−0.11***	−0.11***	−0.11***	−0.11***
	(0.01)	(0.01)	(0.01)	(0.01)
High	−0.13***	−0.13***	−0.12***	−0.12***
	(0.02)	(0.02)	(0.02)	(0.02)
UltraPoor	−0.01	−0.01	−0.01	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)
UltraPoor × Junior	− 0.00	0.00	− 0.00	− 0.00
	(0.02)	(0.02)	(0.02)	(0.02)
UltraPoor × High	0.00	0.00	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)
Female		−0.01	− 0.00	− 0.00
		(0.01)	(0.02)	(0.02)
Junior × Female		0.01	0.00	0.00
		(0.03)	(0.03)	(0.03)
High × Female		0.10**	0.11**	0.11**
		(0.04)	(0.04)	(0.04)
UltraPoor × Female		0.02	0.03	0.03
		(0.02)	(0.02)	(0.02)
UltraPoor × Junior × Female		0.02	0.03	0.03
		(0.05)	(0.04)	(0.04)
UltraPoor × High × Female		−0.07	−0.07	−0.07
		(0.06)	(0.06)	(0.06)
FloodInRd1			−0.01	−0.01
			(0.01)	(0.01)
Head literate			−0.01	−0.01
			(0.02)	(0.02)
Head age			− 0.00	− 0.00
			(0.00)	(0.00)
EldestSon			− 0.00	− 0.00
			(0.01)	(0.01)
EldestDaughter			−0.02	−0.02
			(0.01)	(0.01)
AgeComputed		0.06***	0.06***	0.06***
		(0.01)	(0.01)	(0.01)
ChildAgeOrderAtRd1		−0.04*	−0.04*	−0.04*
		(0.02)	(0.02)	(0.02)
$T = 2$	148	148	147	147
$T = 3$	235	235	230	230
$T \geq 4$	993	993	992	992
$\bar{R}^2$	0.036	0.048	0.048	0.048
$\hat{\rho}$	0.300	−0.017	−0.029	−0.029
$\Pr[\hat{\rho} = 0]$	0.000	0.010	0.000	0.000
N	3597	3597	3583	3583

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 13: FD ESTIMATION OF SCHOOL ENROLLMENT, WITH VS. WITHOUT A GRACE PERIOD

covariates	(1)	(2)	(3)	(4)
(Intercept)	0.11***	0.01	0.05	0.05
	(0.01)	(0.03)	(0.04)	(0.04)
Junior	−0.11***	−0.11***	−0.11***	−0.11***
	(0.02)	(0.02)	(0.02)	(0.02)
High	−0.15***	−0.14***	−0.14***	−0.14***
	(0.02)	(0.02)	(0.02)	(0.02)
WithGrace	−0.01	−0.01	−0.01	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)
WithGrace × Junior	− 0.00	− 0.00	−0.01	−0.01
	(0.02)	(0.02)	(0.02)	(0.02)
WithGrace × High	0.03	0.03	0.04	0.04
	(0.02)	(0.02)	(0.02)	(0.02)
Female		0.00	0.01	0.01
		(0.01)	(0.02)	(0.02)
Junior × Female		−0.02	−0.03	−0.03
		(0.02)	(0.02)	(0.02)
High × Female		0.04	0.05	0.05
		(0.03)	(0.03)	(0.03)
WithGrace × Female		0.01	0.01	0.01
		(0.02)	(0.02)	(0.02)
WithGrace × Junior × Female		0.08**	0.09**	0.09**
		(0.04)	(0.04)	(0.04)
WithGrace × High × Female		0.03	0.03	0.03
		(0.04)	(0.04)	(0.04)
FloodInRd1			−0.01	−0.01
			(0.01)	(0.01)
Head literate			−0.01	−0.01
			(0.02)	(0.02)
Head age			− 0.00	− 0.00
			(0.00)	(0.00)
EldestSon			0.00	0.00
			(0.01)	(0.01)
EldestDaughter			−0.02	−0.02
			(0.01)	(0.01)
AgeComputed		0.06***	0.06***	0.06***
		(0.01)	(0.01)	(0.01)
ChildAgeOrderAtRd1		−0.04*	−0.04*	−0.04*
		(0.02)	(0.02)	(0.02)
$T = 2$	148	148	147	147
$T = 3$	235	235	230	230
$T \geq 4$	993	993	992	992
$\bar{R}^2$	0.037	0.048	0.048	0.048
$\hat{\rho}$	0.204	−0.027	−0.028	−0.028
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000
N	3597	3597	3583	3583

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 14: FD estimation of school enrollment, small size vs. large size

covariates	(1)	(2)	(3)	(4)
(Intercept)	0.15***	0.05	0.08*	0.08*
	(0.02)	(0.03)	(0.04)	(0.04)
Junior	−0.13***	−0.13***	−0.13***	−0.13***
	(0.02)	(0.02)	(0.02)	(0.02)
High	−0.17***	−0.17***	−0.17***	−0.17***
	(0.03)	(0.03)	(0.03)	(0.03)
LargeSize	−0.03*	−0.03*	−0.03*	−0.03*
	(0.02)	(0.02)	(0.02)	(0.02)
LargeSize × Junior	0.03	0.02	0.02	0.02
	(0.02)	(0.03)	(0.03)	(0.03)
LargeSize × High	0.05*	0.06*	0.06*	0.06*
	(0.03)	(0.03)	(0.03)	(0.03)
Female		− 0.00	0.01	0.01
		(0.02)	(0.02)	(0.02)
Junior × Female		−0.03	−0.02	−0.02
		(0.04)	(0.04)	(0.04)
High × Female		0.04	0.05	0.05
		(0.06)	(0.06)	(0.06)
LargeSize × Female		0.01	0.01	0.01
		(0.02)	(0.02)	(0.02)
LargeSize × Junior × Female		0.05	0.05	0.05
		(0.04)	(0.04)	(0.04)
LargeSize × High × Female		0.02	0.03	0.03
		(0.06)	(0.06)	(0.06)
FloodInRd1			−0.01	−0.01
			(0.01)	(0.01)
Head literate			− 0.00	− 0.00
			(0.02)	(0.02)
Head age			− 0.00	− 0.00
			(0.00)	(0.00)
EldestSon			0.00	0.00
			(0.01)	(0.01)
EldestDaughter			−0.02	−0.02
			(0.01)	(0.01)
AgeComputed		0.06***	0.06***	0.06***
		(0.01)	(0.01)	(0.01)
ChildAgeOrderAtRd1		−0.04*	−0.04*	−0.04*
		(0.02)	(0.02)	(0.02)
$T = 2$	148	148	147	147
$T = 3$	235	235	230	230
$T \geq 4$	993	993	992	992
$\bar{R}^2$	0.038	0.049	0.049	0.049
$\hat{\rho}$	0.330	−0.020	−0.031	−0.031
$\Pr[\hat{\rho} = 0]$	0.000	0.002	0.000	0.000
N	3597	3597	3583	3583

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 15: FD ESTIMATION OF SCHOOL ENROLLMENT, ROUND 1 VS. ROUND 4 DIFFERENCES

covariates	(1)	(2)	(3)	(4)
(Intercept)	0.58***	0.74***	0.75***	0.75***
	(0.10)	(0.09)	(0.08)	(0.08)
Junior	−0.42***	−0.47***	−0.47***	−0.47***
	(0.10)	(0.09)	(0.09)	(0.09)
High	−0.49***	−0.54***	−0.53***	−0.53***
	(0.10)	(0.10)	(0.10)	(0.10)
Large	−0.15*	−0.18***	−0.18**	−0.18**
	(0.08)	(0.07)	(0.07)	(0.07)
LargeGrace	−0.14*	−0.16**	−0.16**	−0.16**
	(0.08)	(0.07)	(0.07)	(0.07)
Cow	−0.11	−0.14*	−0.14*	−0.14*
	(0.08)	(0.08)	(0.08)	(0.08)
Large × Junior	0.09	0.15	0.15	0.15
	(0.13)	(0.13)	(0.13)	(0.13)
LargeGrace × Junior	0.06	0.10	0.10	0.10
	(0.12)	(0.12)	(0.12)	(0.12)
Cow × Junior	0.01	0.06	0.06	0.06
	(0.12)	(0.11)	(0.11)	(0.11)
Large × High	0.09	0.14	0.14	0.14
	(0.13)	(0.13)	(0.13)	(0.13)
LargeGrace × High	0.06	0.09	0.09	0.09
	(0.13)	(0.14)	(0.14)	(0.14)
Cow × High	0.05	0.11	0.11	0.11
	(0.13)	(0.12)	(0.12)	(0.12)
Female		−0.25***	−0.24***	−0.24***
		(0.07)	(0.07)	(0.07)
Junior × Female		0.48***	0.49***	0.49***
		(0.13)	(0.13)	(0.13)
High × Female		0.35***	0.34***	0.34***
		(0.13)	(0.13)	(0.13)
Large × Female		0.23**	0.23**	0.23**
		(0.10)	(0.10)	(0.10)
LargeGrace × Female		0.12	0.12	0.12
		(0.08)	(0.08)	(0.08)
Cow × Female		0.28***	0.28***	0.28***
		(0.09)	(0.09)	(0.09)
Large × Junior × Female		−0.42**	−0.43**	−0.43**
		(0.18)	(0.17)	(0.17)
LargeGrace × Junior × Female		−0.21	−0.22	−0.22
		(0.18)	(0.18)	(0.18)
Cow × Junior × Female		−0.41**	−0.42**	−0.42**
		(0.18)	(0.18)	(0.18)
Large × High × Female		−0.28*	−0.28*	−0.28*
		(0.17)	(0.17)	(0.17)
LargeGrace × High × Female		0.00	0.01	0.01
		(0.20)	(0.20)	(0.20)
Cow × High × Female		−0.20	−0.19	−0.19
		(0.24)	(0.23)	(0.23)
FloodInRd1			−0.01	−0.01
			(0.03)	(0.03)
EldestSon			−0.02	−0.02
			(0.04)	(0.04)
EldestDaughter			−0.03	−0.03
			(0.03)	(0.03)
ChildAgeOrderAtRd1		−0.01	−0.01	−0.01
		(0.03)	(0.03)	(0.03)
$\bar{R}^2$	0.158	0.166	0.165	0.165
N	1002	1002	1002	1002

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 16: FD ESTIMATION OF SCHOOL ENROLLMENT, ROUND 1 VS. ROUND 4 DIFFERENCES BY ATTRIBUTES

covariates	(1)	(2)	(3)	(4)
(Intercept)	0.23***	0.74***	0.74***	0.74***
	(0.04)	(0.09)	(0.12)	(0.12)
Junior		−0.47***	−0.48***	−0.48***
		(0.09)	(0.09)	(0.09)
High		−0.54***	−0.54***	−0.54***
		(0.10)	(0.10)	(0.10)
WithGrace	0.00	0.02	0.02	0.02
	(0.04)	(0.06)	(0.06)	(0.06)
LargeSize	−0.08*	−0.18***	−0.18**	−0.18**
	(0.05)	(0.07)	(0.07)	(0.07)
NonCash	0.03	0.02	0.02	0.02
	(0.05)	(0.07)	(0.07)	(0.07)
WithGrace × Junior		−0.05	−0.05	−0.05
		(0.12)	(0.12)	(0.12)
WithGrace × High		−0.05	−0.05	−0.05
		(0.13)	(0.13)	(0.13)
LargeSize × Junior		0.15	0.15	0.15
		(0.13)	(0.12)	(0.12)
LargeSize × High		0.14	0.14	0.14
		(0.13)	(0.13)	(0.13)
NonCash × Junior		−0.05	−0.05	−0.05
		(0.10)	(0.10)	(0.10)
NonCash × High		0.02	0.02	0.02
		(0.12)	(0.12)	(0.12)
Female		−0.25***	−0.24***	−0.24***
		(0.07)	(0.07)	(0.07)
Junior × Female		0.48***	0.49***	0.49***
		(0.13)	(0.13)	(0.13)
High × Female		0.35***	0.34**	0.34**
		(0.13)	(0.13)	(0.13)
WithGrace × Female		−0.11	−0.10	−0.10
		(0.09)	(0.09)	(0.09)
LargeSize × Female		0.23**	0.23**	0.23**
		(0.10)	(0.10)	(0.10)
NonCash × Female		0.16**	0.15*	0.15*
		(0.08)	(0.08)	(0.08)
WithGrace × Junior × Female		0.21	0.21	0.21
		(0.16)	(0.16)	(0.16)
WithGrace × High × Female		0.28	0.28	0.28
		(0.19)	(0.19)	(0.19)
LargeSize × Junior × Female		−0.42**	−0.43**	−0.43**
		(0.18)	(0.17)	(0.17)
LargeSize × High × Female		−0.28*	−0.27	−0.27
		(0.17)	(0.17)	(0.17)
NonCash × Junior × Female		−0.20	−0.19	−0.19
		(0.17)	(0.17)	(0.17)
NonCash × High × Female		−0.20	−0.19	−0.19
		(0.25)	(0.25)	(0.25)
FloodInRd1			−0.01	−0.01
			(0.03)	(0.03)
Head literate			−0.04	−0.04
			(0.07)	(0.07)
Head age			0.00	0.00
			(0.00)	(0.00)
EldestSon			−0.01	−0.01
			(0.04)	(0.04)
EldestDaughter			−0.03	−0.03
			(0.03)	(0.03)
ChildAgeOrderAtRd1		−0.01	−0.01	−0.01
		(0.03)	(0.03)	(0.03)
$\bar{R}^2$	0.002	0.166	0.164	0.164
N	1002	1002	1001	1001

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 17: FD ESTIMATION OF SCHOOL ENROLLMENT, ROUND 1 VS. ROUND 4 DIFFERENCES, GRACE PERIOD

covariates	(1)	(2)	(3)	(4)
(Intercept)	0.44^{***}	0.48^{***}	0.50^{***}	0.50^{***}
	(0.06)	(0.08)	(0.07)	(0.07)
Junior	-0.34^{***}	-0.35^{***}	-0.34^{***}	-0.34^{***}
	(0.07)	(0.07)	(0.07)	(0.07)
High	-0.42^{***}	-0.42^{***}	-0.42^{***}	-0.42^{***}
	(0.07)	(0.07)	(0.07)	(0.07)
WithGrace	−0.02	−0.02	−0.02	−0.02
	(0.05)	(0.05)	(0.05)	(0.05)
WithGrace × Junior	−0.04	−0.05	−0.05	−0.05
	(0.08)	(0.08)	(0.08)	(0.08)
WithGrace × High	−0.02	−0.02	−0.02	−0.02
	(0.09)	(0.09)	(0.09)	(0.09)
Female		−0.08	−0.07	−0.07
		(0.05)	(0.05)	(0.05)
Junior × Female		0.18^{*}	0.18^{*}	0.18^{*}
		(0.09)	(0.09)	(0.09)
High × Female		0.13^{*}	0.12	0.12
		(0.08)	(0.08)	(0.08)
WithGrace × Female		0.03	0.03	0.03
		(0.07)	(0.07)	(0.07)
WithGrace × Junior × Female		−0.01	−0.01	−0.01
		(0.13)	(0.13)	(0.13)
WithGrace × High × Female		0.10	0.11	0.11
		(0.15)	(0.15)	(0.15)
FloodInRd1			−0.02	−0.02
			(0.03)	(0.03)
EldestSon			−0.02	−0.02
			(0.04)	(0.04)
EldestDaughter			−0.03	−0.03
			(0.03)	(0.03)
ChildAgeOrderAtRd1		−0.01	−0.01	−0.01
		(0.03)	(0.03)	(0.03)
$\bar{R}^2$	0.153	0.156	0.155	0.155
N	1002	1002	1002	1002

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 18: FD ESTIMATION OF SCHOOL ENROLLMENT, PERIOD INTERACTIONS

covariates	(1)	(2)	(3)	(4)
Junior	−0.07***	−0.11***	−0.11***	−0.10***
	(0.01)	(0.01)	(0.03)	(0.03)
High	−0.08***	−0.13***	−0.23***	−0.22***
	(0.01)	(0.01)	(0.04)	(0.04)
Large	0.07***	−0.03*	−0.02	−0.02
	(0.01)	(0.02)	(0.03)	(0.03)
LargeGrace	0.08***	−0.03	−0.03	−0.02
	(0.01)	(0.02)	(0.04)	(0.04)
Cow	0.09***	−0.02	−0.00	0.00
	(0.02)	(0.02)	(0.04)	(0.04)
Large × Junior			−0.02	−0.02
			(0.05)	(0.05)
LargeGrace × Junior			−0.04	−0.04
			(0.04)	(0.04)
Cow × Junior			−0.01	−0.01
			(0.04)	(0.04)
Large × High			0.01	0.02
			(0.06)	(0.05)
LargeGrace × High			0.06	0.07
			(0.05)	(0.05)
Cow × High			0.08	0.12**
			(0.06)	(0.06)
Female		0.02		0.00
		(0.02)		(0.06)
Junior × Female		0.02		−0.05
		(0.02)		(0.04)
High × Female		0.07***		0.01
		(0.02)		(0.06)
Large × Female		−0.01		−0.02
		(0.03)		(0.07)
LargeGrace × Female		−0.00		0.02
		(0.02)		(0.06)
Cow × Female		0.01		0.03
		(0.02)		(0.06)
Large × Junior × Female				−0.01
				(0.07)
LargeGrace × Junior × Female				0.14*
				(0.07)
Cow × Junior × Female				0.12
				(0.08)
Large × High × Female				0.04
				(0.08)
LargeGrace × High × Female				0.12
				(0.10)
Cow × High × Female				0.13
				(0.09)
rd 2 - 3			0.03	0.03
			(0.02)	(0.03)
Junior × rd 2 - 3			0.04	0.04
			(0.04)	(0.04)
High × rd 2 - 3			0.15**	0.16**
			(0.07)	(0.06)
Large × rd 2 - 3			−0.03	−0.03
			(0.04)	(0.04)
LargeGrace × rd 2 - 3			−0.03	−0.03
			(0.05)	(0.05)
Cow × rd 2 - 3			−0.06	−0.07
			(0.05)	(0.05)
Large × Junior × rd 2 - 3			0.07	0.07
			(0.07)	(0.06)
LargeGrace × Junior × rd 2 - 3			0.07	0.07
			(0.06)	(0.07)
Cow × Junior × rd 2 - 3			−0.00	0.00
			(0.06)	(0.06)
Large × High × rd 2 - 3			−0.00	−0.03
			(0.09)	(0.08)
LargeGrace × High × rd 2 - 3			−0.03	−0.04
			(0.09)	(0.08)
Cow × High × rd 2 - 3			−0.12	−0.14
			(0.10)	(0.10)
Female × rd 2 - 3				0.05
				(0.09)
Large × Female × rd 2 - 3				−0.04
				(0.11)
LargeGrace × Female × rd 2 - 3				−0.05
				(0.10)
Cow × Female × rd 2 - 3				−0.01
				(0.10)
Large × Junior × Female × rd 2 - 3				0.06
				(0.08)
LargeGrace × Junior × Female × rd 2 - 3				−0.04
				(0.09)
Cow × Junior × Female × rd 2 - 3				−0.01
				(0.09)
Large × High × Female × rd 2 - 3				−0.07
				(0.10)
LargeGrace × High × Female × rd 2 - 3				−0.06
				(0.08)
Cow × High × Female × rd 2 - 3				−0.15
				(0.14)

