

The Assignment of Intellectual Property Rights and Innovation

```
##### WORKSPACE & PACKAGES #####
```

```
lapply(c("tidyverse", "lubridate", "fixest", "data.table"), library, character.only = TRUE)
```

```
summarize <- dplyr::summarize
```

```
select <- dplyr::select
```

```
rename <- dplyr::rename
```

```
##### FUNCTIONS #####
```

```
winsorize <- function(object, lower_percentile, upper_percentile, exclude = NULL){
```

```
  if (is.data.frame(object) == TRUE){
```

```
    reference_columns <- names(object)
```

```
    numeric_columns <- sapply(object, is.numeric)
```

```
    exclude_columns <- if(!is.null(exclude)) exclude %>% as.vector() %>% as.character() else vector() %>% as.character()
```

```
    numeric_subset <- object[ , numeric_columns]
```

```
    nonnumeric_subset <- cbind(object[ , !numeric_columns], object[ , exclude_columns])
```

```
    winsorized_variables <- numeric_subset %>% select(- one_of(exclude_columns))
```

```
    columns <- ncol(winsorized_variables)
```

```
    rows <- nrow(winsorized_variables)
```

```
    for (i in 1:columns){
```

```
      L <- (lower_percentile / 100)
```

```
      U <- (upper_percentile / 100)
```

```
      percentile <- as.matrix(quantile(winsorized_variables[[i]], c(L, U) , na.rm = T))
```

```
      min <- percentile[1,1]
```

```
      max <- percentile[2,1]
```

```
      for (j in 1:rows){
```

```
        winsorized_variables[j, i] <- if (is.na(winsorized_variables[j, i]) | is.infinite(winsorized_variables[j, i])) NA else
```

```
        if (winsorized_variables[j, i] < min) min else if (winsorized_variables[j, i] > max) max else winsorized_variables[j, i]
```

```
      }
```

```
    }
```

```
    final_output <- cbind(nonnumeric_subset, winsorized_variables)
```

```
    final_output <- final_output[, c(reference_columns, setdiff(names(final_output), reference_columns))]
```

```
    cat("\n", "In total,", columns, "variables were winsorized:", colnames(winsorized_variables))
```

```
    return(final_output)
```

```
  }
```

```
  else if (is.vector(object) == TRUE){
```

```

L <- (lower_percentile / 100)
U <- (upper_percentile / 100)
percentile <- as.matrix(quantile(object, c(L, U) , na.rm = T))
min <- percentile[1,1]
max <- percentile[2,1]
for (i in 1:length(object)){
  object[i] <- if (is.na(object[i]) | is.infinite(object[i])) NA else
    if (object[i] < min) min else if (object[i] > max) max else object[i]
}
return(object)
}
}

```

```

##### TABLE 1: SUMMARY STATISTICS #####
### NUMBER OF OBSERVATIONS ###
Data %>% filter(!is.na(AvB2)) %>% nrow

```

```
## [1] 389451
```

```
Data$inventor_id[!is.na(Data$AvB2)] %>% unique %>% length
```

```
## [1] 183343
```

```
Data$patent_number[!is.na(Data$AvB2)] %>% unique %>% length
```

```
## [1] 171009
```

PATENT-LEVEL SUMMARY STATISTICS

```

Descriptives <- Data %>%
  filter(!is.na(AvB2)) %>%
  group_by(patent_number) %>%
  mutate(patent_competitor = max(patent_competitor, na.rm = T)) %>%
  ungroup() %>%
  transmute(patent_number,
             individual_patent = individual_patent / 100,
             patent_competitor = patent_competitor / 100,
             early_publication_request = early_publication_request / 100,
             early_publication_request_time = ifelse(early_publication_request == 1, early_publication_request_time, NA),
             patent_originality = patent_originality / 100,
             patent_generality = patent_generality / 100,
             n_inventors) %>%
  distinct() %>%
  select(-patent_number)

psych::describe(Descriptives, quant = c(.25, .75)) %>%
  as.data.frame %>%
  rownames_to_column() %>%
  select(rowname, n, mean, sd, Q0.25, median, Q0.75) %>%
  print(., digits = 3)

