

MSD 2019 Final Project

A replication and extension of Wage disparity and team productivity: evidence from Major League Baseball by Craig A. Depken II, 1999

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Introduction

Problem Description

Motivation

Data Source

Reproduction

Reproduction Code

```
teams <- read_csv(here('data/teams.csv'))
salaries <- read_csv(here('data/salaries.csv'))

teams$WSWin <- as.logical(teams$WSWin == 'Y')
teams <- teams %>%
  filter(1985 <= yearID & yearID <= 2016) %>%
  mutate(winPercentage = W / (W + L) * 1000)

salaries <- salaries %>%
```

```

filter(1985 <= yearID & yearID <= 2016) %>%
mutate(salaryMil = salary / 1000000)

teams <- teams %>%
  inner_join(salaries) %>%
  group_by(yearID, teamID, G, W, L, WSWin, winPercentage) %>%
  summarize(totalSalaryMil = sum(salaryMil))

salaries <- salaries %>%
  inner_join(teams) %>%
  mutate(salaryShare = salaryMil / totalSalaryMil * 100) %>%
  mutate(salaryShareSquared = salaryShare ^ 2) %>%
  select(yearID, teamID, playerID, salary, salaryShare, salaryShareSquared)

#Clearly missing lots of data for this datapoint https://www.baseball-reference.com/teams/TEX/1987.shtml
rangers_1987 <- salaries %>%
  filter(yearID != 1987) %>%
  filter(teamID != 'TEX')

teams <- teams %>%
  inner_join(salaries) %>%
  group_by(yearID, teamID, G, W, L, winPercentage, WSWin, totalSalaryMil) %>%
  summarize(HHI = sum(salaryShareSquared))

teams_old <- teams %>%
  filter(1985 <= yearID & yearID <= 1998) %>%
  mutate(normalizedYear = yearID - 1985)

salaries_old <- salaries %>%
  filter(1985 <= yearID & yearID <= 1998)

summary(teams_old$winPercentage)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   327.2   456.8   498.4   500.0   543.2   703.7
sd(teams_old$winPercentage)

## [1] 66.22653
summary(teams_old$totalSalaryMil)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.88   12.76   22.32   25.16   36.29   72.36
sd(teams_old$totalSalaryMil)

## [1] 14.22702
summary(teams_old$HHI)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   427.5   668.6   756.3   815.6   879.1  5300.1
sd(teams_old$HHI)

## [1] 322.5687

```

```
linear_fixed_old <- lm(formula = winPercentage ~ totalSalaryMil + HHI +
                      normalizedYear + teamID + 0,
                      data = teams_old)
summary(linear_fixed_old)$coefficients[1:3,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil  2.1493337  0.4551468  4.722287 3.404816e-06
## HHI            -0.0120376  0.0114311 -1.053057 2.930560e-01
## normalizedYear -5.4184670  1.5790948 -3.431375 6.738811e-04
```

```
linear_random_old <- lm(formula = winPercentage ~ totalSalaryMil + HHI + normalizedYear,
                       data = teams_old)
summary(linear_random_old)$coefficients[1:4,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## (Intercept)  494.46265725 10.80464965 45.763877 2.501463e-155
## totalSalaryMil  2.27827992  0.38799272  5.871966 9.513353e-09
## HHI            -0.01402974  0.01077516 -1.302045 1.937025e-01
## normalizedYear -6.05527713  1.38637176 -4.367715 1.627858e-05
```

```
log_log_fixed_old <- lm(formula = log(winPercentage) ~ log(totalSalaryMil) + log(HHI) +
                      normalizedYear + teamID + 0,
                      data = teams_old)
summary(log_log_fixed_old)$coefficients[1:3,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## log(totalSalaryMil)  0.068481958 0.023048764  2.971177 0.00317594
## log(HHI)            -0.043092478 0.034083173 -1.264333 0.20696902
## normalizedYear      -0.006815679 0.003712079 -1.836081 0.06721103
```

```
log_log_random_old <- lm(formula = log(winPercentage) ~ log(totalSalaryMil) + log(HHI) +
                       normalizedYear,
                       data = teams_old)
summary(log_log_random_old)$coefficients[1:4,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## (Intercept)      6.336734123 0.228514736 27.730090 9.463580e-93
## log(totalSalaryMil)  0.077748160 0.019984364  3.890450 1.184254e-04
## log(HHI)          -0.046572660 0.031165596 -1.494361 1.359244e-01
## normalizedYear    -0.008653452 0.003294086 -2.626966 8.969280e-03
```