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE ??: FD ESTIMATION OF SCHOOL ENROLLMENT, PERIOD INTERACTIONS, CONTINUED

covariates	(1)	(2)	(3)	(4)
rd 3 - 4			−0.13***	−0.13***
			(0.03)	(0.03)
Junior × rd 3 - 4			0.15**	0.15**
			(0.06)	(0.06)
High × rd 3 - 4			0.36***	0.37***
			(0.09)	(0.09)
Large × rd 3 - 4			−0.01	−0.01
			(0.07)	(0.07)
LargeGrace × rd 3 - 4			0.01	0.01
			(0.08)	(0.09)
Cow × rd 3 - 4			−0.03	−0.04
			(0.09)	(0.09)
Large × Junior × rd 3 - 4			0.06	0.05
			(0.10)	(0.10)
LargeGrace × Junior × rd 3 - 4			0.05	0.05
			(0.09)	(0.09)
Cow × Junior × rd 3 - 4			−0.04	−0.04
			(0.09)	(0.10)
Large × High × rd 3 - 4			0.01	−0.02
			(0.13)	(0.12)
LargeGrace × High × rd 3 - 4			−0.10	−0.11
			(0.12)	(0.12)
Cow × High × rd 3 - 4			−0.27*	−0.32**
			(0.15)	(0.14)
Female × rd 3 - 4				0.07
				(0.15)
Large × Female × rd 3 - 4				0.00
				(0.18)
LargeGrace × Female × rd 3 - 4				−0.12
				(0.16)
Cow × Female × rd 3 - 4				−0.07
				(0.16)
Large × Junior × Female × rd 3 - 4				0.06
				(0.11)
LargeGrace × Junior × Female × rd 3 - 4				−0.09
				(0.12)
Cow × Junior × Female × rd 3 - 4				−0.02
				(0.11)
Large × High × Female × rd 3 - 4				−0.06
				(0.15)
LargeGrace × High × Female × rd 3 - 4				−0.14
				(0.15)
Cow × High × Female × rd 3 - 4				−0.11
				(0.17)
FloodInRd1		−0.00		−0.00
		(0.01)		(0.01)
Head literate		−0.00		−0.00
		(0.02)		(0.02)
Head age		0.00		−0.00
		(0.00)		(0.00)
EldestSon		0.01		0.01
		(0.01)		(0.01)
EldestDaughter		−0.01		−0.01
		(0.01)		(0.01)
AgeComputed		0.07***	0.09***	0.10***
		(0.01)	(0.02)	(0.02)
ChildAgeOrderAtRd1		−0.04*	−0.04*	−0.04*
		(0.02)	(0.02)	(0.02)
$T = 2$	148	147	148	147
$T = 3$	235	230	235	230
$T = 4$	993	992	993	992
$\bar{R}^2$	0.031	0.069	0.086	0.082
$\hat{\rho}$	−0.036	−0.028	−0.025	−0.023
Pr[$\hat{\rho} = 0$]	0.000	0.000	0.000	0.000
N	3597	3583	3597	3583

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 19: FD ESTIMATION OF SCHOOL ENROLLMENT, PERIOD INTERACTIONS, GRACE PERIOD

covariates	(1)	(2)	(3)	(4)
Junior	0.00	−0.11***	−0.11***	−0.11***
	(0.01)	(0.01)	(0.02)	(0.02)
High	−0.03***	−0.14***	−0.22***	−0.22***
	(0.01)	(0.02)	(0.03)	(0.03)
WithGrace	0.06***	−0.01	− 0.00	0.00
	(0.01)	(0.01)	(0.03)	(0.03)
WithGrace × Junior	−0.11***	−0.01	−0.01	−0.02
	(0.02)	(0.02)	(0.03)	(0.03)
WithGrace × High	−0.08***	0.03	0.07*	0.08**
	(0.02)	(0.02)	(0.04)	(0.04)
Female		0.01		−0.01
		(0.01)		(0.04)
Junior × Female		−0.03		−0.04
		(0.02)		(0.03)
High × Female		0.04		0.03
		(0.03)		(0.03)
WithGrace × Female		0.01		0.03
		(0.02)		(0.04)
WithGrace × Junior × Female		0.08**		0.12**
		(0.04)		(0.05)
WithGrace × High × Female		0.03		0.10*
		(0.04)		(0.06)
rd 2 - 3			0.01	0.02
			(0.02)	(0.02)
Junior × rd 2 - 3			0.08**	0.08**
			(0.03)	(0.03)
High × rd 2 - 3			0.15***	0.16***
			(0.04)	(0.04)
WithGrace × rd 2 - 3			−0.03	−0.03
			(0.03)	(0.03)
WithGrace × Junior × rd 2 - 3			−0.01	− 0.00
			(0.05)	(0.05)
WithGrace × High × rd 2 - 3			−0.07	−0.08
			(0.06)	(0.06)
Female × rd 2 - 3				0.03
				(0.05)
WithGrace × Female × rd 2 - 3				−0.01
				(0.06)
WithGrace × Junior × Female × rd 2 - 3				−0.03
				(0.06)
WithGrace × High × Female × rd 2 - 3				−0.08
				(0.07)
rd 3 - 4			−0.12***	−0.12***
			(0.02)	(0.02)
Junior × rd 3 - 4			0.18***	0.18***
			(0.05)	(0.05)
High × rd 3 - 4			0.37***	0.37***
			(0.07)	(0.07)
WithGrace × rd 3 - 4			− 0.00	−0.01
			(0.06)	(0.06)
WithGrace × Junior × rd 3 - 4			−0.03	−0.02
			(0.07)	(0.07)
WithGrace × High × rd 3 - 4			−0.18*	−0.21**
			(0.10)	(0.10)
Female × rd 3 - 4				0.07
				(0.08)
WithGrace × Female × rd 3 - 4				−0.09
				(0.10)
WithGrace × Junior × Female × rd 3 - 4				−0.05
				(0.08)
WithGrace × High × Female × rd 3 - 4				−0.10
				(0.11)
FloodInRd1		− 0.00		− 0.00
		(0.01)		(0.01)
Head literate				− 0.00
				(0.02)
Head age				− 0.00
				(0.00)
EldestSon				0.01
				(0.01)
EldestDaughter				−0.01
				(0.01)
AgeComputed		0.06***	0.09***	0.10***
		(0.01)	(0.01)	(0.02)
ChildAgeOrderAtRd1		−0.04*	−0.04**	−0.04**
		(0.02)	(0.02)	(0.02)
$T = 2$	148	148	148	147
$T = 3$	235	235	235	230
$T = 4$	993	993	993	992
$\bar{R}^2$	0.028	0.069	0.087	0.088
$\hat{\rho}$	0.007	−0.026	−0.023	−0.019
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000
N	3597	3597	3597	3583

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 20: FD ESTIMATION OF SCHOOL ENROLLMENT, PERIOD INTERACTIONS, SMALL VS. LARGE SIZED LOANS

covariates	(1)	(2)	(3)	(4)
Junior	0.01	−0.11***	−0.10***	−0.10***
	(0.01)	(0.02)	(0.03)	(0.03)
High	−0.03	−0.15***	−0.23***	−0.22***
	(0.02)	(0.02)	(0.04)	(0.04)
LargeSize	0.05***	−0.02*	−0.02	−0.01
	(0.01)	(0.01)	(0.03)	(0.03)
LargeSize × Junior	−0.12***	0.00	−0.02	−0.02
	(0.02)	(0.02)	(0.04)	(0.04)
LargeSize × High	−0.09***	0.04	0.05	0.07
	(0.03)	(0.03)	(0.05)	(0.04)
Female		0.02		0.00
		(0.02)		(0.06)
Junior × Female		−0.04		−0.04
		(0.03)		(0.04)
High × Female		0.03		0.02
		(0.06)		(0.06)
LargeSize × Female		−0.01		0.01
		(0.02)		(0.06)
LargeSize × Junior × Female		0.07*		0.08
		(0.04)		(0.05)
LargeSize × High × Female		0.03		0.10
		(0.06)		(0.07)
rd 2 - 3			0.03	0.03
			(0.02)	(0.03)
Junior × rd 2 - 3			0.04	0.04
			(0.04)	(0.04)
High × rd 2 - 3			0.15**	0.16**
			(0.07)	(0.06)
LargeSize × rd 2 - 3			−0.04	−0.04
			(0.03)	(0.04)
LargeSize × Junior × rd 2 - 3			0.05	0.04
			(0.05)	(0.05)
LargeSize × High × rd 2 - 3			−0.04	−0.06
			(0.08)	(0.07)
Female × rd 2 - 3				0.05
				(0.09)
LargeSize × Female × rd 2 - 3				−0.03
				(0.10)
LargeSize × Junior × Female × rd 2 - 3				0.00
				(0.05)
LargeSize × High × Female × rd 2 - 3				−0.08
				(0.06)
rd 3 - 4			−0.13***	−0.13***
			(0.03)	(0.03)
Junior × rd 3 - 4			0.15**	0.15**
			(0.06)	(0.06)
High × rd 3 - 4			0.36***	0.37***
			(0.09)	(0.09)
LargeSize × rd 3 - 4			−0.01	−0.01
			(0.06)	(0.06)
LargeSize × Junior × rd 3 - 4			0.03	0.02
			(0.07)	(0.07)
LargeSize × High × rd 3 - 4			−0.11	−0.14
			(0.11)	(0.10)
Female × rd 3 - 4				0.07
				(0.15)
LargeSize × Female × rd 3 - 4				−0.06
				(0.16)
LargeSize × Junior × Female × rd 3 - 4				−0.02
				(0.07)
LargeSize × High × Female × rd 3 - 4				−0.10
				(0.09)
FloodInRd1		−0.00		−0.00
		(0.01)		(0.01)
Head literate				−0.00
				(0.02)
Head age				−0.00
				(0.00)
EldestSon				0.01
				(0.01)
EldestDaughter				−0.01
				(0.01)
AgeComputed		0.07***	0.09***	0.10***
		(0.01)	(0.02)	(0.02)
ChildAgeOrderAtRd1		−0.04*	−0.04**	−0.04*
		(0.02)	(0.02)	(0.02)
$T = 2$	148	148	148	147
$T = 3$	235	235	235	230
$T = 4$	993	993	993	992
$\bar{R}^2$	0.04	0.07	0.087	0.086
$\hat{\rho}$	0.014	−0.024	−0.023	−0.021
$\Pr[\hat{\rho} = 0]$	0.002	0.000	0.000	0.000
N	3597	3597	3597	3583

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. First-differenced regressands are regressed on categorical and time-variant covariates. Net saving is taken from administrative data and merged with survey data at Year-Month of survey interviews. Head age and literacy are from baseline data. Intercept terms are omitted in estimating equations. Net saving is saving - withdrawal. All dummy interaction terms are first demeaned and then interacted.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

IV.3 Assets

Assets reportd in rd 1 is too small, indicating possible errors or different way of reporting only in rd 1. So we also examine rd 2 vs. rd 4 differences (as3, as4).

```
source(paste0(pathprogram, "ReadTrimAssetOriginalHHsFDData.R"))
```

```
Dropped 2804 obs due to NA.
Dropped 4027 obs due to NA.
Dropped 2804 obs due to NA.
Dropped 4027 obs due to NA.
Dropped 2039 obs due to NA.
Dropped 2040 obs due to NA.
Dropped 2039 obs due to NA.
Dropped 2040 obs due to NA.
```

Main assets are household assets (HAssetAmount) and production assets (PAssetAmount) both with 4973 observations. After first-differencing, they become 3595 observations, with 21, 94, 3480 households observed for 2, 3, 4 times. We also examine rd 2 vs. rd 4 differences, which has 2389 observations. After first-differencing, they become 1161 observations.

```
FileName ← "Asset"
FileNameHeader ← paste0(c("", "Grace", "PovertyStatus", "Size", "Attributes",
  "Rd24Diff", "Rd24Grace", "Rd24DiffAttributes"), "OriginalHHs")
Assuffixes ← c("", "G", "P", "S", "a", "D", "DG", "Da")
listheader ← paste0("as", Assuffixes)
DataToUse1 ← c(rep("das1d", 3), "das1Rd", rep("das2d", 3), "das2Rd")
DataToUse2 ← c(rep("das3d", 3), "das3Rd", rep("das4d", 3), "das4Rd")
Regressands ← c(rep("HAssetAmount", 4), rep("PAssetAmount", 4))
Addseparatingcols = 4; Separatingcolwidth = .2
Separatingcoltitle = c("Household asset amount (Tk)", "Productive asset amount (Tk)")

source(paste0(pathprogram, "AssetCovariateSelection.R"))

exclheader ← paste0("excl", Assuffixes)
source(paste0(pathprogram, "FDEstimationFile.R"))

#dummy chunk
```

Table 21: FD estimation of assets

	Household asset amount (Tk)				Productive asset amount (Tk)			
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	6633.5***	8132.6***	9544.7***	10414.0***	−216.2***	−59.4	18.7	−350.7*
	(940.5)	(1333.8)	(1616.5)	(2469.8)	(58.7)	(160.4)	(165.0)	(212.0)
Large	1022.0	386.6	317.4	2911.6	129.0	354.2*	355.4*	20.9
	(1538.5)	(1454.4)	(1366.9)	(3111.6)	(100.1)	(193.5)	(185.7)	(353.4)
LargeGrace	1835.7	1437.4	987.4	3150.3	−62.7	54.9	32.9	−134.4
	(1544.1)	(1647.4)	(1629.1)	(3063.7)	(96.1)	(159.0)	(156.1)	(265.0)
Cow	1508.8	1861.9	1574.1	3233.1	135.1	148.4	144.6	145.1
	(1585.9)	(1943.0)	(1811.9)	(3599.7)	(91.2)	(137.9)	(134.2)	(196.7)
rd 2 - 3		2530.7	2533.2			−265.4	−265.7	
		(1940.5)	(1950.4)			(295.6)	(296.0)	
Large × rd 2 - 3		4774.1	4820.3			−823.6	−823.5	
		(4892.3)	(4899.8)			(928.4)	(929.6)	
LargeGrace × rd 2 - 3		4650.6	4689.1			−276.5	−276.2	
		(5183.8)	(5183.9)			(653.7)	(654.6)	
Cow × rd 2 - 3		3499.1	3422.5			152.6	151.2	
		(6180.8)	(6229.7)			(507.3)	(507.5)	
rd 3 - 4		−6539.4***	−6510.9***	−9357.6***		−488.7**	−489.9**	−298.3
		(1680.9)	(1676.2)	(2159.8)		(227.2)	(227.7)	(202.2)
Large × rd 3 - 4		2022.6	2037.1	−3813.6		−1479.2**	−1481.5**	−998.5
		(2561.2)	(2562.8)	(5799.2)		(628.5)	(628.7)	(675.7)
LargeGrace × rd 3 - 4		−242.7	−269.3	−5618.1		−909.3	−912.6	−742.5*
		(3642.9)	(3645.0)	(4931.6)		(608.7)	(611.6)	(398.0)
Cow × rd 3 - 4		−6742.5	−6688.8	−10379.9		−275.1	−277.7	−352.7
		(5364.1)	(5343.6)	(7374.1)		(286.9)	(287.0)	(316.1)
FloodInRd1			−3003.2***	−2897.1**			−113.8	197.4
			(1069.5)	(1463.2)			(70.4)	(161.3)
Head literate			2259.9	1338.2			−124.1**	−39.4
			(1974.6)	(3276.6)			(58.8)	(254.2)
6M repayment				1914.3				−25.3
				(1812.4)				(407.3)
6M net saving				−8134.5				−740.1
				(9978.7)				(911.0)
6M other member net saving				−9892.3				−5633.7
				(40250.7)				(3695.1)
6M other member Repaid				−3184.9				287.0
				(4587.9)				(537.8)
$T = 2$	21	21	21	44	21	21	21	44
$T = 3$	47	47	44	1160	47	47	44	1160
$T = 4$	1160	1160	1160	0	1160	1160	1160	0
$\bar{R}^2$	−0.001	0.013	0.014	0.014	−0.001	0.001	0	0
$\hat{\rho}$	0.062	0.104	0.091	−0.017	−0.091	−0.077	−0.065	0.413
$\Pr[\hat{\rho} = 0]$	0.006	0.000	0.000	0.334	0.000	0.000	0.000	0.000
N	3595	3595	3589	2364	3595	3595	3589	2364

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 22: FD estimation of assets by attributes

	Household asset amount (Tk)				Productive asset amount (Tk)			
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	6633.5***	8132.6***	9544.7***	10414.0***	−216.2***	−59.4	18.7	−350.7*
	(940.5)	(1333.8)	(1616.5)	(2469.8)	(58.7)	(160.4)	(165.0)	(212.0)
WithGrace	813.8	1050.8	670.0	238.7	−191.7*	−299.3	−322.6	−155.3
	(1726.8)	(1625.7)	(1589.6)	(3532.1)	(111.2)	(216.9)	(213.6)	(405.9)
LargeSize	1022.0	386.6	317.4	2911.6	129.0	354.2*	355.4*	20.9
	(1538.5)	(1454.4)	(1366.9)	(3111.6)	(100.1)	(193.5)	(185.7)	(353.4)
NonCash	−326.9	424.5	586.7	82.9	197.8*	93.5	111.7	279.4
	(1769.2)	(2074.3)	(1988.0)	(3590.3)	(103.3)	(169.2)	(165.7)	(238.7)
rd 2 - 3		2530.7	2533.2			−265.4	−265.7	
		(1940.5)	(1950.4)			(295.6)	(296.0)	
LargeSize × rd 2 - 3		4774.1	4820.3			−823.6	−823.5	
		(4892.3)	(4899.8)			(928.4)	(929.6)	
WithGrace × rd 2 - 3		−123.5	−131.1			547.1	547.3	
		(4672.4)	(4665.6)			(1006.2)	(1008.0)	
NonCash × rd 2 - 3		−1151.5	−1266.7			429.1	427.4	
		(6008.3)	(6047.7)			(638.8)	(639.7)	
rd 3 - 4		−6539.4***	−6510.9***	−9357.6***		−488.7**	−489.9**	−298.3
		(1680.9)	(1676.2)	(2159.8)		(227.2)	(227.7)	(202.2)
LargeSize × rd 3 - 4		2022.6	2037.1	−3813.6		−1479.2**	−1481.5**	−998.5
		(2561.2)	(2562.8)	(5799.2)		(628.5)	(628.7)	(675.7)
WithGrace × rd 3 - 4		−2265.3	−2306.4	−1804.5		569.9	568.9	256.0
		(3741.4)	(3737.3)	(5104.5)		(820.3)	(822.6)	(676.4)
NonCash × rd 3 - 4		−6499.8	−6419.5	−4761.8		634.2	634.9	389.8
		(6017.6)	(5989.5)	(7760.0)		(600.2)	(603.1)	(393.2)
FloodInRd1			−3003.2***	−2897.1**			−113.8	197.4
			(1069.5)	(1463.2)			(70.4)	(161.3)
Head literate			2259.9	1338.2			−124.1**	−39.4
			(1974.6)	(3276.6)			(58.8)	(254.2)
6M repayment				1914.3				−25.3
				(1812.4)				(407.3)
6M net saving				−8134.5				−740.1
				(9978.7)				(911.0)
6M other member net saving				−9892.3				−5633.7
				(40250.7)				(3695.1)
6M other member Repaid				−3184.9				287.0
				(4587.9)				(537.8)
$T = 2$	21	21	21	44	21	21	21	44
$T = 3$	47	47	44	1160	47	47	44	1160
$T = 4$	1160	1160	1160	0	1160	1160	1160	0
$\bar{R}^2$	−0.001	0.013	0.014	0.014	−0.001	0.001	0	0
$\hat{\rho}$	0.062	0.104	0.091	−0.017	−0.091	−0.077	−0.065	0.413
$\Pr[\hat{\rho} = 0]$	0.006	0.000	0.000	0.334	0.000	0.000	0.000	0.000
N	3595	3595	3589	2364	3595	3595	3589	2364

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 23: FD estimation of assets, moderately poor vs. ultra poor

	Household asset amount (Tk)				Productive asset amount (Tk)			
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	8177.1***	9490.4***	10659.9***	14212.2***	−107.1	99.5	163.0	−209.2
	(798.4)	(1405.0)	(1690.0)	(2697.2)	(84.5)	(259.7)	(275.1)	(153.6)
UltraPoor	−412.7	−473.4	−407.2	−1525.1	−72.9	1.0	−2.2	−182.4
	(736.6)	(818.6)	(837.8)	(2343.1)	(92.1)	(181.2)	(182.1)	(197.4)
rd 2 - 3		3013.1	3010.1			−250.9	−251.2	
		(2202.6)	(2218.7)			(300.4)	(300.7)	
UltraPoor × rd 2 - 3		−2097.3	−2054.8			−338.6	−339.0	
		(4635.3)	(4683.0)			(628.8)	(629.3)	
rd 3 - 4		−6884.0***	−6846.1***	−10253.3***		−507.3**	−508.4**	−302.8
		(1987.6)	(1977.8)	(2582.3)		(249.4)	(249.9)	(187.4)
UltraPoor × rd 3 - 4		2198.9	2092.0	4089.0		−444.7	−446.7	−98.6
		(2579.2)	(2540.4)	(5340.8)		(516.4)	(516.8)	(330.3)
FloodInRd1			−3076.3***	−3033.8**			−97.2	217.6
			(997.0)	(1366.2)			(67.0)	(155.4)
Head literate			2251.9	1288.9			−109.8*	−32.7
			(1916.0)	(3200.2)			(61.8)	(254.6)
6M repayment				2017.0				−4.1
				(1869.0)				(409.8)
6M net saving				−7199.5				−505.1
				(9757.7)				(939.8)
6M other member net saving				−20703.9				−4043.1
				(28681.9)				(2979.1)
6M other member Repaid				−2023.3				360.2
				(4841.0)				(483.9)
$T = 2$	21	21	21	44	21	21	21	44
$T = 3$	47	47	44	1160	47	47	44	1160
$T = 4$	1160	1160	1160	0	1160	1160	1160	0
$\bar{R}^2$	0	0.012	0.014	0.014	0	0.001	0	−0.001
$\hat{\rho}$	0.061	0.106	0.088	−0.015	−0.088	−0.072	−0.061	0.462
$\Pr[\hat{\rho} = 0]$	0.007	0.000	0.000	0.400	0.000	0.000	0.000	0.000
N	3595	3595	3589	2364	3595	3595	3589	2364