```

##	rowname	n	mean	sd	Q0.25	median	Q0.75
## 1	individual_patent	171009	0.12833	0.3344	0.000	0.000	0.000
## 2	patent_competitor	171009	0.14347	0.3505	0.000	0.000	0.000
## 3	early_publication_request	171009	0.00299	0.0546	0.000	0.000	0.000
## 4	early_publication_request_time	511	47.22505	101.5267	0.000	0.000	37.000
## 5	patent_originality	144077	0.49353	0.2779	0.398	0.590	0.713
## 6	patent_generality	120126	0.31643	0.2718	0.000	0.384	0.562
## 7	n_inventors	171009	2.47158	1.6541	1.000	2.000	3.000

INVENTOR-LEVEL SUMMARY STATISTICS

```

Descriptives <- Data %>%
  filter(!is.na(AvB2)) %>%
  left_join(Moves.all,
            by = c("inventor_id", "priority_year")) %>%
  left_join(Moves.to_control,
            by = c("inventor_id", "priority_year")) %>%
  left_join(Inventors %>%
            filter(inventor_country == "US") %>%
            left_join(Combined %>%
                      select(patent_number, first_priority_date),
                      by = "patent_number") %>%
            filter(!is.na(first_priority_date)) %>%
            mutate(priority_year = lubridate::year(first_priority_date)) %>%
            mutate(inventor_state = inventor_state) %>%
            distinct() %>%
            na.omit %>%
            group_by(inventor_state, priority_year) %>%
            summarize(inventors_in_state = n()) %>%
            ungroup(),
            by = c("inventor_state", "priority_year")) %>%
  left_join(Inventors %>%
            filter(inventor_country == "US") %>%
            left_join(Combined %>%
                      select(patent_number, first_priority_date),
                      by = "patent_number") %>%
            filter(!is.na(first_priority_date)) %>%
            mutate(priority_year = lubridate::year(first_priority_date) + 1) %>%
            mutate(inventor_state = inventor_state) %>%
            distinct() %>%
            na.omit %>%
            group_by(inventor_state, priority_year) %>%
            summarize(lag_inventors_in_state = n()) %>%
            ungroup(),
            by = c("inventor_state", "priority_year")) %>%
  left_join(Assignees %>%
            filter(assignee_country == "US") %>%
            left_join(Combined %>%
                      select(patent_number, first_priority_date),
                      by = "patent_number") %>%
            filter(!is.na(first_priority_date)) %>%
            mutate(priority_year = lubridate::year(first_priority_date)) %>%
            mutate(inventor_state = assignee_state) %>%
            distinct() %>%
            na.omit %>%
            group_by(inventor_state, priority_year) %>%
            summarize(assignees_in_state = n()) %>%
            ungroup(),
            by = c("inventor_state", "priority_year")) %>%
  left_join(Assignees %>%
            filter(assignee_country == "US") %>%
            left_join(Combined %>%

```

```

      select(patent_number, first_priority_date),
      by = "patent_number") %>%
    filter(!is.na(first_priority_date)) %>%
    mutate(priority_year = lubridate::year(first_priority_date) + 1) %>%
    mutate(inventor_state = assignee_state) %>%
    distinct() %>%
    na.omit %>%
    group_by(inventor_state, priority_year) %>%
    summarize(lag_assignees_in_state = n()) %>%
    ungroup(),
    by = c("inventor_state", "priority_year")) %>%
  mutate(inventors_in_state = inventors_in_state %>% replace_na(., 0) %>% winsorize(., 1, 99),
    lag_inventors_in_state = lag_inventors_in_state %>% replace_na(., 0) %>% winsorize(.,
1, 99),
    assignees_in_state = assignees_in_state %>% replace_na(., 0) %>% winsorize(., 1, 99),
    lag_assignees_in_state = lag_assignees_in_state %>% replace_na(., 0) %>% winsorize(.,
1, 99),
    agglomeration_state.inventors = (inventors_in_state - lag_inventors_in_state) %>% winso
rize(., 1, 99),
    agglomeration_state.assignees = (assignees_in_state - lag_assignees_in_state) %>% winso
rize(., 1, 99),
    agglomeration_state.inventors = agglomeration_state.inventors / 1000,
    agglomeration_state.assignees = agglomeration_state.assignees / 1000) %>%
  transmute(inventor_id,
    AvB2,
    changes_employer,
    changes_to_control,
    agglomeration_state.inventors,
    agglomeration_state.assignees,
    n_patents,
    same_state) %>%
  distinct() %>%
  group_by(inventor_id) %>%
  summarize(AvB2 = mean(AvB2, na.rm = T),
    changes_employer = mean(changes_employer, na.rm = T),
    changes_to_control = mean(changes_to_control, na.rm = T),
    agglomeration_state.inventors = mean(agglomeration_state.inventors, na.rm = T),
    agglomeration_state.assignees = mean(agglomeration_state.assignees, na.rm = T),
    n_patents = mean(n_patents, na.rm = T),
    same_state = mean(same_state, na.rm = T)) %>%
  ungroup() %>%
  select(-inventor_id)

psych::describe(Descriptives, quant = c(.25, .75)) %>%
  as.data.frame %>%
  rownames_to_column() %>%
  select(rowname, n, mean, sd, Q0.25, median, Q0.75) %>%
  print(., digits = 3)