Reproduction Notes

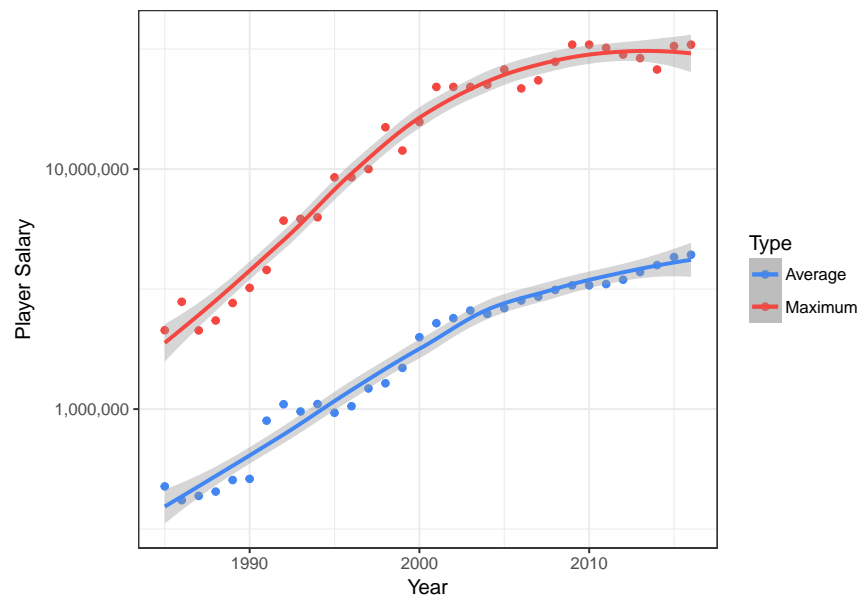
- original author did not describe how time fixed effects are accounted for (across expansion periods or every year)
- no discussion about limiting to 25 man roster vs 40 man roster
- no discussion of cut players, traded players
- no discussion of signing bonuses

Reproduction Analysis

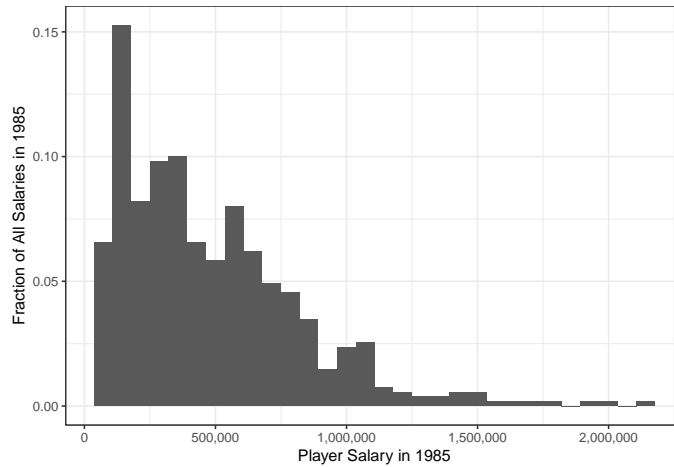
Extension

Extension Code

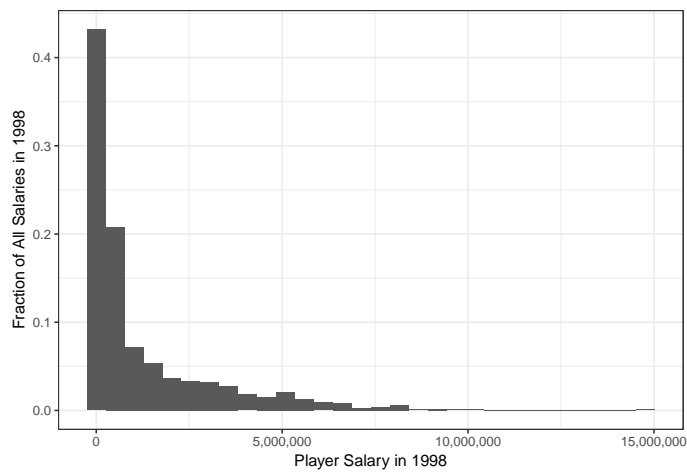
```
salary_vs_time <- salaries %>%  
  group_by(yearID) %>%  
  summarize(avg = mean(salary), max = max(salary))  
  
ggplot(data = salary_vs_time) +  
  geom_point(aes(x = yearID, y = avg, color = 'Average')) +  
  geom_smooth(aes(x = yearID, y = avg, color = 'Average')) +  
  geom_point(aes(x = yearID, y = max, color = 'Maximum')) +  
  geom_smooth(aes(x = yearID, y = max, color = 'Maximum')) +  
  scale_color_manual(values = c('#4286f4', '#f44741')) +  
  scale_y_log10(labels = comma) +  
  labs(color = 'Type') +  
  xlab('Year') +  
  ylab('Player Salary')
```