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 24: FD estimation of assets, with vs. without a grace period

	Household asset amount (Tk)				Productive asset amount (Tk)			
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	7322.4***	8303.9***	9670.2***	12495.4***	−129.2**	207.5	278.4	−359.2
	(879.1)	(966.6)	(1369.0)	(2281.1)	(59.2)	(239.4)	(247.9)	(315.9)
WithGrace	983.2	1390.5	1068.4	1231.7	−50.7	−136.3	−148.8	31.9
	(1247.2)	(1286.6)	(1204.2)	(2715.2)	(80.2)	(149.6)	(148.1)	(261.5)
rd 2 - 3		2785.2	2789.1			−309.6	−309.9	
		(1949.9)	(1959.9)			(330.9)	(331.2)	
WithGrace × rd 2 - 3		848.6	800.3			491.4	490.8	
		(3877.2)	(3895.5)			(671.7)	(672.5)	
rd 3 - 4		−6410.9***	−6382.7***	−9587.1***		−568.8**	−570.0**	−313.1
		(1717.5)	(1711.9)	(2244.3)		(258.2)	(258.6)	(225.4)
WithGrace × rd 3 - 4		−4857.5	−4853.7	−5466.2		403.7	401.9	83.6
		(3373.7)	(3366.6)	(4753.3)		(520.8)	(521.6)	(476.9)
FloodInRd1			−3010.3***	−2950.9**			−103.1	223.7
			(1038.0)	(1437.5)			(70.9)	(165.1)
Head literate			2277.3	1297.0			−106.9*	−19.8
			(1909.8)	(3202.8)			(58.9)	(254.6)
6M repayment				1965.1				−13.3
				(1809.9)				(403.1)
6M net saving				−7402.1				−489.8
				(9680.1)				(936.9)
6M other member net saving				−11149.6				−4040.4
				(35215.0)				(3330.0)
6M other member Repaid				−3744.9				379.1
				(4457.3)				(542.6)
$T = 2$	21	21	21	44	21	21	21	44
$T = 3$	47	47	44	1160	47	47	44	1160
$T = 4$	1160	1160	1160	0	1160	1160	1160	0
$\bar{R}^2$	0	0.013	0.015	0.014	0	0.001	0	−0.001
$\hat{\rho}$	0.061	0.102	0.089	−0.016	−0.091	−0.083	−0.067	0.454
$\Pr[\hat{\rho} = 0]$	0.007	0.000	0.000	0.371	0.000	0.000	0.000	0.000
N	3595	3595	3589	2364	3595	3595	3589	2364

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 25: FD estimation of assets, small vs. large size loans

	Household asset amount (Tk)				Productive asset amount (Tk)			
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	6633.5***	8144.1***	9571.5***	10370.5***	−216.2***	2.5	−91.8	−356.7*
	(940.3)	(1339.6)	(1604.3)	(2454.0)	(58.7)	(166.1)	(86.3)	(213.8)
LargeSize	1455.4	1231.6	960.6	3024.5	67.2	178.7	133.5	18.6
	(1182.8)	(1299.8)	(1242.2)	(2446.8)	(74.3)	(117.0)	(81.8)	(200.8)
rd 2 - 3		2523.4	2525.2			−258.1		
		(1945.8)	(1956.1)			(293.8)		
LargeSize × rd 2 - 3		4303.7	4306.0			−316.0		
		(4417.3)	(4431.0)			(516.7)		
rd 3 - 4		−6581.6***	−6553.7***	−9518.3***		−481.8**	−351.9**	−277.7
		(1746.8)	(1741.2)	(2195.3)		(232.2)	(143.5)	(194.2)
LargeSize × rd 3 - 4		−1655.5	−1642.2	−6821.0		−890.4**	−731.4***	−668.3**
		(2758.6)	(2757.6)	(4509.8)		(360.1)	(206.3)	(331.7)
FloodInRd1			−3029.6***	−2951.0**		−94.9	−95.0	214.1
			(994.2)	(1368.5)		(67.0)	(67.1)	(153.6)
Head literate			2258.1	1304.2		−107.1*	−106.4*	−19.0
			(1896.9)	(3191.5)		(60.3)	(60.2)	(256.0)
6M repayment				1916.7				−25.4
				(1837.9)				(409.9)
6M net saving				−8756.2				−649.1
				(10069.0)				(933.1)
6M other member net saving				−21161.7				−4413.0
				(28832.8)				(3042.3)
6M other member Repaid				−2831.8				277.0
				(4626.2)				(468.6)
$T = 2$	21	21	21	44	21	21	21	44
$T = 3$	47	47	44	1160	47	44	44	1160
$T = 4$	1160	1160	1160	0	1160	1160	1160	0
$\bar{R}^2$	0	0.012	0.014	0.014	0	0	0	0
$\hat{\rho}$	0.063	0.115	0.097	−0.009	−0.087	−0.060	−0.034	0.360
$\Pr[\hat{\rho} = 0]$	0.006	0.000	0.000	0.603	0.000	0.000	0.012	0.000
N	3595	3595	3589	2364	3595	3589	3589	2364

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 26: FD estimation of assets, round 2 and 4 comparison

	Household asset amount (Tk)				Productive asset amount (Tk)			
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	11278.8***	14311.5***	14311.5***	15968.4***	−366.5*	−637.4**	−637.4**	−716.9**
	(2441.3)	(3199.6)	(3199.6)	(3455.0)	(203.8)	(301.9)	(301.9)	(301.3)
Large	4182.6	4020.4	4020.4	2964.2	−509.9	−499.0	−499.0	−443.0
	(4208.9)	(3959.7)	(3959.7)	(3990.0)	(486.9)	(470.5)	(470.5)	(465.4)
LargeGrace	5448.6	4472.7	4472.7	4738.8	−532.9	−448.3	−448.3	−632.4
	(4212.5)	(4482.6)	(4482.6)	(4819.6)	(447.8)	(436.1)	(436.1)	(443.2)
Cow	1777.3	1225.8	1225.8	1692.4	241.4	284.0	284.0	121.8
	(4181.1)	(3931.4)	(3931.4)	(4146.1)	(254.4)	(264.8)	(264.8)	(320.9)
FloodInRd1		−5927.5**	−5927.5**	−5095.4*		497.1	497.1	312.4
		(2960.2)	(2960.2)	(2870.0)		(327.1)	(327.1)	(335.9)
Head literate		2684.2	2684.2	2425.4		−83.3	−83.3	−90.2
		(6714.2)	(6714.2)	(6702.1)		(526.8)	(526.8)	(519.2)
6M repayment				9310.3***				847.1*
				(2922.7)				(476.2)
6M net saving				2548.1				1822.8
				(26233.0)				(1897.9)
6M other member net saving				25421.9				−6666.5
				(47296.6)				(6219.5)
6M other member Repaid				−16346.6**				11.5
				(7304.6)				(552.4)
$\bar{R}^2$	−0.001	0.003	0.003	0.008	0	0	0	0
N	1161	1161	1161	1160	1161	1161	1161	1160

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates between round 2 and 4. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 27: FD estimation of assets, round 2 and 4 comparison, grace period

	Household asset amount (Tk)				Productive asset amount (Tk)			
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	14103.3***	17155.7***	17155.7***	18093.5***	−710.9**	−1002.8**	−1002.8**	−1043.4**
	(2471.7)	(3597.5)	(3597.5)	(3720.5)	(308.5)	(432.7)	(432.7)	(436.2)
WithGrace	791.2	112.1	112.1	1071.4	198.0	259.5	259.5	81.2
	(3465.4)	(3556.8)	(3556.8)	(3853.1)	(380.5)	(378.2)	(378.2)	(324.7)
FloodInRd1		−6130.6**	−6130.6**	−5252.8*		540.0	540.0	354.7
		(2940.7)	(2940.7)	(2797.5)		(341.0)	(341.0)	(343.8)
Head literate		2551.2	2551.2	2293.3		−46.6	−46.6	−52.8
		(6549.8)	(6549.8)	(6561.6)		(526.9)	(526.9)	(518.3)
6M repayment				9386.7***				831.8*
				(2942.9)				(474.0)
6M net saving				1772.8				1997.8
				(26030.7)				(1909.3)
6M other member net saving				21017.2				−5570.5
				(47406.0)				(6507.1)
6M other member Repaid				−17321.9**				193.7
				(7282.0)				(519.7)
$\bar{R}^2$	−0.001	0.003	0.003	0.009	−0.001	0	0	0
N	1161	1161	1161	1160	1161	1161	1161	1160

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates between round 2 and 4. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

```
FileNameHeader ← paste0(FileNameHeader, "Robustness")
listheader ← paste0("as", Assuffixes)
exclheader ← paste0("excl", Assuffixes)
DataToUse1 ← DataToUse2 ← c(rep("das1d", 3), rep("das2d", 3))
Regressands ← c(rep("HAssetAmount", 3), rep("PAssetAmount", 3))
Addseparatingcols = 3; Separatingcolwidth = .2
```

```
Separatingcoltitle = c("Household asset amount (Tk)", "Productive asset amount (Tk)")
source(paste0(pathprogram, "FDEstimationFile.R"))
```

Robustness: To understand underlying pattern of asset accumulation, we compare the loan recipients and loan rejecters. This distinction is made by households by choice, so the indicator variable is considered to be endogenous to asset level. This is a limitation, however, it has its own merit in giving an idea how loan recipients faired during the study period relative to loan nonrecipients. Table 28 shows that the pure controls also experience similar increase-increase-decrease pattern for household assets. This suggests the pattern observed among the loan recipients may be a systemic pattern of the area, not necessarily reflecting the repayment burdern. This partially relieves a concern that repayment burden was excessive for loan recipients.

Table 28: FD estimation of assets, loan recipients vs. pure control

	Household asset amount (Tk)			Productive asset amount (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	8358.3***	9566.1***	10609.1***	−158.0***	189.3	247.6
	(688.9)	(1285.2)	(1510.3)	(45.6)	(220.1)	(226.2)
PureControl	−3691.9***	−3264.5*	−2738.3	−2.8	−577.8**	−562.4**
	(912.2)	(1793.7)	(1726.9)	(58.2)	(252.1)	(249.8)
PureControl × rd 2 - 3		−3001.4	−3022.3		773.9*	771.6*
		(3144.4)	(3156.0)		(398.0)	(398.4)
PureControl × rd 3 - 4		1818.2	1777.5		945.0***	944.4***
		(2896.2)	(2875.7)		(321.7)	(322.4)
rd 2 - 3		3233.2	3236.1		−377.9	−378.1
		(2239.5)	(2252.7)		(358.6)	(359.1)
rd 3 - 4		−6925.6***	−6892.9***		−664.8**	−666.2**
		(2127.9)	(2119.1)		(287.2)	(287.9)
FloodInRd1			−2843.0***			−96.6
			(978.3)			(68.7)
Head literate			2209.7			−103.5*
			(1891.0)			(60.6)
$T = 2$	21	21	21	21	21	21
$T = 3$	47	47	44	47	47	44
$T = 4$	1160	1160	1160	1160	1160	1160
$\bar{R}^2$	0.001	0.013	0.015	0	0.001	0
$\hat{\rho}$	0.058	0.114	0.097	−0.089	−0.077	−0.067
$\Pr[\hat{\rho} = 0]$	0.011	0.000	0.000	0.000	0.000	0.000
N	3595	3595	3589	3595	3595	3589

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates between round 2 and 4. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Pure control is members not receiving loans while they were put on a wait list. Sample is continuing members and replacing members of early rejecters. Household assets do not include livestock. Regressions (1)-(2), (4)-(5) use only arm and calendar information. (3) and (6) information if the household was exposed to the flood in round 1. Pure controls are households who rejected to receive a loan.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Finding IV.2 Table 21 (1) shows household assets increase after receiving the loans in all arms. Total incremant is largest among the large grace arm as indicated in (2). In (3), increments are positive in rd 2 - 3, suggesting substantial purchase after receiving a loan. Significant decreases in rd 3 - 4 for all arms indicate liquidation of assets for repayment. Productive assets of large size loan arms decrease in rd 3 - 4 in Table 24 (6). These may indicate forced liquidation for repayment, which can entail efficiency losses.

IV.4 Livestock

```
lvo ← readRDS(paste0(pathsaveHere, "RosterLivestockAdminOriginalHHsDataUsedForEstimatio
lvo[, grepout("Loan|UD|Forced", colnames(lvo)) := NULL]
lvostrings ← "^groupid$|hhid|^Arm$|tee|^dummy[TLCMUWSN]|^TotalIm|Floo|Time\\.|Head"
lvoR ← lvo[(Fromxid), grepout(paste0(lvostrings, "|RM"), colnames(lvo)), with = F]
```

```
lvo ← lvo[(Fromxid), grepout(lvostrings, colnames(lvo)), with = F]
lvo3 ← lvo[tee == 2 | tee == 4, ]
lvoR3 ← lvoR[tee == 2 | tee == 4, ]
datas ← c("lvo", "lvoR", "lvo3", "lvoR3")
ddatas ← paste0("d", datas)
ddatasd ← paste0(ddatas, "d")
for (i in 1:length(datas)) {
#   dl ← prepFDData(get(datas[i]), Group = "^hhid$", TimeVar = "tee", Cluster = "groupid"
#     LevelCovariates = "^dummy[A-Z].*[a-z]$|^Arm|Floo|^Time\\..$",
#     drop.if.NA.in.differencing = T, LevelPeriodToKeep = "last",
#     use.var.name.for.dummy.prefix = F, print.messages = F)
dl ← FirstDiffPanelData(get(datas[i]),
  Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
  LevelCovariates = "^dummy|Head|^Time\\..$|Female$|Floo|Eldest|^Arm|^cred.*s$|xid$|Sch.*
  dat ← dl$diff
  dat[, grepout("^en$", colnames(dat)) := NULL]
  # Recreate Time.4 which is dropped when kept only 1:(T-1) obs.
  dat[, grepout("Time.?2", colnames(dat)) := NULL]
  assign(ddatas[i], dl)
  assign(ddatasd[i], dat)
}
```

```
Dropped 2807 obs due to NA.
Dropped 4031 obs due to NA.
Dropped 2041 obs due to NA.
Dropped 2042 obs due to NA.
```

```
dlvoRd ← dlvoRd[tee > 2, ]
```

```
source(paste0(pathprogram, "ReadTrimLivestockFDData.R"))
```

```
Dropped 196 obs due to T<2.
Dropped 1402 obs due to NA.
Dropped 196 obs due to T<2.
Dropped 3080 obs due to NA.
Dropped 154 obs due to T<2.
Dropped 1272 obs due to NA.
Dropped 154 obs due to T<2.
Dropped 1386 obs due to NA.
```

```
FileName ← "Livestock"
FileNameHeader ← paste0(c("", "Grace", "PovertyStatus", "Size", "Attributes",
    "TInt", "TIntGrace", "TIntSize", "Rd14Diff", "Rd14DiffGrace", "Rd14DiffAttributes"),
     "OriginalHHs")
Lvsuffixes ← c("", "G", "P", "S", "a", "T", "TG", "TS", "D", "DG", "Da")
listheader ← paste0("lv", Lvsuffixes)
DataToUse1 ← rep("dlvod", 6)
DataToUse2 ← rep("dlvo3d", 6)
tableboxwidth ← 4.5
Regressands ← rep("TotalImputedValue", 6)
Addseparatingcols ← NULL; Separatingcolwidth ← NULL
Separatingcoltitle ← NULL
```

```
source(paste0(pathprogram, "LivestockCovariateSelection.R"))
```

```
exclheader ← paste0("excl", Lvsuffixes)
source(paste0(pathprogram, "FDEstimationFile.R"))
```

TABLE 29: FD ESTIMATION OF LIVESTOCK HOLDING VALUES

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	5396.9***	11936.0***	11945.2***	12836.2***	13082.9***	12693.7***
	(532.8)	(1007.8)	(1026.3)	(1031.5)	(943.5)	(1016.9)
Large	3468.5***	4794.9***	4834.5***	4984.4***	4202.5***	5005.4***
	(866.3)	(1250.5)	(1265.6)	(1327.6)	(1043.3)	(1326.1)
LargeGrace	2292.9**	2723.4**	2750.6**	3007.2**	3834.6***	3185.8***
	(892.2)	(1248.4)	(1256.7)	(1215.0)	(1085.3)	(1215.6)
Cow	2882.8***	3410.3***	3501.7***	3473.1***	3727.0***	3460.5***
	(680.9)	(973.0)	(970.6)	(924.3)	(1001.3)	(928.2)
rd 2 - 3		−9110.0***	−9045.3***	−9047.8***	−9034.6***	−9043.9***
		(1523.4)	(1528.0)	(1530.2)	(1192.8)	(1529.9)
Large × rd 2 - 3		−5014.4	−4796.4	−4849.2	−4328.5	−4851.7
		(4506.8)	(4525.8)	(4536.9)	(3457.2)	(4533.5)
LargeGrace × rd 2 - 3		−1075.8	−1077.6	−1116.4	−2120.9	−1121.2
		(3753.8)	(3756.3)	(3757.6)	(3058.1)	(3758.9)
Cow × rd 2 - 3		−3186.3	−3172.2	−3204.5	−6356.4**	−3210.3
		(3386.1)	(3387.5)	(3389.7)	(3138.1)	(3390.3)
rd 3 - 4		−12529.8***	−12584.6***	−12608.7***	−13692.8***	−12619.9***
		(1251.9)	(1252.3)	(1248.6)	(937.9)	(1245.5)
Large × rd 3 - 4		−6142.0*	−6358.3*	−6403.0*	−4576.6*	−6389.6*
		(3728.9)	(3729.7)	(3742.4)	(2547.1)	(3738.1)
LargeGrace × rd 3 - 4		−655.4	−652.2	−660.1	−1101.4	−651.2
		(2565.2)	(2565.1)	(2570.6)	(2129.6)	(2568.7)
Cow × rd 3 - 4		−742.8	−759.3	−924.5	−1618.7	−956.1
		(2315.7)	(2313.2)	(2278.2)	(2181.6)	(2267.8)
HadCows				−5608.3***	−6244.3*	
				(781.7)	(3553.0)	
Large × HadCows					6725.0	
					(7971.0)	
LargeGrace × HadCows					−12123.8	
					(8379.8)	
Cow × HadCows					−6986.1	
					(5122.8)	
HadCows × rd 2 - 3					−5552.0	
					(5513.5)	
Large × HadCows × rd 2 - 3					−1841.7	
					(11622.5)	
LargeGrace × HadCows × rd 2 - 3					7632.1	
					(12565.0)	
Cow × HadCows × rd 2 - 3					18487.8**	
					(8184.9)	
HadCows × rd 3 - 4					7578.0**	
					(3304.1)	
Large × HadCows × rd 3 - 4					−10221.2	
					(11226.1)	
LargeGrace × HadCows × rd 3 - 4					10785.2	
					(12060.0)	
Cow × HadCows × rd 3 - 4					4737.1	
					(5655.0)	
NumCowsOwnedAtRd1						−3843.6***
						(607.0)
FloodInRd1			218.6	297.7	349.4	481.9
			(545.9)	(528.3)	(527.6)	(550.1)
Head literate			−1300.3**	−1098.6*	−933.3	−1028.5
			(659.6)	(659.3)	(629.2)	(639.2)
$T = 2$	29	29	28	28	28	28
$T = 3$	101	101	99	99	99	99
$T = 4$	1272	1272	1272	1272	1272	1272
$\bar{R}^2$	0.003	0.072	0.073	0.084	0.091	0.088
$\hat{\rho}$	−0.237	−0.247	−0.255	−0.260	−0.268	−0.267
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000
N	4047	4047	4042	4042	4042	4042

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Regressand is TotalImputedValue, a sum of all livestock holding values evaluated at respective median market prices in the same year.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 30: FD ESTIMATION OF LIVESTOCK HOLDING VALUES BY ATTRIBUTES