```

##	rowname	n	mean	sd	Q0.25	median	Q0.75
## 1	AvB2	183343	0.2686	0.416	0.000	0.000	0.500
## 2	changes_employer	183343	0.1856	0.376	0.000	0.000	0.000
## 3	changes_to_control	183343	0.0204	0.133	0.000	0.000	0.000
## 4	agglomeration_state.inventors	183343	-0.7586	1.405	-0.858	-0.317	0.060
## 5	agglomeration_state.assignees	183343	-0.3204	0.556	-0.434	-0.118	-0.011
## 6	n_patents	183343	1.3855	1.041	1.000	1.000	1.333
## 7	same_state	183343	0.6356	0.471	0.000	1.000	1.000

FIRM-LEVEL SUMMARY STATISTICS

```

Descriptives <- Data.firm %>%
  filter(!is.na(AvB2.ex_ante)) %>% filter(!is.infinite(AvB2.ex_ante)) %>% # drop Texas
  transmute(AvB2.ex_ante,
    n_patents,
    n_inventors,
    same_state,
    perc_treat_state_patents = perc_treat_state_patents / 100,
    perc_cross_treat_control_patent = perc_cross_treat_control_patent / 100,
    avg_perc_disclosure.early = avg_perc_disclosure.early / 100,
    hhi_class = hhi_class / 100)

psych::describe(Descriptives, quant = c(.25, .75)) %>%
  as.data.frame %>%
  rownames_to_column() %>%
  select(rowname, n, mean, sd, Q0.25, median, Q0.75) %>%
  print(., digits = 3)

```

##	rowname	n	mean	sd	Q0.25	median	Q0.75
## 1	AvB2.ex_ante	17978	0.12625	0.3175	0.0	0	0.000
## 2	n_patents	17978	7.71632	60.7235	1.0	1	2.000
## 3	n_inventors	17978	11.99227	89.1944	1.0	2	5.000
## 4	same_state	17978	0.74697	0.3773	0.5	1	1.000
## 5	perc_treat_state_patents	17978	0.63515	0.4623	0.0	1	1.000
## 6	perc_cross_treat_control_patent	17978	0.05842	0.2069	0.0	0	0.000
## 7	avg_perc_disclosure.early	17978	0.00399	0.0589	0.0	0	0.000
## 8	hhi_class	17978	0.23818	0.3222	0.0	0	0.481

TABLE 2: ALCATEL VS. BROWN AND PATENT ASSIGNMENT

PANEL A: INDIVIDUAL PATENTS

```

MODEL <- feols(individual_patent ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inventors) + same_state) | firm_year + inventor_id + inventor_city + hqstate_year + class_year, Data); summary(MODEL, cluster = c("firm", "inventor_id", "class")) %>% lapply(., print)

```

```
## OLS estimation, Dep. Var.: individual_patent
## Observations: 389,451
## Fixed-effects: firm_year: 49,928, inventor_id: 183,343, inventor_city: 11,327, hqstate_year: 307, class_year: 1,772
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error  t value Pr(>|t|)
## AvB2 -0.016599   0.009979 -1.66343 0.096973 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.244654    Adj. R2: 0.999746
##              Within R2: 3.896e-5
## OLS estimation, Dep. Var.: individual_patent
## Observations: 389,451
## Fixed-effects: firm_year: 49,928, inventor_id: 183,343, inventor_city: 11,327, hqstate_year: 307, class_year: 1,772
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error  t value Pr(>|t|)
## AvB2          -0.015863   0.009342 -1.69803 0.090245 .
## asinh(n_patents) -0.003790   0.003177 -1.19282 0.233614
## asinh(n_inventors) -0.001981   0.001337 -1.48120 0.139306
## same_state       0.068630   0.049051  1.39914 0.162510
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.2446    Adj. R2: 0.999746
##              Within R2: 4.76e-4
```

```
## `$`rhs: AvB2`
## NULL
##
## `$`rhs: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