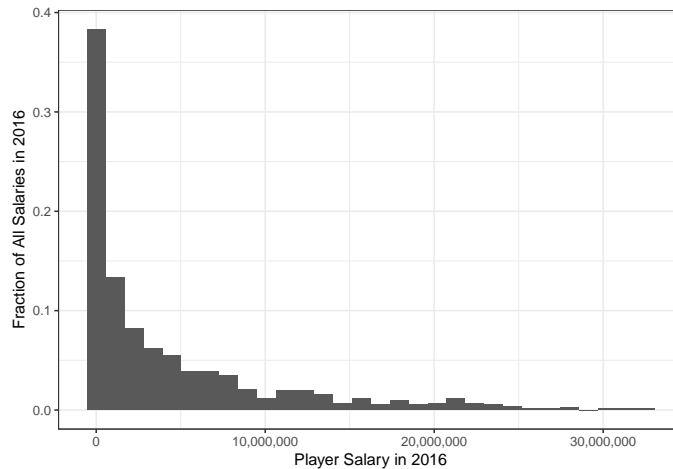
```
salaries_1985 <- filter(salaries, yearID == 1985)  
salaries_1998 <- filter(salaries, yearID == 1998)  
salaries_2016 <- filter(salaries, yearID == 2016)  
  
ggplot(data = salaries_1985) +  
  geom_histogram(aes(x = salary, y = (..count..) / sum(..count..))) +  
  scale_x_continuous(labels = comma) +  
  xlab('Player Salary in 1985') +  
  ylab('Fraction of All Salaries in 1985')
```



```
ggplot(data = salaries_1998) +
  geom_histogram(aes(x = salary, y = (..count..) / sum(..count..))) +
  scale_x_continuous(labels = comma) +
  xlab('Player Salary in 1998') +
  ylab('Fraction of All Salaries in 1998')
```



```
ggplot(data = salaries_2016) +
  geom_histogram(aes(x = salary, y = (..count..) / sum(..count..))) +
  scale_x_continuous(labels = comma) +
  xlab('Player Salary in 2016') +
  ylab('Fraction of All Salaries in 2016')
```