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	5396.9***	11936.0***	11945.2***	12836.2***	13169.8***	12693.7***
	(532.8)	(1007.8)	(1026.3)	(1031.5)	(961.7)	(1016.9)
WithGrace	−1175.6	−2071.5	−2083.9	−1977.1	−1976.7	−1819.6
	(989.3)	(1485.1)	(1521.3)	(1544.1)	(1551.0)	(1560.2)
LargeSize	3468.5***	4794.9***	4834.5***	4984.4***	5006.7***	5005.4***
	(866.3)	(1250.5)	(1265.6)	(1327.6)	(1325.9)	(1326.1)
NonCash	589.8	686.9	751.1	465.9	472.3	274.7
	(831.9)	(1260.3)	(1257.5)	(1169.4)	(1157.4)	(1176.2)
rd 2 - 3		−9110.0***	−9045.3***	−9047.8***	−9056.8***	−9043.9***
		(1523.4)	(1528.0)	(1530.2)	(1208.3)	(1529.9)
LargeSize × rd 2 - 3		−5014.4	−4796.4	−4849.2	−4868.1	−4851.7
		(4506.8)	(4525.8)	(4536.9)	(4487.2)	(4533.5)
WithGrace × rd 2 - 3		3938.5	3718.8	3732.8	3737.4	3730.5
		(4839.9)	(4858.6)	(4866.8)	(4885.4)	(4865.8)
NonCash × rd 2 - 3		−2110.5	−2094.6	−2088.1	−2084.7	−2089.1
		(3818.2)	(3821.4)	(3820.3)	(3798.3)	(3822.8)
rd 3 - 4		−12529.8***	−12584.6***	−12608.7***	−13679.8***	−12619.9***
		(1251.9)	(1252.3)	(1248.6)	(948.6)	(1245.5)
LargeSize × rd 3 - 4		−6142.0*	−6358.3*	−6403.0*	−6570.3*	−6389.6*
		(3728.9)	(3729.7)	(3742.4)	(3736.5)	(3738.1)
WithGrace × rd 3 - 4		5486.6	5706.2	5742.9	5642.2	5738.4
		(4147.5)	(4147.7)	(4154.1)	(4244.7)	(4151.0)
NonCash × rd 3 - 4		−87.4	−107.1	−264.4	86.4	−305.0
		(2942.7)	(2941.9)	(2907.7)	(2829.6)	(2906.4)
HadCows				−5608.3***	−7474.1**	
				(781.7)	(2939.4)	
HadCows × rd 2 - 3					43.6	
					(4355.2)	
HadCows × rd 3 - 4					5802.1	
					(4025.2)	
NumCowsOwnedAtRd1						−3843.6***
						(607.0)
FloodInRd1			218.6	297.7	291.9	481.9
			(545.9)	(528.3)	(528.8)	(550.1)
Head literate			−1300.3**	−1098.6*	−1102.7*	−1028.5
			(659.6)	(659.3)	(658.4)	(639.2)
$T = 2$	29	29	28	28	28	28
$T = 3$	101	101	99	99	99	99
$T = 4$	1272	1272	1272	1272	1272	1272
$\bar{R}^2$	0.003	0.072	0.073	0.084	0.086	0.088
$\hat{\rho}$	−0.237	−0.247	−0.255	−0.260	−0.263	−0.267
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000
N	4047	4047	4042	4042	4042	4042

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Regressand is TotalImputedValue, a sum of all livestock holding values evaluated at respective median market prices in the same year.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 31: FD ESTIMATION OF LIVESTOCK HOLDING VALUES, ULTRA VS. MODERATELY POOR

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	7254.6***	14715.9***	14646.4***	15763.5***	16145.6***	15713.2***
	(393.7)	(1320.3)	(1277.8)	(1287.1)	(1066.0)	(1265.7)
UltraPoor	759.1*	263.9	249.2	19.6	−12.3	−38.4
	(416.5)	(789.8)	(781.0)	(814.7)	(804.3)	(807.3)
rd 2 - 3		−9135.4***	−9069.4***	−9071.6***	−9107.2***	−9067.3***
		(1540.4)	(1543.6)	(1546.1)	(1234.8)	(1545.9)
UltraPoor × rd 2 - 3		3099.8	3193.0	3191.3	3198.6	3193.5
		(3350.9)	(3350.7)	(3358.6)	(3271.7)	(3356.7)
rd 3 - 4		−12580.1***	−12637.5***	−12652.6***	−13731.9***	−12660.2***
		(1294.5)	(1297.6)	(1293.6)	(985.4)	(1291.1)
UltraPoor × rd 3 - 4		3963.2	3881.4	3935.2	4152.6	3973.6
		(2725.2)	(2732.5)	(2721.2)	(2670.0)	(2713.7)
HadCows				−5509.4***	−7432.0**	
				(842.2)	(3039.4)	
HadCows × rd 2 - 3					185.7	
					(4338.7)	
HadCows × rd 3 - 4					5813.2	
					(4076.3)	
NumCowsOwnedAtRd1						−3777.6***
						(635.5)
FloodInRd1			421.8	497.2	493.9	666.0
			(524.9)	(502.9)	(503.5)	(515.7)
Head literate			−1030.8	−849.3	−851.4	−792.2
			(677.8)	(679.3)	(678.3)	(660.0)
$T = 2$	29	29	28	28	28	28
$T = 3$	101	101	99	99	99	99
$T = 4$	1272	1272	1272	1272	1272	1272
$\bar{R}^2$	0	0.068	0.069	0.08	0.082	0.083
$\hat{\rho}$	−0.232	−0.239	−0.240	−0.252	−0.257	−0.252
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000
N	4047	4047	4042	4042	4042	4042

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Regressand is TotalImputedValue, a sum of all livestock holding values evaluated at respective median market prices in the same year.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 32: FD ESTIMATION OF LIVESTOCK HOLDING VALUES, RD 1 VS. RD 4 COMPARISON

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	4480.1***	4480.1***	5118.2***	6616.7***	6616.7***	6121.7***
	(1575.0)	(1575.0)	(1838.6)	(1951.7)	(1951.7)	(1894.0)
LargeSize	3972.5**	3972.5**	3962.1**	4099.9**	4099.9**	4155.5**
	(1924.7)	(1924.7)	(1937.5)	(1936.1)	(1936.1)	(1944.7)
HadCows				−9212.2***	−9212.2***	
				(2895.7)	(2895.7)	
NumCowsOwnedAtRd1						−4982.9**
						(1987.4)
FloodInRd1			−1737.0	−1600.0	−1600.0	−1425.5
			(1477.8)	(1435.0)	(1435.0)	(1464.8)
Head literate			1781.3	2053.9	2053.9	2052.2
			(2198.6)	(2179.0)	(2179.0)	(2186.6)
$\bar{R}^2$	0.003	0.003	0.004	0.025	0.025	0.022
N	1272	1272	1272	1272	1272	1272

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Regressand is TotalImputedValue, a sum of all livestock holding values evaluated at respective median market prices in the same year.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Check quickly if the estimated results make sense.

```
lvo ← readRDS(paste0(pathsaveHere, "LivestockAdminDataUsedForEstimation.rds"))
setkey(lvo, Arm, tee)
lvostat ← lvo[grepl("es", creditstatus),.(MeanIV = mean(TotalImputedValue, na.rm = T),
  StdIV = var(TotalImputedValue, na.rm = T)^(.5),
  N = sum(!is.na(TotalImputedValue))), by = .(Arm, tee)]
lvostat[, c("ciLB", "ciUB") := list(MeanIV - StdIV * qt(.975, N- 1), MeanIV + StdIV * qt(.
```

```
setkey(lvo, hhid, survey)
lvo[hhid %in% hhid[TotalImputedValue > 100000],
  .(hhid, Arm, Year, LivestockCode, number_owned,
  mrkt_value, TotalImputedValue)]
```

	hhid	Arm	Year	LivestockCode	number_owned	mrkt_value
1:	7020319	large	2012	cow/ox	2	0
2:	7020319	large	2014	cow/ox	5	18000
3:	7020319	large	2015	cow/ox	6	19000
4:	7020319	large	2017	cow/ox	5	25000
5:	7020614	large grace	2012		0	0
6:	7020614	large grace	2014	cow/ox	2	16000
7:	7020614	large grace	2015	cow/ox	5	16000
8:	7020614	large grace	2017	cow/ox	6	24000
9:	7021003	large grace	2012	cow/ox	1	0
10:	7021003	large grace	2014	cow/ox	8	18000
11:	7021003	large grace	2015	cow/ox	4	20000
12:	7021003	large grace	2017	cow/ox	4	23000
13:	7021012	large grace	2012	Chicken/duck	4	0
14:	7021012	large grace	2014	cow/ox	2	24000
15:	7021012	large grace	2015	cow/ox	3	19000
16:	7021012	large grace	2017	cow/ox	8	25000
17:	7021216	cow	2012	cow/ox	6	0
18:	7021216	cow	2014	cow/ox	5	20000
19:	7021216	cow	2015	cow/ox	3	18000
20:	7021216	cow	2017	cow/ox	3	30000
21:	7031706	large	2012	cow/ox	1	0
22:	7031706	large	2014	cow/ox	7	12000
23:	7031706	large	2015	cow/ox	3	15000
24:	7031706	large	2017	cow/ox	3	38000
25:	7031715	large	2012	cow/ox	2	0
26:	7031715	large	2014	cow/ox	9	15000
27:	7031715	large	2015	cow/ox	8	16000
28:	7031715	large	2017	cow/ox	1	30000
29:	7031716	large	2012	cow/ox	1	0
30:	7031716	large	2014	cow/ox	6	16000
31:	7031716	large	2015	cow/ox	5	17000
32:	7031716	large	2017	cow/ox	2	42000
33:	7031905	large	2012	cow/ox	4	0
34:	7031905	large	2014	cow/ox	5	16000
35:	7031905	large	2015	cow/ox	7	20000
36:	7031905	large	2017	cow/ox	7	20000
37:	7042017	large	2012		0	0
38:	7042017	large	2014	cow/ox	3	18000
39:	7042017	large	2015	cow/ox	6	20000
40:	7042017	large	2017	cow/ox	4	20000
41:	7054005	large grace	2012		0	0
42:	7054005	large grace	2014	cow/ox	4	18000
43:	7054005	large grace	2015	cow/ox	2	16000
44:	7054005	large grace	2017	cow/ox	10	15000
45:	7054012	large grace	2012	cow/ox	4	0
46:	7054012	large grace	2014	cow/ox	15	20000
47:	7054012	large grace	2015	cow/ox	12	16000
48:	7054012	large grace	2017	cow/ox	10	22000
49:	7085916	cow	2012		0	0
50:	7085916	cow	2014		NA	NA
51:	7085916	cow	2015	cow/ox	2	18000
52:	7085916	cow	2017	cow/ox	6	20000
53:	7096202	large	2012	cow/ox	4	0
54:	7096202	large	2014	cow/ox	2	10000
55:	7096202	large	2015	cow/ox	8	14000

```
56:  7096202        large 2017         cow/ox             9       20000
57:  7096207        large 2012         cow/ox             1           0
58:  7096207        large 2014         cow/ox             6       12000
59:  7096207        large 2015         cow/ox             7       22000
60:  7096207        large 2017         cow/ox             6       16000
61:  7096218        large 2012         cow/ox             1           0
62:  7096218        large 2014         cow/ox             9       16000
63:  7096218        large 2015         cow/ox             7       16000
64:  7096218        large 2017         cow/ox             6       20000
65:  7106408          cow 2012         cow/ox             2           0
66:  7106408          cow 2014         cow/ox             3       15000
67:  7106408          cow 2016         cow/ox             7       14500
68:  7137207 traditional 2012                            0           0
69:  7137207 traditional 2014         cow/ox             1       16000
70:  7137207 traditional 2015         cow/ox             6       14000
71:  7137207 traditional 2017         cow/ox             6       16000
72:  8169519 large grace 2012  Chicken/duck             4           0
73:  8169519 large grace 2014         cow/ox             1       20000
74:  8169519 large grace 2015         cow/ox             6       25000
75:  8169519 large grace 2017         cow/ox             3       40000
76:  8169619        large 2012  Chicken/duck             4           0
77:  8169619        large 2014         cow/ox             3       16000
78:  8169619        large 2016         cow/ox             6       18000
79:  8169619        large 2017         cow/ox             6       38000
       hhid          Arm Year LivestockCode number_owned mrkt_value
    TotalImputedValue
 1:              40000
 2:             100000
 3:             120000
 4:             100000
 5:                  0
 6:              40000
 7:             100000
 8:             120000
 9:              20000
10:             160000
11:              80000
12:              80000
13:                  0
14:              40000
15:              60000
16:             160000
17:             120000
18:             100000
19:              60000
20:              60000
21:              20000
22:             140000
23:              60000
24:              60000
25:              40000
26:             180000
27:             160000
28:              20000
29:              20000
30:             120000
31:             100000
32:              40000
33:              80000
34:             100000
35:             140000
```

```
36:             140000
37:                  0
38:              60000
39:             120000
40:              80000
41:                  0
42:              80000
43:              40000
44:             200000
45:              80000
46:             300000
47:             240000
48:             200000
49:                  0
50:                  0
51:              40000
52:             120000
53:              80000
54:              40000
55:             160000
56:             180000
57:              20000
58:             120000
59:             140000
60:             120000
61:              20000
62:             180000
63:             140000
64:             120000
65:              40000
66:              60000
67:             140000
68:                  0
69:              20000
70:             120000
71:             120000
72:                  0
73:              20000
74:             120000
75:              60000
76:                  0
77:              60000
78:             120000
79:             120000
    TotalImputedValue
```

```
lvo[, HoldingClass := "below 1000"]
lvo[TotalImputedValue ≥ 1000 & TotalImputedValue < 30000,
  HoldingClass := "1000-29999"]
lvo[TotalImputedValue ≥ 30000 & TotalImputedValue < 50000,
  HoldingClass := "30000-49999"]
lvo[TotalImputedValue ≥ 50000,
  HoldingClass := "above 50000"]
lvo[, HoldingClass := factor(HoldingClass,
  levels = c("below 1000", "1000-29999", "30000-49999", "above 50000"))]
setkey(lvo, Arm, HoldingClass, tee)
lvostat2 ← lvo[grepl("es", creditstatus),.(MeanIV = mean(TotalImputedValue, na.rm = T),
  StdIV = var(TotalImputedValue, na.rm = T)^(.5),
  N = sum(!is.na(TotalImputedValue))), by = .(Arm, HoldingClass, tee)]
```

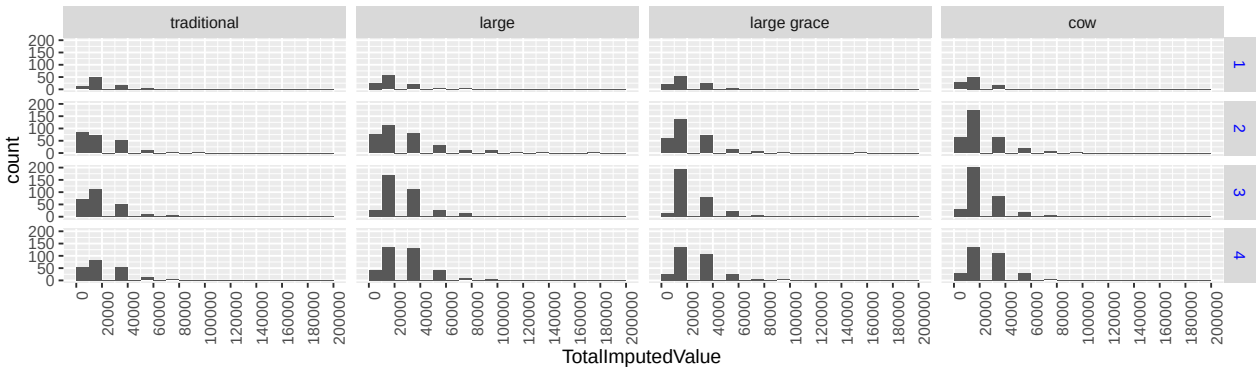

Figure 2: Total imputed value of livestock holding
Livestock holding values are computed by using respective median prices of each year.

```
lvostat2[, c("ciLB", "ciUB") := list(MeanIV - StdIV * qt(.975, N- 1), MeanIV + StdIV * qt(
lvostat3 ← lvo[grepl("es", creditstatus),.(MeanIV = mean(TotalImputedValue, na.rm = T),
  StdIV = var(TotalImputedValue, na.rm = T)^(.5),
  N = sum(!is.na(TotalImputedValue))), by = .(Arm, HoldingClass, Year)]
lvostat3[, c("ciLB", "ciUB") := list(MeanIV - StdIV * qt(.975, N- 1), MeanIV + StdIV * qt(
```

```
library(ggplot2)
ggplot(data = lvo[TotalImputedValue > 0], aes(TotalImputedValue)) +
  geom_histogram(breaks = c(0, seq(10000, 200000, 10000))) +
  #scale_x_log10(breaks = c(1, 100, 1000, 10000, 20000, 30000, 50000)) +
  scale_x_continuous(breaks = seq(0, 200000, 20000)) +
  theme(axis.text.x = element_text(angle = 90, vjust = 1, hjust = 1),
   strip.text.y = element_text(colour = "blue"))+
  facet_grid(tee ~ Arm)
```

```
library(ggplot2)
ggplot(data = lvostat2, aes(HoldingClass, N)) +
  geom_col() +
  xlab("Livestock holding classes") +
  theme(axis.text.x = element_text(angle = 90, vjust = 1, hjust = 1),
    strip.text.y = element_text(colour = "blue"))+
  facet_grid(tee ~ Arm)
```

```
library(ggplot2)
ggplot(data = lvostat3, aes(HoldingClass, N)) +
  geom_col() +
  xlab("Livestock holding classes") +
  theme(axis.text.x = element_text(angle = 90, vjust = 1, hjust = 1),
    strip.text.y = element_text(colour = "blue"))+
  facet_grid(Year ~ Arm)
```

- Why does cow report below 1000 holding in rds 2-4?

```
lvo[, NumberOfCows := 0L]
lvo[grepl("ow", LivestockCode), NumberOfCows := as.integer(number_owned)]
lvo[,
  .(MeanImputedVal = mean(TotalImputedValue, na.rm = T),
  MeanNumCows = mean(NumberOfCows, na.rm = T),
  N = sum(!is.na(TotalImputedValue))), by = .(Arm, survey)]
```

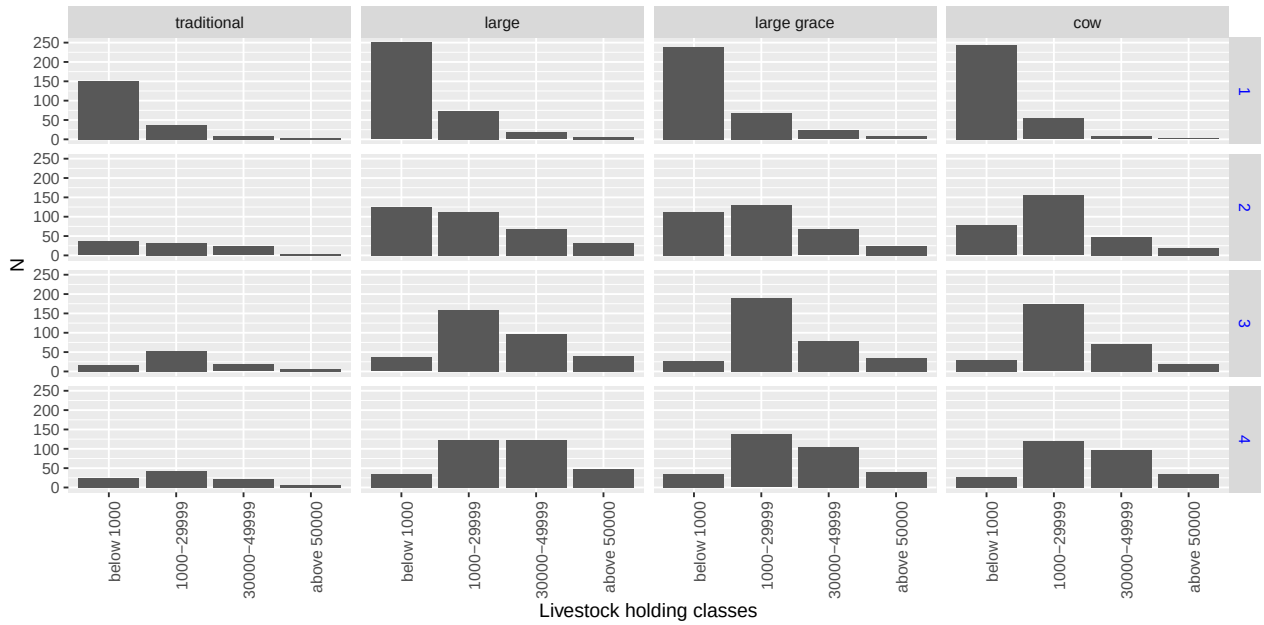

Figure 3: Histogram of livestock holding classes
Livestock holding values are computed by using respective median prices of each year.