```
### PANEL B: FUTURE COMPETITOR PATENTS ###
```

```
MODEL <- feols(patent_competitor ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inventors) + same_state) | firm_year + inventor_id + inventor_city + hqstate_year + class_year, Data); summary(MODEL, cluster = c("firm", "inventor_id", "class")) %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: patent_competitor
## Observations: 389,451
## Fixed-effects: firm_year: 49,928, inventor_id: 183,343, inventor_city: 11,327, hqstate_year: 307, class_year: 1,772
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error  t value Pr(>|t|)
## AvB2 -1.83086    0.901575 -2.03074 0.042912 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 13.1      Adj. R2: 0.420624
##              Within R2: 1.659e-4
## OLS estimation, Dep. Var.: patent_competitor
## Observations: 389,451
## Fixed-effects: firm_year: 49,928, inventor_id: 183,343, inventor_city: 11,327, hqstate_year: 307, class_year: 1,772
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error  t value Pr(>|t|)
## AvB2          -1.877761    0.906450 -2.07155 0.0389184 *
## asinh(n_patents) -0.680006    0.352286 -1.93027 0.0542479 .
## asinh(n_inventors) 0.245384    0.143559  1.70929 0.0881374 .
## same_state       -2.772426    0.973568 -2.84770 0.0046204 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 13.1      Adj. R2: 0.420863
##              Within R2: 5.999e-4
```

```
## `$` rhs: AvB2`
## NULL
##
## `$` rhs: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

```
##### TABLE 3: ALCATEL VS. BROWN AND INVENTOR MOBILITY - MOVES ANYWHERE #####
```

```
treatment_date <- ymd("2005-01-01")
```

```
Data2 <- Data %>%
```

```
  left_join(Moves.all,
            by = c("inventor_id", "priority_year")) %>%
  mutate(post = ifelse(filing_date >= (treatment_date %m-% years(1)), 1, 0), # set post period one year earlier to avoid overlapping DVs
         treat = ifelse(!inventor_state %in% c("CA", "DE", "IL", "KS", "MN", "NC", "NV", "UT", "WA"), 1, 0),
         treat2 = ifelse(inventor_state == "TX", NA, treat),
         AvB = post * treat,
         AvB2 = post * treat2,
         changes_employer = changes_employer * 100) %>%
  filter(filing_date >= (treatment_date %m-% years(1))) %>% # use only "2004" for static design (i.e., year prior to treatment)
  filter(filing_date <= (treatment_date - 1)) %>% # use only "2004" for static design (i.e., year prior to treatment)
  distinct(inventor_id, .keep_all = T)
```

```
MODEL <- feols(changes_employer ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inventors) + same_state) | firm_year + hqstate_year + class_year, Data2); summary(MODEL, cluster = "firm") %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: changes_employer
```

```
## Observations: 63,555
```

```
## Fixed-effects: firm_year: 12,833, hqstate_year: 88, class_year: 447
```

```
## Standard-errors: Clustered (firm)
```

```
##      Estimate Std. Error  t value  Pr(>|t|)
```

```
## AvB2 -3.73117    0.750926 -4.96876 6.8254e-07 ***
```

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
## RMSE: 35.0      Adj. R2: 0.118835
```

```
##           Within R2: 9.875e-4
```

```
## OLS estimation, Dep. Var.: changes_employer
```

```
## Observations: 63,555
```

```
## Fixed-effects: firm_year: 12,833, hqstate_year: 88, class_year: 447
```

```
## Standard-errors: Clustered (firm)
```

```
##      Estimate Std. Error  t value  Pr(>|t|)
```

```
## AvB2          -3.714156    0.807869 -4.597473 4.3174e-06 ***
```

```
## asinh(n_patents) 12.144282    1.086721 11.175156 < 2.2e-16 ***
```

```
## asinh(n_inventors) -2.544213    0.444611 -5.722330 1.0743e-08 ***
```

```
## same_state       -0.215492    1.214049 -0.177499 8.5912e-01
```

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
## RMSE: 34.7      Adj. R2: 0.135621
```

```
##           Within R2: 0.020077
```

```
## $\`rhs: AvB2`
## NULL
##
## $\`rhs: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

TABLE 4: ALCATEL VS. BROWN AND INVENTOR MOBILITY - MOVES TO CONTROL STATES