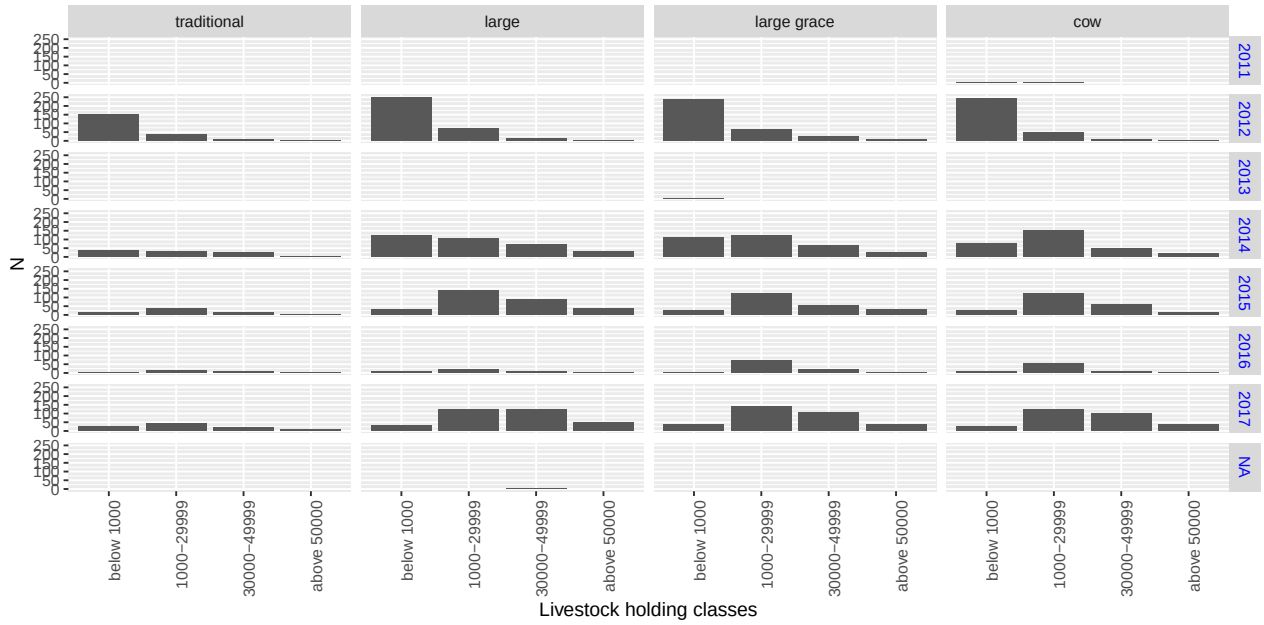

Figure 4: Histogram of livestock holding classes by year
Livestock holding values are computed by using respective median prices of each year.

	Arm	survey	MeanImputedVal	MeanNumCows	N
1:	traditional	1	5065.33	0.233668	398
2:	traditional	2	15854.00	0.817844	280
3:	traditional	3	20179.62	1.022059	277
4:	traditional	4	21233.75	1.050000	240
5:	large	1	6092.42	0.275689	399
6:	large	3	31056.41	1.625000	386
7:	large	2	24992.86	1.278820	383
8:	large	4	32686.07	1.630890	382
9:	large grace	1	7392.54	0.333333	399
10:	large grace	2	21510.32	1.150943	341

```
11: large grace       3       27565.65    1.422619 347
12: large grace       4       30276.97    1.528024 343
13:         cow       1        4997.68    0.218045 399
14:         cow       2       20550.29    1.078035 364
15:         cow       3       25399.62    1.300562 365
16:         cow       4       28700.23    1.436950 342
```

```
#lvo[,.(N = sum(!is.na(TotalImputedValue))), by = .(Arm, survey)]
```

```
library(ggplot2)
lvo[, LivestockType := LivestockCode]
lvo[grepl("Ox|Cow", LivestockCode), LivestockType := "Cow/Ox"]
lvo[grepl("Goat|She", LivestockCode), LivestockType := "Goat/Sheep"]
lvo[grepl("Duc|Hen", LivestockCode), LivestockType := "Poultry"]
lvo[, LivestockType := factor(LivestockType)]
lvotype ← lvo[grepl("es", creditstatus),
  .(Std = var(number_owned, na.rm = T)^(.5),
    Total = sum(number_owned, na.rm = T),
    N = sum(!is.na(number_owned))),
    by = .(Arm,  LivestockType, Year)]
lvotype ← lvotype[!is.na(Arm), ]
lvotype[, Mean := round(Total/N, 1)]
setnames(lvotype, grepout("^T|N|^S|^M", colnames(lvotype)),
  paste0("value.", grepout("^T|N|^S|^M", colnames(lvotype))))
lvotype[is.na(LivestockType)|LivestockType == "", LivestockType := "Other"]
lvotype[grepl("cow", LivestockType), LivestockType := "Cow/Ox"]
lvotypel ← reshape(lvotype, direction = "long",
  idvar = c("Arm", "LivestockType", "Year"),
  varying = grepout("val", colnames(lvotype)))
lvotypel ← lvotypel[grepl("Cow", LivestockType) & grepl("Mean|Tot|^N", time), ]
lvotypel ← lvotypel[!is.na(Year), ]
setkey(lvotypel, Arm, Year, LivestockType)
lvotypel[, Variable := time]
lvotypel[grepl("N", time), Variable := "Number of owners"]
lvotypel[, Variable := factor(Variable, levels = c("Mean", "Total", "Number of owners"))]
ggplot(data = lvotypel, aes(Year, value)) +
  geom_col(data = lvotypel[grepl("Total", Variable), ]) +
  geom_col(data = lvotypel[grepl("Mean", Variable), ]) +
  geom_col(data = lvotypel[grepl("N", Variable), ]) +
  xlab("Year") +
  theme(axis.text.x = element_text(angle = 90, vjust = 1, hjust = 1),
    strip.text.y = element_text(colour = "blue"))+
  facet_grid(Variable ~ Arm, scale = "free_y")
```

Finding IV.3 FIGURE **??** shows general increase in upper holding classes round 3 and further upper holding classes in round 4. FIGURE **??** shows livestock type is not entered (yet collected) in rd3. At this moment, one needs to omit rd 3. All estimation results by far are subject to this omission.

IV.5 Assets+Livestock

```
ass ← readRDS(paste0(pathsaveHere, "AssetAdminDataUsedForEstimation.rds"))
```

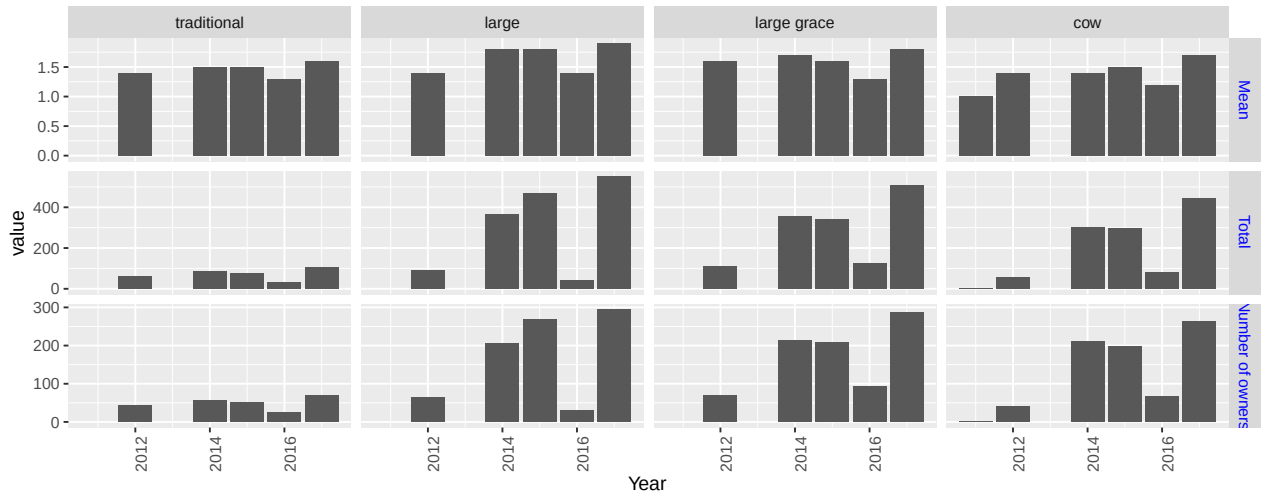

Figure 5: Number of cows/oxen by year

Means are mean holding among the owners. Totals are total number of cows/oxen owned. Mean and total number of cows/oxen may diverge because the number of owners differ across round.

```
# creaditstatus != yes are pure controls
table0(ass[survey == 1,.(BorrowerStatus, creditstatus)])
```

```
                creditstatus
BorrowerStatus     Yes   No
  borrower        1192  157
  pure saver         0   26
  quit membership    0  220
```

```
table0(ass[survey == 1,.(Mstatus, creditstatus)])
```

```
             creditstatus
Mstatus         Yes   No
  gErosion        0   80
  gRejection      0  140
  iRejection      1  157
  iReplacement    0    0
  newGroup        0    0
  oldMember    1191   26
```

```
ass[, grepout("Loan|UD|Forced", colnames(ass)) := NULL]
CovStrings ← "^groupid$|hhid|tee|^dummy.*[a-z]$|Floo|Time\\.?.|With|.Size|Head|^creditsta
ass ← ass[!(hhid == 7043715 & HAssetAmount == 0), ]
ass1 ← ass[, grepout(paste0(CovStrings, "^HAsse"), colnames(ass)), with = F]
ass1R ← ass[, grepout(paste0(CovStrings, "^HAsse|RM"), colnames(ass)), with = F]
ass2 ← ass[, grepout(paste0(CovStrings, "^PAsse"), colnames(ass)), with = F]
ass2R ← ass[, grepout(paste0(CovStrings, "^PAsse|RM"), colnames(ass)), with = F]
# before-after style 2 time point data. Choose tee == 2 as baseline because there are many
ass ←  readRDS(paste0(pathsaveHere, "AssetAdminDataUsedForEstimation.rds"))
ass ← ass[!(hhid == 7043715 & HAssetAmount == 0), ]
ass[, grepout("Time|Loan", colnames(ass)) := NULL]
ass3 ← ass[tee == 2 | tee == 4, grepout(paste0(CovStrings, "^HAsse"), colnames(ass)), wit
ass3R ← ass[tee == 2 | tee == 4, grepout(paste0(CovStrings, "^HAsse|RM"), colnames(ass)),
ass4 ← ass[tee == 2 | tee == 4, grepout(paste0(CovStrings, "^PAsse"), colnames(ass)), wit
ass4R ← ass[tee == 2 | tee == 4, grepout(paste0(CovStrings, "^PAsse|RM"), colnames(ass)),
datas0 ← paste0("ass", rep(1:4, each = 2), c("", "R"))
datas ← paste0("as", rep(1:4, each = 2), c("", "R"))
```

```
ddatas ← paste0("d", datas)
ddatasd ← paste0(ddatas, "d")
for (i in 1:length(datas)) {
#   dl ← prepFDData(get(datas0[i]), Group = "^hhid$", TimeVar = "tee", Cluster = "groupid
#     # before considering pure control contrast
#     #LevelCovariates = "^dummy|Floo|^Time\\..$|Head",
#     # after considering pure control contrast
#     LevelCovariates = "^dummy|Floo|^Time\\..$|Head|^cred.*s$",
#     drop.if.NA.in.differencing = T, LevelPeriodToKeep = "last",
#     use.var.name.for.dummy.prefix = F, print.messages = F)
   dl ← FirstDiffPanelData(X = get(datas0[i]),
     Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
     LevelCovariates = "^dummy|Head|^Time\\..$|Female$|Floo|Eldest|^cred.*s$|xid$|SchPa")
  dat ← dl$diff
  dat[, grepout("^en$", colnames(dat)) := NULL]
  # create PureControl*Time2, Time3 interactions and drop creditstatus
  if (grepl("ass[12]", datas0[i]) & any(grepl("cred.*s$", colnames(dat)))) {
    dat[, PureControl := 0L]
    dat[!grepl("es$", creditstatus), PureControl := 1L]
    dat[, creditstatus := NULL]
    dat[, c("PureControl.Time3", "PureControl.Time4") :=
      .(PureControl * Time.3, PureControl * Time.4)]
  }
  assign(ddatas[i], dl)
  assign(ddatasd[i], dat)
}
```

```
Dropped 196 obs due to T<2.
Dropped 1402 obs due to NA.
Dropped 196 obs due to T<2.
Dropped 3080 obs due to NA.
Dropped 196 obs due to T<2.
Dropped 1402 obs due to NA.
Dropped 196 obs due to T<2.
Dropped 3080 obs due to NA.
Dropped 130 obs due to T<2.
Dropped 1274 obs due to NA.
Dropped 130 obs due to T<2.
Dropped 1388 obs due to NA.
Dropped 130 obs due to T<2.
Dropped 1274 obs due to NA.
Dropped 130 obs due to T<2.
Dropped 1388 obs due to NA.
```

```
das1Rd ← das1Rd[tee > 2, ]
das2Rd ← das2Rd[tee > 2, ]
das1d[, Tee := .N, by = hhid]
das2d[, Tee := .N, by = hhid]
```

```
lvo ← readRDS(paste0(pathsaveHere, "LivestockAdminDataUsedForEstimation.rds"))
table0(lvo[, .(tee, Arm)])
```

```
   Arm
tee traditional large large grace cow
  1         398   399         379 398
  2         283   390         373 379
  3         276   384         348 365
  4         238   377         330 328
```

```
table0(lvo[grepl("ow", LivestockCode), .(tee, Arm)])
```

```
   Arm
tee traditional large large grace cow
  1          66    78          81  63
  2         151   254         258 283
  3         189   348         323 324
  4         156   328         291 287
```

```
# xid ← readRDS(paste0(path1234, "ID.rds"))
# xidlv ← xid[,.(Mstatus, AssignOriginal, groupid, hhid, survey, year)]
# setnames(xidlv, "AssignOriginal", "Arm")
# setkey(lvo, Arm, groupid, hhid, survey, Mstatus)
# setkey(xidlv, Arm, groupid, hhid, survey, Mstatus)
# lvo ← merge(lvo, xidlv, by = key(xidlv), all = T)
lvo[, grepout("Loan|UD|Forced", colnames(lvo)) := NULL]
lvostrings ← "^groupid$|hhid|^Arm$|tee|^dummy[TLCMUWS]|creditst|^TotalIm|Floo|Time\\.|liv
lvoR ← lvo[, grepout(paste0(lvostrings, "|RM"), colnames(lvo)), with = F]
lvo ← lvo[, grepout(lvostrings, colnames(lvo)), with = F]
lvo3 ← lvo[tee == 2 | tee == 4, ]
lvoR3 ← lvoR[tee == 2 | tee == 4, ]
datas ← c("lvo", "lvoR", "lvo3", "lvoR3")
ddatas ← paste0("d", datas)
ddatasd ← paste0(ddatas, "d")
for (i in 1:length(datas)) {
#   dl ← prepFDData(get(datas[i]), Group = "^hhid$", TimeVar = "tee", Cluster = "groupid"
#     LevelCovariates = "^dummy|^Arm$|Floo|^Time\\..$|Head|Cows|liv.*de$|credits",
#     drop.if.NA.in.differencing = T, LevelPeriodToKeep = "last",
#     use.var.name.for.dummy.prefix = F, print.messages = F)
   dl ← FirstDiffPanelData(X = get(datas[i]),
     Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
     LevelCovariates = "^dummy|^Arm$|Floo|^Time\\..$|Head|Cows|liv.*de$|credits|xid$|SchPa
  dat ← dl$diff
  dat[, grepout("^en$", colnames(dat)) := NULL]
  assign(ddatas[i], dl)
  assign(ddatasd[i], dat)
}
```

```
Dropped 196 obs due to T<2.
Dropped 1402 obs due to NA.
Dropped 196 obs due to T<2.
Dropped 3080 obs due to NA.
Dropped 154 obs due to T<2.
Dropped 1272 obs due to NA.
Dropped 154 obs due to T<2.
Dropped 1386 obs due to NA.
```

```
dlvoRd ← dlvoRd[tee > 1, ]
```

```
ass ← readRDS(paste0(pathsaveHere, "RosterAssetAdminOriginalHHsDataUsedForEstimation.rds
assstrings ← "^Arm$|^groupid$|hhid|tee|^.Asse|^dummy.*[a-z]$|Floo|Time\\.?.|Head|With|.Si
lvostrings ← "^groupid$|hhid|tee|^TotalIm|Cows"
ass[, grepout("Loan|UD|Forced", colnames(ass)) := NULL]
ass1 ← ass[(Fromxid), grepout(assstrings, colnames(ass)), with = F]
ass1R ← ass[(Fromxid), grepout(paste0(assstrings, "|RM"), colnames(ass)), with = F]
# before-after style 2 time point data. Choose tee == 2 as baseline because there are many
```

```
ass ← readRDS(paste0(pathsaveHere, "RosterAssetAdminOriginalHHsDataUsedForEstimation.rds
ass[, grepout("Time|Loan", colnames(ass)) := NULL]
lvo ← readRDS(paste0(pathsaveHere, "RosterLivestockAdminOriginalHHsDataUsedForEstimatio
lvo[, grepout("Loan|UD|Forced", colnames(lvo)) := NULL]
lvo1 ← lvo[(Fromxid), grepout(lvostrings, colnames(lvo)), with = F]
# merge
#commonstrings ← "^groupid$|hhid|^Arm|tee|Floo|Time\\.?.|Head"
commoncols ← intersect(colnames(ass1), colnames(lvo1))
AL1 ← merge(ass1, lvo1, by = commoncols, ALl = T)
AL1[is.na(TotalImputedValue), TotalImputedValue := 0]
AL1[, TotalValue := TotalImputedValue + HAssetAmount + PAssetAmount]
ALfig ← AL1[, .(Arm, groupid, hhid, tee, TotalValue)]
AL1[, c("TotalImputedValue", "HAssetAmount", "PAssetAmount", "Arm") := NULL]
AL1 ← unique(AL1)
AL2 ← AL1[tee == 2 | tee == 4, ]
AL2[, grepout("Time", colnames(AL2)) := NULL]

commoncols ← intersect(colnames(ass1R), colnames(lvo1))
AL1R ← merge(ass1R, lvo1, by = commoncols, ALl = T)
AL1R[is.na(TotalImputedValue), TotalImputedValue := 0]
AL1R[, TotalValue := TotalImputedValue + HAssetAmount + PAssetAmount]
ALfig ← AL1R[, .(Arm, groupid, hhid, tee, TotalValue)]
AL1R[, c("TotalImputedValue", "HAssetAmount", "PAssetAmount", "Arm") := NULL]
AL1R ← unique(AL1R)
AL2R ← AL1R[tee == 2 | tee == 4, ]
AL2R[, grepout("Time", colnames(AL2)) := NULL]
```

```
Warning in `[.data.table`(AL2R, , `:=`(grepout("Time", colnames(AL2)), NULL)): length(LHS)
```

```
datas ← c(paste0("AL", 1:2), paste0("AL", 1:2, "R"))
ddatas ← paste0("d", datas)
ddatasd ← paste0(ddatas, "d")
for (i in 1:length(datas)) {
  dl ← prepFDData(get(datas[i]), Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
    LevelCovariates = "^dummy|^Arm|Floo|^Time\\..$|Head|Cows",
    drop.if.NA.in.differencing = T, LevelPeriodToKeep = "last",
    use.var.name.for.dummy.prefix = F, print.messages = F)
  dat ← dl$diff
  if (i == 1) {
    # Recreate Time.4 which is dropped when kept only 1:(T-1) obs.
    #dat[, c("Time.2", "Time.3", "Time.4") := 0L]
    #dat[tee == 1, Time.2 := 1L]
    #dat[tee == 2, Time.3 := 1L]
    #dat[tee == 3, Time.4 := 1L]
    dat[, grepout("Time.?2", colnames(dat)) := NULL]
  }
  assign(ddatas[i], dl)
  assign(ddatasd[i], dat)
}
dAL1Rd ← dAL1Rd[tee > 2, ]

FileName ← "AssetLivestock"
FileNameHeader ←
  paste0(c("", "Grace", "PovertyStatus", "Size", "Attributes",
    "TInt", "TIntGrace", "TIntSize", "Rd24Diff", "Rd24DiffGrace",
    "Rd24DiffPovertyStatus", "Rd24DiffSize", "Rd24DiffAttributes"), "OriginalHHs")
```

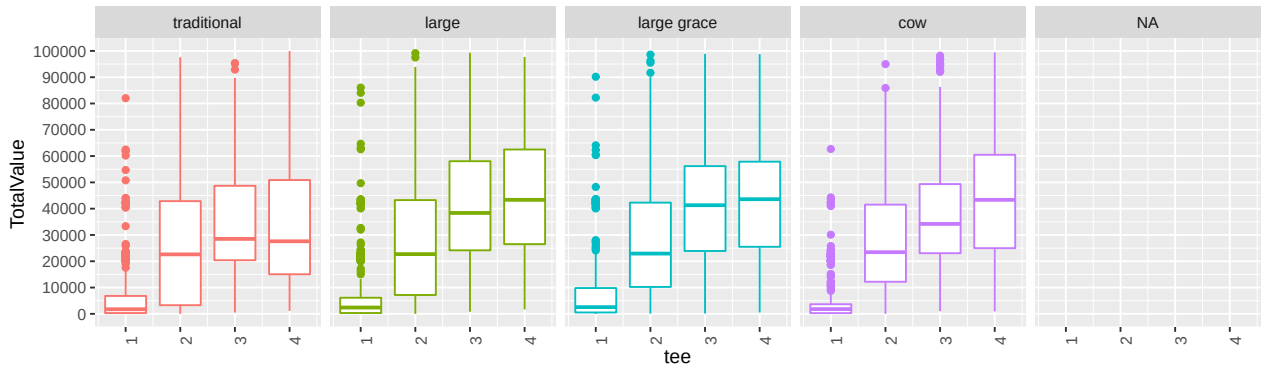

Figure 6: Total asset values
Sum of assets and livestock holding values. Original 1600 HHs.

```
alsuffixes ← c("", "G", "P", "S", "a", "T", "TG", "TS", "D", "DG", "DP", "DS", "Da")
listheader ← paste0("al", alsuffixes)
DataToUse1 ← rep("dAL1d", 6)
DataToUse2 ← rep("dAL2d", 6)
Addseparatingcols ← NULL; Separatingcolwidth ← NULL
Separatingcoltitle ← NULL
Regressands ← rep("TotalValue", 6)
tableboxwidth ← 4.5

source(paste0(pathprogram, "AssetLivestockCovariateSelection.R"))

exclheader ← paste0("excl", alsuffixes)
source(paste0(pathprogram, "FDEstimationFile.R"))

library(ggplot2)
ggplot(data = ALfig, aes(group = tee)) +
#  geom_point(size = .1, position = position_dodge(width = .5)) +
#  geom_smooth(span = .5, aes(colour = Arm, group = Arm)) +
  #scale_x_log10(breaks = c(1, 100, 1000, 10000, 20000, 30000, 50000)) +
  geom_boxplot(aes(x= tee, y = TotalValue, colour = Arm))+
  #scale_y_log10(breaks = c(1, 1000, 5000, 10000, 20000, 50000, 100000, 500000)) +
  scale_y_continuous(breaks = seq(0, 100000, 10000), limits = c(0, 100000)) +
  theme(axis.text.x = element_text(angle = 90, vjust = 1, hjust = 1),
    strip.text.y = element_text(colour = "blue"), legend.position = "none") +
  facet_grid(. ~ Arm)

# dummy chunk
```

Table 33: FD estimation of total assets, original HHs

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	11404.6***	19753.6***	21220.8***	21220.8***	21220.8***	21081.9***
	(1118.0)	(1690.1)	(1869.8)	(1869.8)	(1869.8)	(2138.4)
Large	5104.6***	4735.4***	4703.6***	4703.6***	4703.6***	4732.4***
	(1607.4)	(1742.9)	(1586.1)	(1586.1)	(1586.1)	(1595.8)
LargeGrace	4487.9**	4162.1**	3707.6*	3707.6*	3707.6*	3694.6*
	(1882.2)	(2096.7)	(2115.7)	(2115.7)	(2115.7)	(2092.1)
Cow	4867.7***	5528.9**	5300.5***	5300.5***	5300.5***	5364.9***
	(1712.9)	(2194.3)	(2042.2)	(2042.2)	(2042.2)	(2070.9)
rd 2 - 3		−6257.7***	−6188.8***	−6188.8***	−6188.8***	−6188.3***
		(2257.5)	(2255.6)	(2255.6)	(2255.6)	(2256.1)
Large × rd 2 - 3		5066.2	5357.9	5357.9	5357.9	5358.9
		(5917.0)	(5877.8)	(5877.8)	(5877.8)	(5879.1)
LargeGrace × rd 2 - 3		5009.0	5026.6	5026.6	5026.6	5027.4
		(5663.8)	(5664.7)	(5664.7)	(5664.7)	(5665.6)
Cow × rd 2 - 3		1083.7	1023.6	1023.6	1023.6	1023.8
		(6448.4)	(6484.5)	(6484.5)	(6484.5)	(6485.6)
rd 3 - 4		−18818.5***	−18849.6***	−18849.6***	−18849.6***	−18850.7***
		(1810.6)	(1812.3)	(1812.3)	(1812.3)	(1812.4)
Large × rd 3 - 4		−630.0	−850.0	−850.0	−850.0	−851.7
		(4012.9)	(4048.5)	(4048.5)	(4048.5)	(4050.0)
LargeGrace × rd 3 - 4		−900.0	−918.7	−918.7	−918.7	−923.2
		(4236.3)	(4241.7)	(4241.7)	(4241.7)	(4240.2)
Cow × rd 3 - 4		−7556.5	−7494.5	−7494.5	−7494.5	−7497.4
		(5850.3)	(5824.0)	(5824.0)	(5824.0)	(5825.0)
NumCowsOwnedAtRd1						487.1
						(2133.7)
FloodInRd1			−2878.7**	−2878.7**	−2878.7**	−2903.5**
			(1237.8)	(1237.8)	(1237.8)	(1175.5)
Head literate			1146.7	1146.7	1146.7	1108.1
			(1926.6)	(1926.6)	(1926.6)	(1810.0)
$T = 2$	22	22	22	22	22	22
$T = 3$	45	45	43	43	43	43
$T = 4$	1159	1159	1159	1159	1159	1159
$\bar{R}^2$	0.001	0.038	0.039	0.039	0.039	0.039
$\hat{\rho}$	−0.162	−0.137	−0.141	−0.141	−0.141	−0.140
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000
N	3589	3589	3585	3585	3585	3585

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 34: FD estimation of total assets by attributes

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	11404.6***	19753.6***	21220.8***	21734.1***	23377.7***	21081.9***
	(1118.0)	(1690.1)	(1869.8)	(1970.4)	(1896.0)	(2138.4)
WithGrace	−616.7	−573.2	−996.0	−924.2	−863.8	−1037.8
	(1904.4)	(1986.4)	(2056.0)	(2043.3)	(2052.5)	(1964.3)
LargeSize	5104.6***	4735.4***	4703.6***	4589.2***	4474.7***	4732.4***
	(1607.4)	(1742.9)	(1586.1)	(1608.6)	(1624.3)	(1595.8)
NonCash	379.7	1366.8	1592.9	1435.3	1285.5	1670.3
	(1994.2)	(2392.3)	(2412.9)	(2372.8)	(2363.5)	(2282.7)
rd 2 - 3		−6257.7***	−6188.8***	−6190.8***	−8759.7***	−6188.3***
		(2257.5)	(2255.6)	(2255.8)	(2385.2)	(2256.1)
LargeSize × rd 2 - 3		5066.2	5357.9	5354.6	6033.4	5358.9
		(5917.0)	(5877.8)	(5878.7)	(5624.2)	(5879.1)
WithGrace × rd 2 - 3		−57.2	−331.2	−331.3	−709.9	−331.5
		(6105.9)	(6060.7)	(6061.2)	(5832.7)	(6061.9)
NonCash × rd 2 - 3		−3925.3	−4003.0	−4000.6	−3118.8	−4003.6
		(6622.1)	(6651.3)	(6651.3)	(6413.7)	(6652.6)
rd 3 - 4		−18818.5***	−18849.6***	−18847.0***	−20890.1***	−18850.7***
		(1810.6)	(1812.3)	(1811.4)	(1844.3)	(1812.4)
LargeSize × rd 3 - 4		−630.0	−850.0	−841.0	−319.6	−851.7
		(4012.9)	(4048.5)	(4045.1)	(3970.2)	(4050.0)
WithGrace × rd 3 - 4		−269.9	−68.7	−59.9	−369.8	−71.5
		(4086.8)	(4126.2)	(4121.1)	(4083.6)	(4126.2)
NonCash × rd 3 - 4		−6656.5	−6575.8	−6581.4	−5870.9	−6574.2
		(5901.2)	(5875.0)	(5872.5)	(5707.4)	(5876.0)
HadCows				−2278.7	−10323.3***	
				(1515.2)	(2703.7)	
HadCows × rd 2 - 3					13442.7***	
					(4486.2)	
HadCows × rd 3 - 4					10656.4**	
					(4511.6)	
NumCowsOwnedAtRd1						487.1
						(2133.7)
FloodInRd1			−2878.7**	−2867.4**	−2871.8**	−2903.5**
			(1237.8)	(1240.5)	(1241.0)	(1175.5)
Head literate			1146.7	1240.8	1217.6	1108.1
			(1926.6)	(1912.6)	(1909.8)	(1810.0)
$T = 2$	22	22	22	22	22	22
$T = 3$	45	45	43	43	43	43
$T = 4$	1159	1159	1159	1159	1159	1159
$\bar{R}^2$	0.001	0.038	0.039	0.039	0.042	0.039
$\hat{\rho}$	−0.162	−0.137	−0.141	−0.140	−0.144	−0.140
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000
N	3589	3589	3585	3585	3585	3585

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 35: FD estimation of total assets, moderately poor vs. ultra poor, original HHs

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	15537.3***	24333.5***	25590.3***	25590.3***	25590.3***	25472.5***
	(932.3)	(1768.0)	(1985.6)	(1985.6)	(1985.6)	(2224.6)
UltraPoor	25.0	−514.3	−478.5	−478.5	−478.5	−442.4
	(963.9)	(1108.0)	(1130.9)	(1130.9)	(1130.9)	(1211.0)
rd 2 - 3		−5986.3**	−5927.6**	−5927.6**	−5927.6**	−5926.9**
		(2520.3)	(2524.1)	(2524.1)	(2524.1)	(2524.8)
UltraPoor × rd 2 - 3		−157.7	−26.2	−26.2	−26.2	−28.8
		(5300.2)	(5342.4)	(5342.4)	(5342.4)	(5342.4)
rd 3 - 4		−19412.3***	−19431.0***	−19431.0***	−19431.0***	−19431.7***
		(2056.5)	(2052.2)	(2052.2)	(2052.2)	(2052.4)
UltraPoor × rd 3 - 4		4363.8	4170.7	4170.7	4170.7	4168.9
		(3176.7)	(3135.6)	(3135.6)	(3135.6)	(3133.1)
NumCowsOwnedAtRd1						378.7
						(2218.5)
FloodInRd1			−2953.3***	−2953.3***	−2953.3***	−2969.9***
			(1131.6)	(1131.6)	(1131.6)	(1082.9)
Head literate			1273.2	1273.2	1273.2	1249.8
			(1873.4)	(1873.4)	(1873.4)	(1780.0)
$T = 2$	22	22	22	22	22	22
$T = 3$	45	45	43	43	43	43
$T = 4$	1159	1159	1159	1159	1159	1159
$\bar{R}^2$	0	0.037	0.038	0.038	0.038	0.038
$\hat{\rho}$	−0.157	−0.144	−0.140	−0.140	−0.140	−0.136
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000
N	3589	3589	3585	3585	3585	3585

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 36: FD estimation of total assets, small vs. large size loans, original HHs

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	11404.6***	19760.6***	21163.1***	21163.1***	21163.1***	21031.4***
	(1117.7)	(1693.1)	(1851.5)	(1851.5)	(1851.5)	(2116.1)
LargeSize	4820.4***	4812.4***	4581.9***	4581.9***	4581.9***	4607.1***
	(1356.3)	(1587.6)	(1472.4)	(1472.4)	(1472.4)	(1514.4)
rd 2 - 3		−6270.2***	−6205.3***	−6205.3***	−6205.3***	−6205.0***
		(2256.4)	(2255.4)	(2255.4)	(2255.4)	(2255.9)
LargeSize × rd 2 - 3		3715.8	3798.1	3798.1	3798.1	3798.5
		(4690.2)	(4693.6)	(4693.6)	(4693.6)	(4694.3)
rd 3 - 4		−18835.5***	−18864.2***	−18864.2***	−18864.2***	−18865.4***
		(1849.0)	(1847.8)	(1847.8)	(1847.8)	(1847.7)
LargeSize × rd 3 - 4		−3027.5	−3085.6	−3085.6	−3085.6	−3088.5
		(3679.1)	(3678.0)	(3678.0)	(3678.0)	(3677.8)
NumCowsOwnedAtRd1						452.0
						(2176.9)
FloodInRd1			−2776.5**	−2776.5**	−2776.5**	−2795.3**
			(1131.3)	(1131.3)	(1131.3)	(1084.7)
Head literate			1216.6	1216.6	1216.6	1186.0
			(1844.2)	(1844.2)	(1844.2)	(1746.0)
$T = 2$	22	22	22	22	22	22
$T = 3$	45	45	43	43	43	43
$T = 4$	1159	1159	1159	1159	1159	1159
$\bar{R}^2$	0.001	0.039	0.04	0.04	0.04	0.04
$\hat{\rho}$	−0.166	−0.135	−0.140	−0.140	−0.140	−0.139
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000
N	3589	3589	3585	3585	3585	3585

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 37: FD estimation of total assets, with vs. without a grace period, original HHs

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	14846.6***	22877.6***	24291.4***	24291.4***	24291.4***	24193.5***
	(954.2)	(1368.0)	(1633.3)	(1633.3)	(1633.3)	(1862.9)
WithGrace	1235.8	1658.9	1344.3	1344.3	1344.3	1349.8
	(1380.3)	(1533.8)	(1512.5)	(1512.5)	(1512.5)	(1522.5)
rd 2 - 3		−5971.7**	−5889.9**	−5889.9**	−5889.9**	−5889.6**
		(2338.9)	(2334.2)	(2334.2)	(2334.2)	(2334.7)
WithGrace × rd 2 - 3		−391.6	−605.0	−605.0	−605.0	−605.5
		(4675.4)	(4663.0)	(4663.0)	(4663.0)	(4663.7)
rd 3 - 4		−18825.7***	−18869.1***	−18869.1***	−18869.1***	−18870.1***
		(1841.4)	(1844.5)	(1844.5)	(1844.5)	(1844.4)
WithGrace × rd 3 - 4		−3816.9	−3643.6	−3643.6	−3643.6	−3645.9
		(3645.6)	(3655.8)	(3655.8)	(3655.8)	(3654.9)
NumCowsOwnedAtRd1						389.3
						(2189.8)
FloodInRd1			−2857.5**	−2857.5**	−2857.5**	−2874.0**
			(1194.9)	(1194.9)	(1194.9)	(1146.1)
Head literate			1288.4	1288.4	1288.4	1262.4
			(1865.9)	(1865.9)	(1865.9)	(1768.4)
$T = 2$	22	22	22	22	22	22
$T = 3$	45	45	43	43	43	43
$T = 4$	1159	1159	1159	1159	1159	1159
$\bar{R}^2$	0	0.037	0.038	0.038	0.038	0.038
$\hat{\rho}$	−0.163	−0.142	−0.143	−0.143	−0.143	−0.143
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000
N	3589	3589	3585	3585	3585	3585

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 38: FD estimation of total assets, round 2 and 4 comparison, original HHs

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	13990.0***	13437.3***	16940.3***	16940.3***	16940.3***	14253.3***
	(2761.8)	(2782.1)	(3603.1)	(3603.1)	(3603.1)	(4406.3)
Large	11732.2***	11641.5***	11530.2***	11530.2***	11530.2***	12066.3***
	(4504.0)	(4474.0)	(4345.3)	(4345.3)	(4345.3)	(4051.3)
LargeGrace	10838.4**	10931.3**	9857.8**	9857.8**	9857.8**	9567.5**
	(4608.0)	(4614.5)	(4916.2)	(4916.2)	(4916.2)	(4530.2)
Cow	7124.8*	6996.0*	6519.7	6519.7	6519.7	7713.9**
	(4261.9)	(4179.6)	(3980.6)	(3980.6)	(3980.6)	(3790.6)
NumCowsOwnedAtRd1						9378.1
						(6129.6)
Head literate		4741.4	4535.9	4535.9	4535.9	3831.3
		(7090.2)	(7095.7)	(7095.7)	(7095.7)	(6664.1)
FloodInRd1			−6163.9*	−6163.9*	−6163.9*	−6660.4**
			(3263.4)	(3263.4)	(3263.4)	(2941.1)
$\bar{R}^2$	0.004	0.004	0.008	0.008	0.008	0.024
N	1159	1159	1159	1159	1159	1159

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates between round 2 and 4. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 39: FD estimation of total assets, round 2 and 4 comparison, grace period, original HHs

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	21912.7***	21304.7***	24875.8***	24875.8***	24875.8***	22508.0***
	(2729.9)	(2923.2)	(4053.7)	(4053.7)	(4053.7)	(4566.4)
WithGrace	1067.4	1110.8	379.7	379.7	379.7	475.5
	(3683.7)	(3708.2)	(3811.8)	(3811.8)	(3811.8)	(3653.3)
NumCowsOwnedAtRd1						9323.9
						(6257.1)
Head literate		4696.0	4517.7	4517.7	4517.7	3918.2
		(6965.8)	(6945.7)	(6945.7)	(6945.7)	(6580.2)
FloodInRd1			−6429.9*	−6429.9*	−6429.9*	−6845.4**
			(3286.6)	(3286.6)	(3286.6)	(3018.3)
$\bar{R}^2$	−0.001	−0.001	0.003	0.003	0.003	0.019
N	1159	1159	1159	1159	1159	1159

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates between round 2 and 4. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 40: FD estimation of total assets, round 2 and 4 comparison, ultra poor vs. moderately poor, original HHs

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	21583.3***	20885.1***	24060.0***	24060.0***	24060.0***	21059.4***
	(2784.3)	(2709.4)	(3307.6)	(3307.6)	(3307.6)	(4538.7)
UltraPoor	1324.0	1475.0	1476.1	1476.1	1476.1	2409.8
	(3112.7)	(3138.7)	(3123.9)	(3123.9)	(3123.9)	(3526.3)
NumCowsOwnedAtRd1						9432.0
						(6367.8)
Head literate		4762.2	4598.1	4598.1	4598.1	4045.8
		(6937.7)	(6909.5)	(6909.5)	(6909.5)	(6548.9)
FloodInRd1			−6472.5**	−6472.5**	−6472.5**	−6903.8**
			(3047.9)	(3047.9)	(3047.9)	(2813.6)
$\bar{R}^2$	−0.001	0	0.003	0.003	0.003	0.02
N	1159	1159	1159	1159	1159	1159

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates between round 2 and 4. A first-difference is defined as $\Delta x_{t+k} \equiv x_{t+k} - x_t$ for $k = 1, 2, \ldots$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

IV.6 Incomes

```
source(paste0(pathprogram, "ReadTrimIncomeOriginalHHsFDData.R"))
```

```
Dropped 4546 obs due to T<2.
Dropped 1133 obs due to NA.
Dropped 4546 obs due to T<2.
Dropped 1469 obs due to NA.
Dropped 6242 obs due to NA.
Dropped 6250 obs due to NA.
```

```
source(paste0(pathprogram, "ReadTrimIncomeOriginalHHsFDData.R"))
```

```
Dropped 4546 obs due to T<2.
Dropped 1133 obs due to NA.
Dropped 4546 obs due to T<2.
Dropped 1469 obs due to NA.
Dropped 6242 obs due to NA.
Dropped 6250 obs due to NA.
```

Income sources are mainly labour incomes (lab) and farm revenues (far) with 6165 and 6400 observations, respectively. After first-differencing, they become 486 and 150 observations, with 486 households observed for 487 times.