```
treatment_date <- ymd("2005-01-01")
```

```
Data2 <- Data %>%
```

```
  left_join(Moves.to_control,
            by = c("inventor_id", "priority_year")) %>%
  mutate(post = ifelse(filing_date >= (treatment_date %m-% years(1)), 1, 0), # set post period o
ne year earlier to avoid overlapping DVs
         treat = ifelse(!inventor_state %in% c("CA", "DE", "IL", "KS", "MN", "NC", "NV", "UT",
"WA"), 1, 0),
         treat2 = ifelse(inventor_state == "TX", NA, treat),
         AvB = post * treat,
         AvB2 = post * treat2,
         changes_to_control = changes_to_control %>% replace_na(., 0),
         changes_to_control = changes_to_control * 100) %>%
  filter(filing_date >= (treatment_date %m-% years(1))) %>% # use only "2004" for static design
(i.e., year prior to treatment)
  filter(filing_date <= (treatment_date - 1)) %>% # use only "2004" for static design (i.e., yea
r prior to treatment)
  distinct(inventor_id, .keep_all = T)
```

```
MODEL <- feols(changes_to_control ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inventors) + same_stat
e) | firm_year + hqstate_year + class_year, Data2); summary(MODEL, cluster = c("firm", "inventor
_id")) %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: changes_to_control
## Observations: 63,555
## Fixed-effects: firm_year: 12,833, hqstate_year: 88, class_year: 447
## Standard-errors: Clustered (firm & inventor_id)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2  4.58174    0.449479 10.1935 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 13.9      Adj. R2: -0.015136
##              Within R2:  0.009393
## OLS estimation, Dep. Var.: changes_to_control
## Observations: 63,555
## Fixed-effects: firm_year: 12,833, hqstate_year: 88, class_year: 447
## Standard-errors: Clustered (firm & inventor_id)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2          4.450161    0.403157 11.038268 < 2.2e-16 ***
## asinh(n_patents)  1.683339    0.213108  7.898982 3.0405e-15 ***
## asinh(n_inventors) -0.065634    0.140386 -0.467524 6.4013e-01
## same_state       -0.941818    0.328435 -2.867593 4.1428e-03 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 13.9      Adj. R2: -0.012528
##              Within R2:  0.011998
```

```
## `$`rhs: AvB2`
## NULL
##
## `$`rhs: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

TABLE 5: ALCATEL VS. BROWN AND NEW HIRES IN AGGLOMERATIONS

```
MODEL <- feols(firmchoice ~ AvB2 * agglomeration_state.inventors + same_state | firm_year + inventor_city + hqstate_year, Data.agglomeration); summary(MODEL, cluster = c("firm", "inventor_id"))
```

```
## OLS estimation, Dep. Var.: firmchoice
## Observations: 7,430,950
## Fixed-effects: firm_year: 21,358, inventor_city: 8,279, hqstate_year: 266
## Standard-errors: Clustered (firm & inventor_id)
##
##               Estimate Std. Error   t value   Pr(>|t|)
## AvB2              0.730933   0.153564   4.759807 1.9547e-06
## agglomeration_state.inventors -3.773275   0.601372 -6.274439 3.5988e-10
## same_state         0.001304   0.002462   0.529574 5.9641e-01
## AvB2:agglomeration_state.inventors 2.949356   0.613556   4.806988 1.5461e-06
##
## AvB2                ***
## agglomeration_state.inventors ***
## same_state
## AvB2:agglomeration_state.inventors ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 13.9      Adj. R2: 0.007651
##                Within R2: 0.011625
```

```
MODEL <- feols(firmchoice ~ AvB2 * agglomeration_state.assignees + same_state | firm_year + inventor_city + hqstate_year, Data.agglomeration); summary(MODEL, cluster = c("firm", "inventor_id"))
```

```
## OLS estimation, Dep. Var.: firmchoice
## Observations: 7,430,950
## Fixed-effects: firm_year: 21,358, inventor_city: 8,279, hqstate_year: 266
## Standard-errors: Clustered (firm & inventor_id)
##
##               Estimate Std. Error   t value   Pr(>|t|)
## AvB2              0.655672   0.096528   6.792573 1.1402e-11
## agglomeration_state.assignees -11.570387   1.158602 -9.986506 < 2.2e-16
## same_state         0.001325   0.002473   0.535905 5.9203e-01
## AvB2:agglomeration_state.assignees 9.100630   1.318724   6.901086 5.3536e-12
##
## AvB2                ***
## agglomeration_state.assignees ***
## same_state
## AvB2:agglomeration_state.assignees ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 13.9      Adj. R2: 0.012213
##                Within R2: 0.016169
```

```
##### TABLE 6: ALCATEL VS. BROWN AND EARLY PUBLICATION REQUESTS #####
```

```
### EARLY PUBLICATION REQUESTS - EXTENSIVE MARGINS ###
```

```
# NO INVENTOR FIXED EFFECTS #
```

```
MODEL <- feols(early_publication_request ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inventors) + same_state) | firm_year + inventor_city + hqstate_year + class_year, Data %>% filter(disclosure_days < 546)); summary(MODEL, cluster = c("firm", "inventor_id", "class")) %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: early_publication_request
## Observations: 24,992
## Fixed-effects: firm_year: 7,955, inventor_city: 4,516, hqstate_year: 210, class_year: 1,238
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2  1.21373    0.599524  2.02448  0.043609 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 4.37026      Adj. R2: 0.859894
##              Within R2: 7.806e-4
## OLS estimation, Dep. Var.: early_publication_request
## Observations: 24,992
## Fixed-effects: firm_year: 7,955, inventor_city: 4,516, hqstate_year: 210, class_year: 1,238
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2          1.227837    0.599948  2.046573  0.041377 *
## asinh(n_patents) -0.055780    0.159138 -0.350514  0.726144
## asinh(n_inventors) -0.201470    0.281275 -0.716275  0.474254
## same_state      -0.269901    0.371915 -0.725705  0.468459
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 4.36967      Adj. R2: 0.859894
##              Within R2: 0.001051
```

```
## `$`rhs: AvB2`
## NULL
##
## `$`rhs: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