Obs for survey labour income.

```
table(dlabd[, tee])
```

```
  1   2   3   4
  1 311 128  46
```

Obs for survey labour income and admin repayment data.

```
table(dlabRd[, tee])
```

```
  3   4
106  43
```

```
table(dfarRd[, tee])
```

```
 3  4
79 71
```

Obs for survey farm revenue.

```
table(dfard[, tee])
```

```
 3  4
79 71
```

Obs for survey farm revenue and admin repayment data.

```
table(dfarRd[, tee])
```

```
 3  4
79 71
```

```
dlabRd ← dlabRd[tee > 2, ]
dfard ← dfard[tee > 2, ]
dfarRd ← dfarRd[tee > 2, ]

FileName ← "Incomes"
FileNameHeader ← paste0(c("", "Grace", "PovertyStatus", "Size", "Attributes"),
   "OriginalHHs")
lbsuffixes ← c("", "g", "p", "s", "a")
listheader ← paste0("lb", lbsuffixes)
Regressands ← c(rep("TotalHHLabourIncome", 4), rep("TotalRevenue", 3))
DataToUse1 ← DataToUse2 ← c(rep("dlabd", 3), "dlabRd", rep("dfard", 2), "dfarRd")
Addseparatingcols = 4; Separatingcolwidth = .2
Separatingcoltitle = c("Labour income (Tk)", "Farm income (Tk)")

source(paste0(pathprogram, "IncomeCovariateSelection.R"))

exclheader ← paste0("excl", lbsuffixes)
source(paste0(pathprogram, "FDEstimationFile.R"))

#dummy chunk
```

Table 41: FD estimation of incomes

	Labour income (Tk)				Farm income (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	5.77**	1.79	−1.98	3.71	−8.30	−12.09	−13.90
	(2.93)	(3.70)	(4.12)	(5.50)	(6.88)	(7.91)	(8.47)
Large	−1.46	0.07	0.72	−7.41	9.95	11.72	10.60
	(4.10)	(4.54)	(4.18)	(5.45)	(7.00)	(7.51)	(8.05)
LargeGrace	−5.55	−3.18	−2.26	−11.58**	9.82	4.92	−8.15
	(4.49)	(5.13)	(4.55)	(5.20)	(7.04)	(8.92)	(17.68)
Cow	−7.57	−6.37	−5.56	2.73	6.90	7.52	−0.40
	(4.98)	(5.42)	(4.89)	(10.02)	(7.13)	(7.77)	(10.54)
rd 2 - 3		10.53***	10.43***	15.42***		7.12	15.49
		(3.62)	(3.68)	(5.46)		(8.70)	(14.99)
Large × rd 2 - 3		−2.05	−4.24	6.99		10.01	1.45
		(10.60)	(10.87)	(10.78)		(11.79)	(24.63)
LargeGrace × rd 2 - 3		−9.10	−8.73	0.75		57.96	37.68
		(11.77)	(12.04)	(11.55)		(35.81)	(30.26)
Cow × rd 2 - 3		1.74	1.45	−9.88		18.42	−14.08
		(12.13)	(12.53)	(16.26)		(12.21)	(36.04)
rd 3 - 4		−2.45	−2.02				
		(6.20)	(6.87)				
Large × rd 3 - 4		4.19	1.75				
		(20.89)	(22.21)				
LargeGrace × rd 3 - 4		10.92	10.33				
		(20.98)	(22.02)				
Cow × rd 3 - 4		22.38	22.81				
		(25.28)	(26.87)				
FloodInRd1			8.45***	1.57			−3.39
			(3.19)	(2.85)			(3.17)
Head literate			−10.73	−11.10**			1.89
			(7.42)	(5.61)			(2.56)
6M repayment				−4.16			17.33
				(8.53)			(15.06)
6M net saving				53.01**			61.67
				(22.38)			(61.19)
6M other member net saving				−68.04			−409.32
				(90.53)			(355.57)
6M other member Repaid				−56.00***			−22.53
				(14.01)			(28.02)
$T = 2$	240	240	239	82	56	56	56
$T = 3$	78	78	76	31	47	47	47
$T = 4$	30	30	30	0	0	0	0
$\bar{R}^2$	0	0.008	0.026	0.202	−0.018	0.027	0.031
$\hat{\rho}$	−0.142	−0.190	−0.184	−0.350	−0.575	−0.675	−0.612
$\Pr[\hat{\rho} = 0]$	0.056	0.006	0.011	0.067	0.000	0.000	0.000
N	486	486	481	144	150	150	150

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Labour income is in 1000 Tk unit andis sum of all earned labour incomes. Farm revenue is total of agricultural produce sales.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 42: FD estimation of incomesby attributes

	Labour income (Tk)				Farm income (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	5.77**	1.79	−1.98	3.71	−8.30	−12.09	−13.90
	(2.93)	(3.70)	(4.12)	(5.50)	(6.88)	(7.91)	(8.47)
WithGrace	−4.09	−3.25	−2.99	−4.18	−0.13	−6.80	−18.75
	(4.45)	(4.74)	(4.24)	(4.77)	(1.98)	(5.01)	(14.89)
LargeSize	−1.46	0.07	0.72	−7.41	9.95	11.72	10.60
	(4.10)	(4.54)	(4.18)	(5.45)	(7.00)	(7.51)	(8.05)
NonCash	−2.02	−3.19	−3.29	14.31	−2.92	2.60	7.75
	(5.27)	(5.59)	(5.01)	(9.95)	(2.39)	(5.41)	(10.04)
rd 2 - 3		10.53***	10.43***	15.42***		7.12	15.49
		(3.62)	(3.68)	(5.46)		(8.70)	(14.99)
LargeSize × rd 2 - 3		−2.05	−4.24	6.99		10.01	1.45
		(10.60)	(10.87)	(10.78)		(11.79)	(24.63)
WithGrace × rd 2 - 3		−7.04	−4.49	−6.23		47.95	36.23
		(8.55)	(8.61)	(8.12)		(34.26)	(24.81)
NonCash × rd 2 - 3		10.84	10.18	−10.63		−39.54	−51.77
		(10.39)	(10.64)	(13.07)		(34.41)	(41.55)
rd 3 - 4		−2.45	−2.02				
		(6.20)	(6.87)				
LargeSize × rd 3 - 4		4.19	1.75				
		(20.89)	(22.21)				
WithGrace × rd 3 - 4		6.73	8.58				
		(7.16)	(7.70)				
NonCash × rd 3 - 4		11.46	12.49				
		(15.94)	(16.99)				
FloodInRd1			8.45***	1.57			−3.39
			(3.19)	(2.85)			(3.17)
Head literate			−10.73	−11.10**			1.89
			(7.42)	(5.61)			(2.56)
6M repayment				−4.16			17.33
				(8.53)			(15.06)
6M net saving				53.01**			61.67
				(22.38)			(61.19)
6M other member net saving				−68.04			−409.32
				(90.53)			(355.57)
6M other member Repaid				−56.00***			−22.53
				(14.01)			(28.02)
$T = 2$	240	240	239	82	56	56	56
$T = 3$	78	78	76	31	47	47	47
$T = 4$	30	30	30	0	0	0	0
$\bar{R}^2$	0	0.008	0.026	0.202	−0.018	0.027	0.031
$\hat{\rho}$	−0.142	−0.190	−0.184	−0.350	−0.575	−0.675	−0.612
$\Pr[\hat{\rho} = 0]$	0.056	0.006	0.011	0.067	0.000	0.000	0.000
N	486	486	481	144	150	150	150

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Labour income is in 1000 Tk unit andis sum of all earned labour incomes. Farm revenue is total of agricultural produce sales.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 43: FD estimation of incomes, moderately poor vs. ultra poor

	Labour income (Tk)				Farm income (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	0.55 (3.43)	−2.50 (4.13)	−4.89 (4.13)	3.29 (4.72)	0.27 (1.43)	−2.58 (4.01)	−7.83 (8.24)
UltraPoor	1.60 (3.47)	1.75 (3.73)	0.67 (3.76)	−5.43 (5.36)	0.26 (1.17)	−2.18 (2.18)	−1.03 (1.93)
rd 2 - 3		11.37*** (3.60)	11.39*** (3.62)	13.58*** (4.59)		8.44 (9.23)	10.95 (12.17)
UltraPoor × rd 2 - 3		−6.80 (7.41)	−8.11 (7.56)	11.22 (7.71)		18.97 (14.94)	15.57 (12.36)
rd 3 - 4		0.02 (4.71)	0.47 (5.40)				
UltraPoor × rd 3 - 4		−12.68 (8.70)	−13.99 (9.04)				
FloodInRd1			8.60*** (3.01)	3.05 (2.99)			−3.11 (3.08)
Head literate			−10.70 (7.16)	−8.16 (6.10)			2.17 (2.86)
6M repayment				−3.76 (7.19)			16.01 (12.19)
6M net saving				54.47** (21.50)			58.06 (56.78)
6M other member net saving				−25.90 (80.60)			−259.81 (225.98)
6M other member Repaid				−59.22*** (11.96)			−1.66 (11.70)
$T = 2$ $T = 3$	240 78	240 78	239 76	82 31	56 47	56 47	56 47
$T = 4$ $\bar{R}^2$	30 −0.002	30 0.01	30 0.029	0 0.192	0 −0.007	0 0.003	0 −0.002
$\hat{\rho}$ $\Pr[\hat{\rho} = 0]$	−0.142 0.067	−0.156 0.034	−0.181 0.019	−0.120 0.495	−0.801 0.000	−0.860 0.000	−0.365 0.000
N	486	486	481	144	150	150	150

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Labour income is in 1000 Tk unit andis sum of all earned labour incomes. Farm revenue is total of agricultural produce sales.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 44: FD estimation of incomes, loan size

	Labour income (Tk)				Farm income (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	5.77**	1.85	−1.83	3.96	−8.30	−12.95	−13.12*
	(2.93)	(3.67)	(4.05)	(5.10)	(6.83)	(8.43)	(7.70)
LargeSize	−4.76	−3.04	−2.27	−5.52	9.11	8.68	4.18
	(3.56)	(4.07)	(3.70)	(4.96)	(6.90)	(7.73)	(9.10)
rd 2 - 3		10.45***	10.31***	15.25***		8.53	11.65
		(3.57)	(3.63)	(5.13)		(10.21)	(13.71)
LargeSize × rd 2 - 3		−3.23	−4.00	−0.65		26.33*	13.52
		(10.08)	(10.38)	(10.59)		(15.69)	(18.10)
rd 3 - 4		−2.82	−2.52				
		(6.10)	(6.79)				
LargeSize × rd 3 - 4		11.86	10.83				
		(20.88)	(22.06)				
FloodInRd1			8.33***	2.94		0.42	−2.88
			(3.02)	(2.96)		(1.75)	(3.19)
Head literate			−10.65	−9.16		0.64	1.05
			(7.33)	(6.11)		(1.90)	(2.82)
6M repayment				−1.45			15.20
				(7.43)			(11.78)
6M net saving				55.71**			54.60
				(22.98)			(57.05)
6M other member net saving				−24.65			−268.58
				(78.72)			(245.72)
6M other member Repaid				−62.90***			−1.45
				(14.02)			(11.90)
$T = 2$	240	240	239	82	56	56	56
$T = 3$	78	78	76	31	47	47	47
$T = 4$	30	30	30	0	0	0	0
$\bar{R}^2$	0	0.011	0.028	0.194	−0.005	−0.017	−0.008
$\hat{\rho}$	−0.141	−0.147	−0.166	−0.217	−0.731	−0.668	−0.304
$\Pr[\hat{\rho} = 0]$	0.063	0.050	0.036	0.219	0.000	0.000	0.004
N	486	486	481	144	150	150	150

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Labour income is in 1000 Tk unit andis sum of all earned labour incomes. Farm revenue is total of agricultural produce sales.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 45: FD ESTIMATION OF INCOMES, WITH VS. WITHOUT A GRACE PERIOD

	Labour income (Tk)				Farm income (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	4.81**	1.85	−1.22	−2.34	0.79	−1.82	−3.40
	(2.12)	(2.68)	(3.65)	(4.14)	(1.44)	(3.69)	(5.40)
WithGrace	−5.59*	−4.74	−4.33	2.12	−0.64	−4.80	−12.75
	(3.37)	(3.56)	(3.11)	(5.55)	(1.98)	(3.29)	(9.91)
rd 2 - 3		10.51***	10.29***	15.37***		8.39	13.52
		(3.52)	(3.58)	(5.41)		(9.14)	(14.35)
WithGrace × rd 2 - 3		−2.41	−1.07	−11.15		29.50	12.21
		(7.03)	(7.15)	(8.82)		(18.49)	(7.93)
rd 3 - 4		−2.15	−1.98				
		(5.10)	(5.81)				
WithGrace × rd 3 - 4		13.47	15.16				
		(10.16)	(11.05)				
FloodInRd1			8.16***	2.04			−4.39
			(3.03)	(2.70)			(3.75)
Head literate			−11.28	−9.57			0.75
			(7.29)	(6.50)			(2.73)
6M repayment				0.32			15.45
				(7.78)			(12.31)
6M net saving				52.78**			55.43
				(20.46)			(57.95)
6M other member net saving				−58.03			−334.71
				(100.71)			(312.11)
6M other member Repaid				−55.92***			−4.89
				(11.58)			(14.23)
$T = 2$	240	240	239	82	56	56	56
$T = 3$	78	78	76	31	47	47	47
$T = 4$	30	30	30	0	0	0	0
$\bar{R}^2$	0.004	0.017	0.034	0.201	−0.007	0.022	0.011
$\hat{\rho}$	−0.164	−0.175	−0.154	−0.241	−0.787	−0.948	−0.631
$\Pr[\hat{\rho} = 0]$	0.028	0.013	0.041	0.213	0.000	0.000	0.000
N	486	486	481	144	150	150	150

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Labour income is in 1000 Tk unit andis sum of all earned labour incomes. Farm revenue is total of agricultural produce sales.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Finding IV.4 TABLE 41 (1) and (3) show a general decrease in rd 1 - 2 period and a general increase in rd 2 - 4 periods for labour incomes. (2) and (4) suggest Large grace arm saw a greater swing (decrease and increases) which resulted in overall significant mean increase of -5.55 (at p value of 21.66%), yet not statistically different from traditional, while other arms have estimates closer to traditional. This labour income response can be due to the flood in rd 1 which reduced the labour incomes while repayment burden in later rounds prompted households to earn more labour incomes. Strong positive correlation with other members' previous 6 month repayment in (4) may be due to concerted peer efforts in repayment. Farm revenues do not show any systematic trend.

IV.7 Consumption

```
con ← readRDS(paste0(pathsaveHere, "RosterConsumptionAdminOriginalHHsDataUsedForEstimat
con[, ConsumptionBaseline := 0L]
con[as.Date(IntDate) < as.Date(DisDate1), ConsumptionBaseline := 1L]
con[, ConsumptionBaseline := as.integer(any(ConsumptionBaseline == 1L)),
  by = hhid]

table(con[, .(Arm, ConsumptionBaseline)])
```

```
          ConsumptionBaseline
```

```
Arm              0    1
  traditional  513  284
  large        146 1002
  large grace   51  981
  cow          200  874
```

```
con ← con[(Fromxid),
  grepout("groupid|hhid|tee|^dummy[A-Z]|Floo|Tim|Size|With|Poo|RM|Expen|Head|HH",
  colnames(con)), with = F]
expcol ← grepout("Exp", colnames(con))
con[, paste0("PC", expcol) := .SD/HHsize, .SDcols = expcol]
pcexpcol ← grepout("PC", colnames(con))
con[, c("PCExpenditure", "TotalExpenditure") :=
  .(eval(parse(text=paste(pcexpcol, collapse = "+"))),
    eval(parse(text=paste(expcol, collapse = "+"))))]
con[, grepout("Loan|UD|^Tota|Food|Ener|Soc|^Hygi|^Time$", colnames(con)) := NULL]
# drop Time 2 (period 1-2) and its iteractions, because data starts from t=2
#conR[, grepout("Time.?2|Time.?3|^Time$", colnames(con)) := NULL]
conR = copy(con)
conR[, grepout("Time.?2|^Time$", colnames(con)) := NULL]
con[, grepout("RM", colnames(con)) := NULL]
datas ← c("con", "conR")
ddatas ← paste0("d", datas)
ddatasd ← paste0(ddatas, "d")
for (i in 1:length(datas)) {
# a  dl ← prepFDData(get(datas[i]), Group = "^hhid$", TimeVar = "tee", Cluster = "groupid
# a    LevelCovariates = "^dummy[A-Z].*[a-z]$|Floo|^Time\\..$|Head|HH",
# a    drop.if.NA.in.differencing = T, LevelPeriodToKeep = "last",
# a    use.var.name.for.dummy.prefix = F, print.messages = F)
# a  dat ← dl$diff
  dl ← FirstDiffPanelData(get(datas[i]),
    Group = "^hhid$", TimeVar = "tee", Cluster = "groupid",
     LevelCovariates = "^dummy|Head|^Time\\..$|Female$|Floo|Eldest|HH|credits|xid$|SchPa|^
  dat ← dl$diff
  dat[, grepout("^en$", colnames(dat)) := NULL]
  # Recreate Time.4 which is dropped when kept only 1:(T-1) obs.
  dat[, grepout("Time.?2", colnames(dat)) := NULL]
  assign(ddatas[i], dl)
  assign(ddatasd[i], dat)
}
```

```
Dropped 4028 obs due to NA.
Dropped 4029 obs due to NA.
```

```
Warning in `[.data.table`(dat, , `:=`(grepout("Time.?2", colnames(dat)), : length(LHS)==0;
```

```
dcond[, Tee := .N, by = hhid]
```

Consumption is observed in rd 2-4. There are 6400 observations, with first-differencing, it becomes 2372 observations with 42, 2330 households observed for 2, 3 times.

```
source(paste0(pathprogram, "ReadTrimConsumptionOriginalHHsFDData.R"))
```

```
Dropped 4028 obs due to NA.
Dropped 4029 obs due to NA.
```

```
Warning in `[.data.table`(dat, , `:=`(grepout("Time.?2|Arm", colnames(dat)), : length(LHS)
```

```
FileName ← "Consumption"
cnsuffixes ← c("", "g", "p", "s", "a")
listheader ← paste0("cn", cnsuffixes)
Regressands ← c(rep("PCExpenditure", 4), rep("PCHygieneExpenditure", 3))
DataToUse1 ← DataToUse2 ← c(rep("dcond", 3), "dconRd", rep("dcond", 2), "dconRd")
Addseparatingcols = 4; Separatingcolwidth = .2
Separatingcoltitle = c("Per capita consumption (Tk)", "Per capita hygiene consumption (Tk)
```

```
source(paste0(pathprogram, "ConsumptionCovariateSelection.R"))
```

```
FileNameHeader ← paste0(c("", "Grace", "PovertyStatus", "Size", "Attributes"),
  "OriginalHHs")
exclheader ← paste0("excl", cnsuffixes)
source(paste0(pathprogram, "FDEstimationFile.R"))
```

```
FileNameHeader ← paste0(FileNameHeader, "Robustness")
exclheader ← paste0("excl", cnsuffixes)
source(paste0(pathprogram, "FDEstimationFile.R"))
```

```
#dummy chunk
```