```
# INVENTOR FIXED EFFECTS #
MODEL <- feols(early_publication_request ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inventors) + same_state) | firm_year + inventor_id + inventor_city + hqstate_year + class_year, Data %>% filter(disclosure_days < 546)); summary(MODEL, cluster = c("firm", "inventor_id", "class")) %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: early_publication_request
## Observations: 24,992
## Fixed-effects: firm_year: 7,955, inventor_id: 20,668, inventor_city: 4,516, hqstate_year:
210, class_year: 1,238
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2  2.57473    1.91825  1.34223  0.18031
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 2.16443    Adj. R2: 1.03968
##      Within R2: 0.001125
## OLS estimation, Dep. Var.: early_publication_request
## Observations: 24,992
## Fixed-effects: firm_year: 7,955, inventor_id: 20,668, inventor_city: 4,516, hqstate_year:
210, class_year: 1,238
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2      2.344594    1.730717  1.354695  0.17631
## asinh(n_patents) -0.678170    0.584863 -1.159535  0.24695
## asinh(n_inventors) -0.215637    0.222733 -0.968143  0.33358
## same_state      3.752687    3.335233  1.125165  0.26122
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 2.16296    Adj. R2: 1.03961
##      Within R2: 0.002483
```

```
## `$`rhs: AvB2`
## NULL
##
## `$`rhs: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

```
### EARLY PUBLICATION REQUESTS - INTENSIVE MARGINS ###
# NO INVENTOR FIXED EFFECTS #
MODEL <- feols(asinh(early_publication_request_time) ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inv
entors) + same_state) | firm_year + inventor_city + hqstate_year + class_year, Data %>% filter(e
arly_publication_request == 100)); summary(MODEL, cluster = c("firm", "inventor_id", "class")) %
>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: asinh(early_publication_request_time)
## Observations: 941
## Fixed-effects: firm_year: 275, inventor_city: 409, hqstate_year: 91, class_year: 215
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error   t value Pr(>|t|)
## AvB2 -0.149204    0.159954 -0.932793  0.35266
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.528865    Adj. R2: 1.86783
##      Within R2: 7.298e-4
## OLS estimation, Dep. Var.: asinh(early_publication_request_time)
## Observations: 941
## Fixed-effects: firm_year: 275, inventor_city: 409, hqstate_year: 91, class_year: 215
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error   t value   Pr(>|t|)
## AvB2          -0.207746    0.106695 -1.94711 5.3678e-02 .
## asinh(n_patents) -0.113754    0.062763 -1.81243 7.2227e-02 .
## asinh(n_inventors) -0.211521    0.047369 -4.46536 1.7167e-05 ***
## same_state      1.111302    0.674434  1.64775 1.0182e-01
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.52468    Adj. R2: 1.80291
##      Within R2: 0.016481
```

```
## `$`rhs: AvB2`
## NULL
##
## `$`rhs: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

```
# INVENTOR FIXED EFFECTS #
MODEL <- feols(asinh(early_publication_request_time) ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inventors) + same_state) | firm_year + inventor_id + inventor_city + hqstate_year + class_year, Data %>% filter(early_publication_request == 100)); summary(MODEL, cluster = c("firm", "inventor_id", "class")) %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: asinh(early_publication_request_time)
## Observations: 941
## Fixed-effects: firm_year: 275, inventor_id: 591, inventor_city: 409, hqstate_year: 91, class_year: 215
## Standard-errors: Clustered (firm & inventor_id & class)
##           Estimate Std. Error t value Pr(>|t|)
## AvB2 -0.047998      0      -Inf < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.488777      Adj. R2: 1.05469
##           Within R2: 7.731e-5
## OLS estimation, Dep. Var.: asinh(early_publication_request_time)
## Observations: 941
## Fixed-effects: firm_year: 275, inventor_id: 591, inventor_city: 409, hqstate_year: 91, class_year: 215
## Standard-errors: Clustered (firm & inventor_id & class)
##           Estimate Std. Error t value Pr(>|t|)
## AvB2          -0.059792    0.002550 -23.44621 < 2.2e-16 ***
## asinh(n_patents) -0.056647    0.002317 -24.45233 < 2.2e-16 ***
## asinh(n_inventors) -0.238033    0.071202  -3.34305 0.0010827 **
## same_state       0.647985    0.005228 123.95671 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.48733      Adj. R2: 1.05411
##           Within R2: 0.005991
```

```
## $`rhs`: AvB2`
## NULL
##
## $`rhs`: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

```
##### TABLE 7: ALCATEL VS. BROWN AND NATURE OF INNOVATION #####
### ORIGINALITY - HHI OF BACKWARD CITES BASED ON ENTITIES ###
MODEL <- feols(patent_originality ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inventors) + same_state) | firm_year + inventor_id + inventor_city + hqstate_year + class_year, Data); summary(MODEL, cluster = c("firm", "inventor_id", "class")) %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: patent_originality
## Observations: 342,254
## Fixed-effects: firm_year: 33,911, inventor_id: 158,992, inventor_city: 10,077, hqstate_year: 303, class_year: 1,721
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2  1.36242    0.483059  2.8204 0.005027 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 15.6      Adj. R2: 0.177687
##              Within R2: 6.616e-5
## OLS estimation, Dep. Var.: patent_originality
## Observations: 342,254
## Fixed-effects: firm_year: 33,911, inventor_id: 158,992, inventor_city: 10,077, hqstate_year: 303, class_year: 1,721
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2          1.433044    0.471511 3.039263 2.5220e-03 **
## asinh(n_patents) 1.303104    0.174501 7.467584 4.8788e-13 ***
## asinh(n_inventors) 1.873196    0.219090 8.549878 2.4063e-16 ***
## same_state       0.596832    0.689170 0.866015 3.8698e-01
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 15.5      Adj. R2: 0.17895
##              Within R2: 0.001623
```

```
## `$`rhs: AvB2`
## NULL
##
## `$`rhs: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

```
### GENERALITY - HHI OF FORWARD CITES BASED ON ENTITIES ###
MODEL <- feols(patent_generality ~ AvB2 + sw0(asinh(n_patents) + asinh(n_inventors) + same_state) | firm_year + inventor_id + inventor_city + hqstate_year + class_year, Data); summary(MODEL, cluster = c("firm", "inventor_id", "class")) %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: patent_generality
## Observations: 289,703
## Fixed-effects: firm_year: 27,280, inventor_id: 138,204, inventor_city: 9,120, hqstate_year: 293, class_year: 1,654
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2    1.6155    0.579501 2.78775 0.0055582 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 16.1      Adj. R2: 0.089563
##              Within R2: 8.246e-5
## OLS estimation, Dep. Var.: patent_generality
## Observations: 289,703
## Fixed-effects: firm_year: 27,280, inventor_id: 138,204, inventor_city: 9,120, hqstate_year: 293, class_year: 1,654
## Standard-errors: Clustered (firm & inventor_id & class)
##      Estimate Std. Error t value Pr(>|t|)
## AvB2          1.665701    0.578135 2.88116 4.1733e-03 **
## asinh(n_patents) -0.281017    0.160314 -1.75291 8.0376e-02 .
## asinh(n_inventors) 2.443772    0.352910 6.92463 1.7287e-11 ***
## same_state        0.820353    0.775536 1.05779 2.9078e-01
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 16.1      Adj. R2: 0.091078
##              Within R2: 0.001773
```