TABLE 46: FD ESTIMATION OF CONSUMPTION

	Per capita consumption (Tk)				Per capita hygiene consumption (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	336.8***	571.9***	569.1***	562.8***	171.7***	214.9***	207.3***
	(37.7)	(60.1)	(61.6)	(64.5)	(21.3)	(32.2)	(33.9)
Large	8.9	8.6	7.5	16.2	28.4	46.9	43.4
	(50.7)	(68.8)	(68.6)	(70.3)	(26.7)	(36.6)	(37.8)
LargeGrace	−36.8	−82.0	−82.5	−88.5	13.6	4.1	13.8
	(50.1)	(60.3)	(60.5)	(63.2)	(27.6)	(32.0)	(30.8)
Cow	−40.6	−9.1	−20.5	−27.2	1.2	35.5	37.4
	(46.4)	(58.8)	(57.9)	(64.8)	(28.0)	(35.0)	(34.9)
rd 3 - 4		−461.2***	−448.9***	−449.1***		−109.5***	−91.4***
		(70.8)	(70.7)	(73.1)		(35.1)	(34.0)
Large × rd 3 - 4		3.5	8.2	−8.6		−103.3	−61.2
		(222.4)	(222.9)	(236.1)		(103.7)	(108.3)
LargeGrace × rd 3 - 4		260.1	261.7	270.4		53.1	81.9
		(220.6)	(220.7)	(220.4)		(110.9)	(110.5)
Cow × rd 3 - 4		−158.3	−118.6	−105.5		−186.2*	−163.1*
		(209.6)	(208.6)	(210.1)		(100.7)	(98.5)
FloodInRd1			−9.3	−14.0			−1.0
			(27.6)	(31.8)			(17.3)
Head literate			35.8	35.2			28.7
			(37.5)	(37.9)			(24.5)
6M repayment				22.2			37.1
				(84.4)			(49.2)
6M net saving				−118.1			69.2
				(219.2)			(130.8)
6M other member net saving				−222.7			578.1
				(1063.8)			(427.9)
6M other member Repaid				58.4			15.5
				(161.7)			(80.7)
$T = 2$	42	42	42	43	42	42	43
$T = 3$	1165	1165	1162	1161	1165	1165	1161
$\bar{R}^2$	−0.001	0.072	0.07	0.07	−0.001	0.019	0.018
$\hat{\rho}$	−0.456	−0.374	−0.370	−0.360	−0.319	−0.266	−0.253
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	2372	2372	2366	2365	2372	2372	2365

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Consumption is annualised values.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 47: FD estimation of consumption by attributes

	Per capita consumption (Tk)				Per capita hygiene consumption (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	336.8***	571.9***	569.1***	562.8***	171.7***	214.9***	207.3***
	(37.7)	(60.1)	(61.6)	(64.5)	(21.3)	(32.2)	(33.9)
WithGrace	−45.7	−90.6	−90.0	−104.7*	−14.9	−42.8	−29.6
	(47.3)	(59.6)	(59.8)	(62.3)	(23.8)	(29.9)	(31.6)
LargeSize	8.9	8.6	7.5	16.2	28.4	46.9	43.4
	(50.7)	(68.8)	(68.6)	(70.3)	(26.7)	(36.6)	(37.8)
NonCash	−3.8	72.9	62.0	61.3	−12.3	31.4	23.5
	(42.7)	(47.7)	(47.4)	(49.1)	(25.2)	(27.8)	(25.3)
rd 3 - 4		−461.2***	−448.9***	−449.1***		−109.5***	−91.4***
		(70.8)	(70.7)	(73.1)		(35.1)	(34.0)
LargeSize × rd 3 - 4		3.5	8.2	−8.6		−103.3	−61.2
		(222.4)	(222.9)	(236.1)		(103.7)	(108.3)
WithGrace × rd 3 - 4		256.5	253.4	279.0		156.3	143.1
		(198.0)	(198.4)	(196.7)		(100.5)	(96.7)
NonCash × rd 3 - 4		−418.4**	−380.3**	−375.9**		−239.2**	−245.0***
		(183.6)	(182.3)	(182.6)		(97.4)	(93.6)
FloodInRd1			−9.3	−14.0			−1.0
			(27.6)	(31.8)			(17.3)
Head literate			35.8	35.2			28.7
			(37.5)	(37.9)			(24.5)
6M repayment				22.2			37.1
				(84.4)			(49.2)
6M net saving				−118.1			69.2
				(219.2)			(130.8)
6M other member net saving				−222.7			578.1
				(1063.8)			(427.9)
6M other member Repaid				58.4			15.5
				(161.7)			(80.7)
$T = 2$	42	42	42	43	42	42	43
$T = 3$	1165	1165	1162	1161	1165	1165	1161
$\bar{R}^2$	−0.001	0.072	0.07	0.07	−0.001	0.019	0.018
$\hat{\rho}$	−0.456	−0.374	−0.370	−0.360	−0.319	−0.266	−0.253
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	2372	2372	2366	2365	2372	2372	2365

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Consumption is annualised values.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 48: FD estimation of consumption, moderately poor vs. ultra poor

	Per capita consumption (Tk)				Per capita hygiene consumption (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	335.3***	565.2***	547.9***	547.3***	195.7***	255.0***	246.6***
	(25.4)	(47.1)	(45.4)	(46.7)	(14.4)	(24.5)	(25.3)
UltraPoor	−25.5	−26.8	−16.3	−18.9	−16.3	−19.9	−15.5
	(24.2)	(29.2)	(28.0)	(27.8)	(16.3)	(17.2)	(17.4)
rd 3 - 4		−454.9***	−438.8***	−443.4***		−113.3***	−95.7***
		(75.1)	(74.2)	(77.2)		(38.2)	(36.1)
UltraPoor × rd 3 - 4		−20.0	−56.7	−53.6		12.7	−3.6
		(89.1)	(82.5)	(83.6)		(54.9)	(55.1)
FloodInRd1			−4.9	−5.7			−1.7
			(28.0)	(31.4)			(17.2)
Head literate			35.5	34.8			27.5
			(35.9)	(36.4)			(23.6)
6M repayment				17.6			37.5
				(86.5)			(49.9)
6M net saving				−112.3			82.0
				(227.7)			(131.5)
6M other member net saving				−182.6			428.8
				(971.7)			(430.7)
6M other member Repaid				0.9			−0.3
				(163.2)			(78.1)
$T = 2$	42	42	42	43	42	42	43
$T = 3$	1165	1165	1162	1161	1165	1165	1161
$\bar{R}^2$	0	0.065	0.064	0.063	0	0.011	0.01
$\hat{\rho}$	−0.458	−0.375	−0.369	−0.363	−0.322	−0.298	−0.282
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	2372	2372	2366	2365	2372	2372	2365

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Consumption is annualised values.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Table 49: FD estimation of consumption, large vs. small size loans

	Per capita consumption (Tk)				Per capita hygiene consumption (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	336.8***	571.0***	566.0***	563.9***	171.7***	209.9***	208.6***
	(37.7)	(60.4)	(61.7)	(64.5)	(21.3)	(34.5)	(33.8)
LargeSize	−22.7	−27.4	−31.4	−32.6	14.5	26.9	30.4
	(41.9)	(54.3)	(54.3)	(55.7)	(23.6)	(29.9)	(29.7)
rd 3 - 4		−458.2***	−445.9***	−449.6***		−102.2***	−93.4***
		(73.2)	(72.8)	(76.0)		(36.2)	(35.2)
LargeSize × rd 3 - 4		35.1	50.4	44.1		−72.0	−53.9
		(189.6)	(189.4)	(194.5)		(90.0)	(91.4)
FloodInRd1			−5.8	−6.9		−1.3	−0.6
			(28.5)	(32.0)		(17.0)	(17.4)
Head literate			37.1	36.7		29.4	28.2
			(36.0)	(36.5)		(23.7)	(23.7)
6M repayment				17.0			35.1
				(84.3)			(49.5)
6M net saving				−101.2			71.4
				(224.2)			(127.8)
6M other member net saving				−202.1			435.7
				(1016.6)			(436.9)
6M other member Repaid				6.3			−4.0
				(162.5)			(78.8)
$T = 2$	42	42	42	43	42	42	43
$T = 3$	1165	1165	1162	1161	1165	1162	1161
$\bar{R}^2$	0	0.065	0.064	0.063	0	0.01	0.011
$\hat{\rho}$	−0.462	−0.380	−0.373	−0.367	−0.318	−0.300	−0.286
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	2372	2372	2366	2365	2372	2366	2365

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Consumption is annualised values.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

TABLE 50: FD ESTIMATION OF CONSUMPTION, WITH VS. WITHOUT A GRACE PERIOD

	Per capita consumption (Tk)				Per capita hygiene consumption (Tk)		
covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	342.8***	576.9***	573.5***	576.5***	190.9***	247.4***	239.6***
	(25.9)	(52.6)	(53.1)	(53.1)	(13.0)	(27.4)	(29.0)
WithGrace	−44.7	−51.5	−56.7	−76.2*	−11.8	−11.9	−7.1
	(33.6)	(43.9)	(43.4)	(46.1)	(18.2)	(23.8)	(24.7)
rd 3 - 4		−458.6***	−446.3***	−454.0***		−112.3***	−96.3***
		(73.7)	(73.3)	(76.1)		(36.9)	(35.5)
WithGrace × rd 3 - 4		48.9	66.4	98.4		3.4	4.8
		(148.0)	(147.3)	(140.8)		(73.7)	(69.5)
FloodInRd1			−9.8	−16.0			−2.7
			(27.5)	(31.3)			(17.6)
Head literate			36.0	35.8			28.3
			(36.2)	(36.8)			(23.7)
6M repayment				21.3			37.4
				(85.1)			(49.7)
6M net saving				−114.5			82.0
				(230.0)			(131.7)
6M other member net saving				−575.2			396.4
				(991.3)			(421.6)
6M other member Repaid				48.8			3.2
				(152.3)			(75.5)
$T = 2$	42	42	42	43	42	42	43
$T = 3$	1165	1165	1162	1161	1165	1165	1161
$\bar{R}^2$	0	0.066	0.065	0.065	0	0.011	0.01
$\hat{\rho}$	−0.456	−0.379	−0.372	−0.371	−0.317	−0.292	−0.286
$\Pr[\hat{\rho} = 0]$	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	2372	2372	2366	2365	2372	2372	2365

Source: Estimated with GUK administrative and survey data.

Notes: 1. First-difference estimates. A first-difference is defined as $\Delta x_{t+1} \equiv x_{t+1} - x_t$. Saving and repayment misses are taken from administrative data and merged with survey data at Year-Month of survey interviews. Intercept terms are omitted in estimating equations. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Consumption is annualised values.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

Finding IV.5 TABLE 46 uses rd 2 - 4 data and shows an increase in per member consumption in rd 2 - 3 period. The estimates are imprecise for all interaction terms. Continued increases in consumption hints welfare gains, but do not differ by arms. Per member food consumption increases in rd 2- 3 period but decreases in rd 3 - 4 period.

IV.8 IGA

```
adw2 ← readRDS(paste0(path1234, "admin_data_wide2.rds"))
iga ← adw2[, .(hhid, Arm, Date, iga11st, iga12nd, iga13rd)]
setnames(iga, c("hhid", "Arm", "Date", paste0("iga", 1:3)))
#table0(iga[, iga1])
#table0(iga[, iga2])
#table0(iga[, iga3])
setkey(iga, hhid, Date)
iga[, NumIGA := sum(!is.na(iga1)) + sum(!is.na(iga2)) + sum(!is.na(iga3)), by = .(hhid, D
#iga[NumIGA == 0 & !is.na(iga1), ]
setkey(iga, NumIGA, iga1, iga2, iga3)
iga.unique ← unique(iga[, .(NumIGA, iga1, iga2, iga3)])
iga.unique ← iga[iga.unique, .N/48, by = .EACHI]
setnames(iga.unique, "V1", "N")
setorder(iga.unique, -NumIGA, -N, iga1, iga2, iga3)
setkey(iga, NumIGA, iga1, Arm)
igaArm.unique ← unique(iga[, .(NumIGA, iga1, Arm)])
igaArm.unique ← iga[igaArm.unique, .N/48, by = .EACHI]
setnames(igaArm.unique, "V1", "N")
```

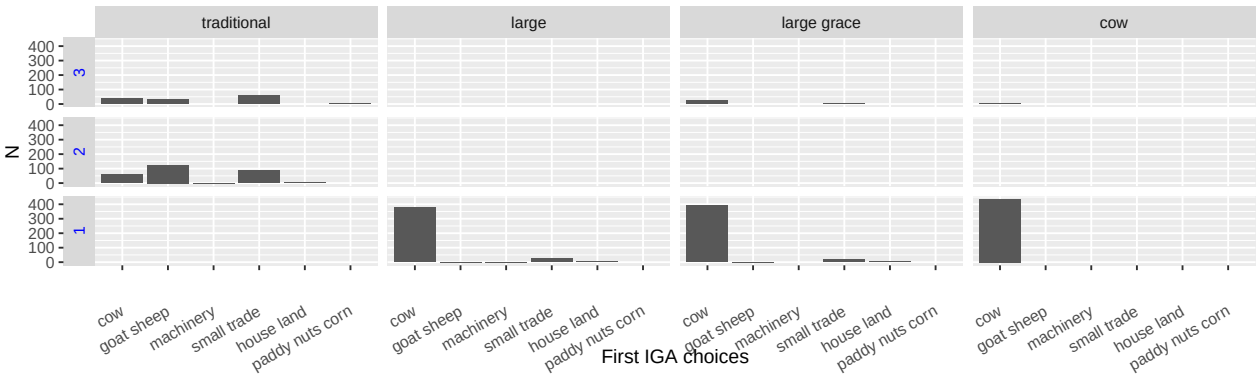

Figure 7: Income generatng activity choices
The first income generating activity choices are plotted.

```
setorder(igaArm.unique, -NumIGA, -N, iga1)
for (i in 1:3) {
  iga[, paste0("IGA.", i) := as.character(NA)]
  iga[grepl("Cow|oxen", eval(parse(text = paste0("iga", i)))),
    paste0("IGA.", i) := "cow"]
  iga[grepl("Goa|heep", eval(parse(text = paste0("iga", i)))),
    paste0("IGA.", i) := "goat sheep"]
  iga[grepl("small", eval(parse(text = paste0("iga", i)))),
    paste0("IGA.", i) := "small trade"]
  iga[grepl("house|land", eval(parse(text = paste0("iga", i)))),
    paste0("IGA.", i) := "house land"]
  iga[grepl("machi", eval(parse(text = paste0("iga", i)))),
    paste0("IGA.", i) := "machinery"]
  iga[grepl("addy|nut", eval(parse(text = paste0("iga", i)))),
    paste0("IGA.", i) := "paddy nuts corn"]
  iga[, paste0("IGA.", i) := factor(eval(parse(text = paste0("IGA.", i))),
    levels = c("cow", "goat sheep", "machinery", "small trade", "house land", "paddy nuts
}
setkey(iga, NumIGA, IGA.1, IGA.2, IGA.3, Arm)
iga.unique3 ← unique(iga[, .(NumIGA, IGA.1, IGA.2, IGA.3, Arm)])
iga.unique3 ← iga[iga.unique3, .N/48, by = .EACHI]
setnames(iga.unique3, "V1", "N")
setorder(iga.unique3, -NumIGA, -N, Arm, IGA.1, IGA.2, IGA.3)
iga.unique3[, NumIGA := factor(NumIGA, levels = 3:0)]

library(ggplot2)
ggplot(data = iga.unique3[NumIGA != 0 & !is.na(IGA.1), ], aes(IGA.1, N)) +
  geom_col() +
  xlab("First IGA choices") +
  theme(axis.text.x = element_text(angle = 30, vjust = .5, hjust = 1),
    strip.text.y = element_text(colour = "blue"))+
  facet_grid(NumIGA ~ Arm, switch = "y")

iga.unique3[, num := 1:.N]
igaUL ← reshape(iga.unique3, direction = "long", idvar = c("num", "NumIGA", "Arm", "N"),
  varying = paste0("IGA.", 1:3))
setnames(igaUL, "time", "rank")
setkey(igaUL, num, rank)
library(ggplot2)
ggplot(data = igaUL[NumIGA != 0 & !is.na(IGA), ], aes(IGA, N)) +
```

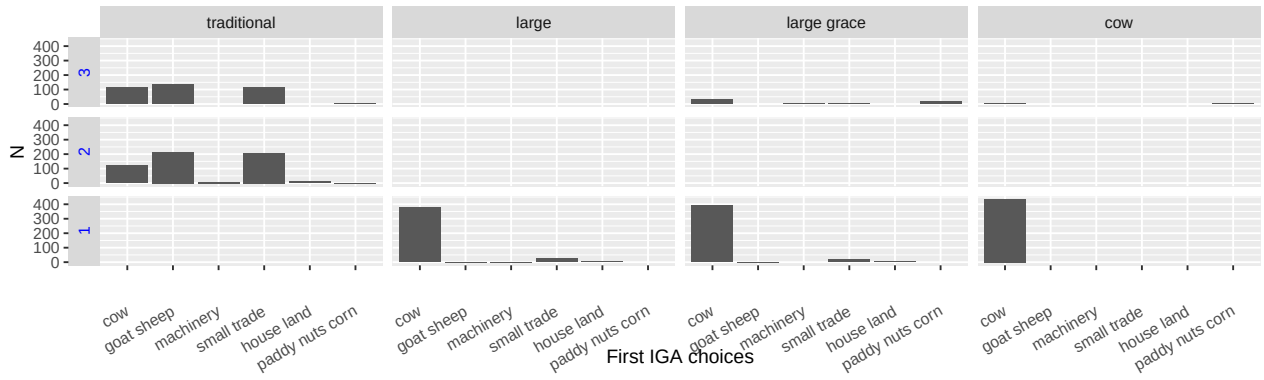

Figure 8: All income generatng activity choices
All of multiple investment choices are summed by arms and the number of IGAs and plotted as bars.

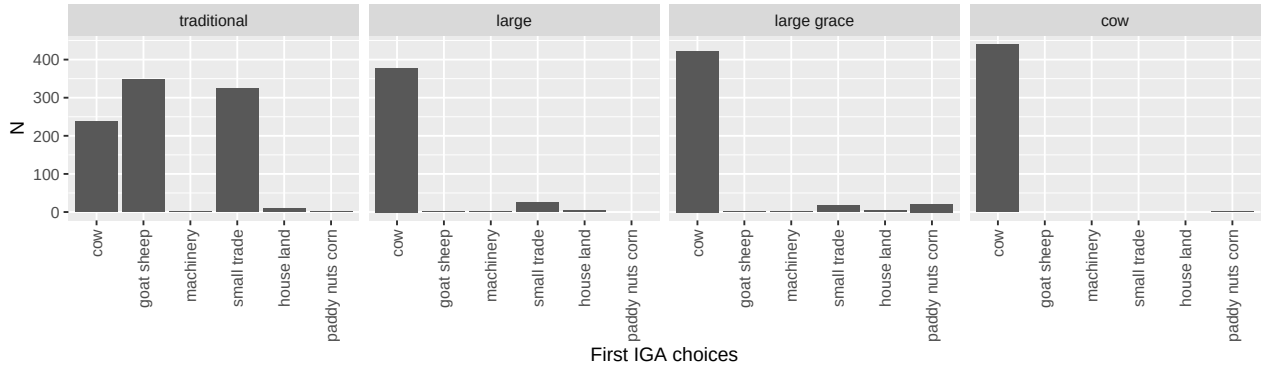

Figure 9: All income generatng activity choices collapsed over different number of IGAs
All of multiple investment choices are summed by arms and plotted as bars.

```
  geom_col() +
  xlab("First IGA choices") +
  theme(axis.text.x = element_text(angle = 30, vjust = .5, hjust = 1),
    strip.text.y = element_text(colour = "blue"))+
  facet_grid(NumIGA ~ Arm, switch = "y")
```

```
iga.unique3[, num := 1:.N]
igaUL ← reshape(iga.unique3, direction = "long", idvar = c("num", "NumIGA", "Arm", "N"),
  varying = paste0("IGA.", 1:3))
setnames(igaUL, "time", "rank")
setkey(igaUL, num, rank)
library(ggplot2)
ggplot(data = igaUL[NumIGA != 0 & !is.na(IGA), ], aes(IGA, N)) +
  geom_col() +
  xlab("First IGA choices") +
  theme(axis.text.x = element_text(angle = 90, vjust = .5, hjust = 1),
    strip.text.y = element_text(colour = "blue"))+
  facet_grid(. ~ Arm, switch = "y")
```

Finding IV.6 FIGURE **??**, **??** show that there are very few members who chose to invest in more than one project for the "large" arms, while in the traditional arm, almost no one invested only in one project. Goat/sheep and small trades are the top choices for the first IGA in traditional. This indicates the exitence of both a liquidity constraint and convexity in the production technology of large domestic animals. This also validates our supposition that dairy livestock

production is the most preferred and probably the only economically viable investment choice. It reduces a concern that the cow arm may have imposed an unnecessary restriction in an investment choice by forcing to receive a cow. FIGURE **??** shows there are a significant number of cases in the traditional arm that members reportedly raise cows, yet they are also accompanied by pararell projects in smaller livestock production and small trades. Contrasting large, large grace with cow arms, it suggests that entrepreneurship (to the extent that is necessary for dairy livestock production) may not be an impediment for a microfinance loan uptake among members.

Together with TABLE **??** showing smaller net saving and repayment among traditional, the restriction on a project choice induced by a smaller loaned sum resulted in smaller returns. Between with or no grace period loans, cumulative net saving and repayment are both larger with loans with a grace period. No such difference is found between cow and other arms.