```
## `$`rhs: AvB2`
## NULL
##
## `$`rhs: AvB2 + asinh(n_patents) + asinh(n_inventors) + same_state`
## NULL
```

```
##### TABLE 8: ALCATEL VS. BROWN AND AGGREGATE FIRM-LEVEL EFFECTS #####
### ACROSS STATES ###
MODEL <- feols(c(perc_treat_state_patents, # treat vs control patents
                perc_cross_treat_control_patent) # cross control-treat patents
              ~ AvB2.ex_ante + asinh(n_patents) + asinh(n_inventors) + same_state | filing_year, Data.firm); summary(MODEL, cluster = "firm") %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: perc_treat_state_patents
## Observations: 17,978
## Fixed-effects: filing_year: 4
## Standard-errors: Clustered (firm)
##
##           Estimate Std. Error   t value   Pr(>|t|)
## AvB2.ex_ante      81.11840    1.011409  80.20334 < 2.2e-16 ***
## asinh(n_patents)  -6.30585    0.749089  -8.41803 < 2.2e-16 ***
## asinh(n_inventors) 4.59819    0.692221   6.64266 3.2153e-11 ***
## same_state       -18.83231    0.925458 -20.34918 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 42.3      Adj. R2: 0.162274
##                Within R2: 0.162403
## OLS estimation, Dep. Var.: perc_cross_treat_control_patent
## Observations: 17,978
## Fixed-effects: filing_year: 4
## Standard-errors: Clustered (firm)
##
##           Estimate Std. Error   t value   Pr(>|t|)
## AvB2.ex_ante      -4.75161    0.690635  -6.88007 6.2832e-12 ***
## asinh(n_patents) -10.26206    0.458690 -22.37255 < 2.2e-16 ***
## asinh(n_inventors) 10.13721    0.396142  25.58986 < 2.2e-16 ***
## same_state       -9.69251    0.444413 -21.80968 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 19.7      Adj. R2: 0.097423
##                Within R2: 0.097413
```

```
## $`lhs: perc_treat_state_patents`
## NULL
##
## $`lhs: perc_cross_treat_control_patent`
## NULL
```

```
### OVERALL PORTFOLIO ###
MODEL <- feols(c(avg_perc_disclosure.early, # average patent disclosure timeliness
                 hhi_class) # diversity among technology classes
               ~ AvB2.ex_ante + asinh(n_patents) + asinh(n_inventors) + same_state | filing_year,
               Data.firm); summary(MODEL, cluster = "firm") %>% lapply(., print)
```

```
## OLS estimation, Dep. Var.: avg_perc_disclosure.early
## Observations: 17,978
## Fixed-effects: filing_year: 4
## Standard-errors: Clustered (firm)
##
##           Estimate Std. Error   t value Pr(>|t|)
## AvB2.ex_ante    0.432181   0.226593   1.907300 0.056506 .
## asinh(n_patents) -0.011394   0.134000  -0.085031 0.932238
## asinh(n_inventors) -0.046322   0.113102  -0.409554 0.682140
## same_state      0.209223   0.103657   2.018405 0.043572 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 5.88632      Adj. R2: 2.591e-4
##                   Within R2: 5.125e-4
## OLS estimation, Dep. Var.: hhi_class
## Observations: 17,978
## Fixed-effects: filing_year: 4
## Standard-errors: Clustered (firm)
##
##           Estimate Std. Error   t value   Pr(>|t|)
## AvB2.ex_ante      1.621008   0.845635   1.916913 5.5273e-02 .
## asinh(n_patents)  28.972262   0.731053  39.630868 < 2.2e-16 ***
## asinh(n_inventors) -1.764525   0.290191  -6.080558 1.2345e-09 ***
## same_state        -0.316449   0.426617  -0.741764 4.5825e-01
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 17.1        Adj. R2: 0.717625
##                   Within R2: 0.697356
```

```
## `$lhs: avg_perc_disclosure.early`
## NULL
##
## `$lhs: hhi_class`
## NULL
```