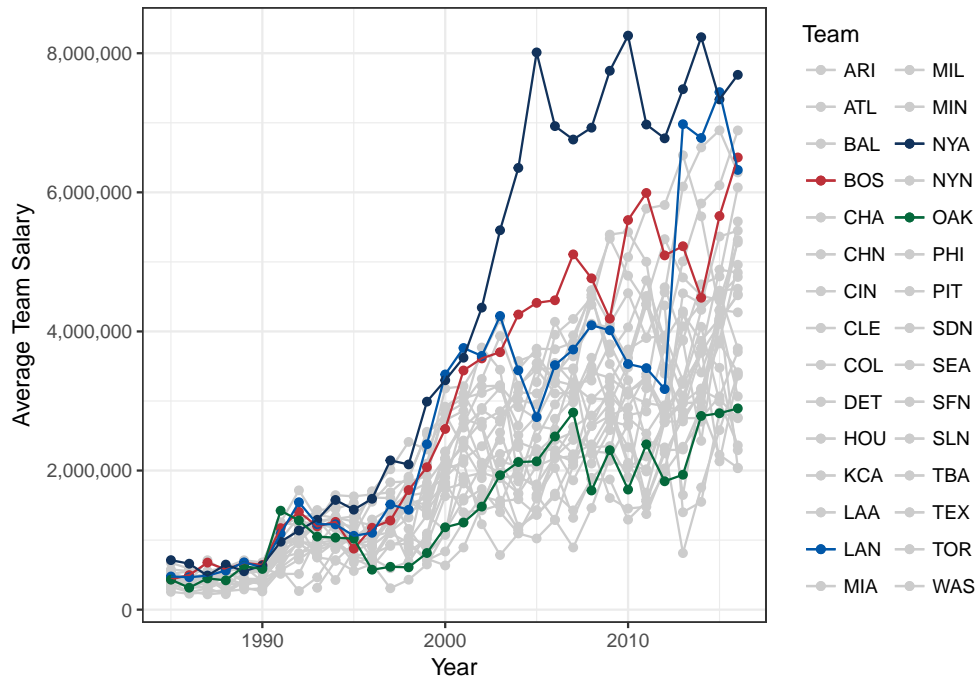


```
current_teamIDs <- c('ARI', 'ATL', 'BAL', 'BOS', 'CHA', 'CHN', 'CIN', 'CLE', 'COL', 'DET',
                    'HOU', 'KCA', 'LAA', 'LAN', 'MIA', 'MIL', 'MIN', 'NYA', 'NYN', 'OAK',
                    'PHI', 'PIT', 'SDN', 'SEA', 'SFN', 'SLN', 'TBA', 'TEX', 'TOR', 'WAS')
team_colors <- c('#ffffff', '#ffffff', '#ffffff', '#BD3039', '#ffffff',
                '#ffffff', '#ffffff', '#ffffff', '#ffffff', '#ffffff',
                '#ffffff', '#ffffff', '#ffffff', '#0157a8', '#ffffff',
                '#ffffff', '#ffffff', '#11325b', '#ffffff', '#04683b',
                '#ffffff', '#ffffff', '#ffffff', '#ffffff', '#ffffff',
                '#ffffff', '#ffffff', '#ffffff', '#ffffff', '#ffffff')
colored_teamIDs <- c('BOS', 'LAN', 'NYA', 'OAK')

team_salary_vs_time <- salaries %>%
  filter(teamID %in% current_teamIDs) %>%
  group_by(yearID, teamID) %>%
  summarize(avg = mean(salary)) %>%
  mutate(flag = teamID %in% colored_teamIDs)

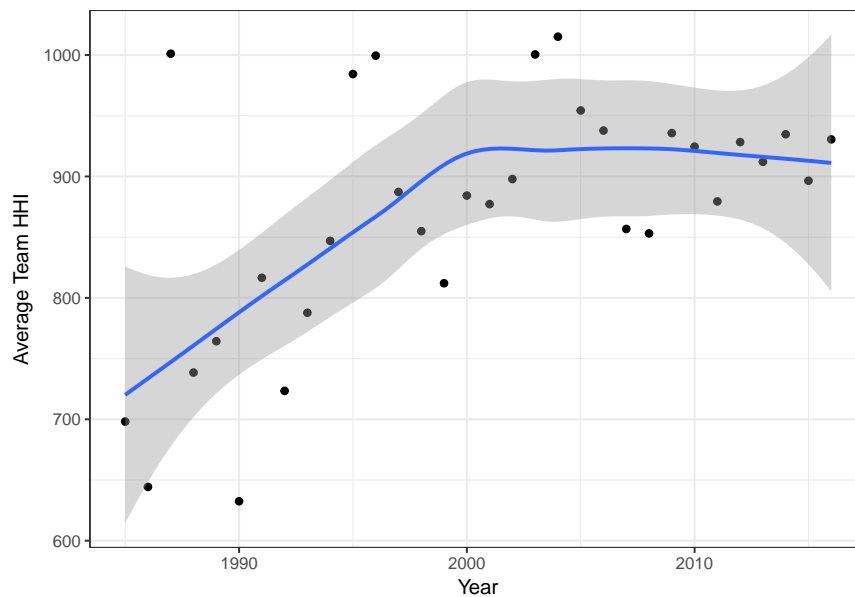
underlay_data <- filter(team_salary_vs_time, !flag)
overlay_data <- filter(team_salary_vs_time, flag)

ggplot() +
  geom_point(data = underlay_data, aes(x = yearID, y = avg, color = teamID)) +
  geom_line(data = underlay_data, aes(x = yearID, y = avg, color = teamID)) +
  geom_point(data = overlay_data, aes(x = yearID, y = avg, color = teamID)) +
  geom_line(data = overlay_data, aes(x = yearID, y = avg, color = teamID)) +
  scale_y_continuous(labels = comma) +
  scale_color_manual(values = team_colors) +
  labs(color = 'Team') +
  xlab('Year') +
  ylab('Average Team Salary')
```



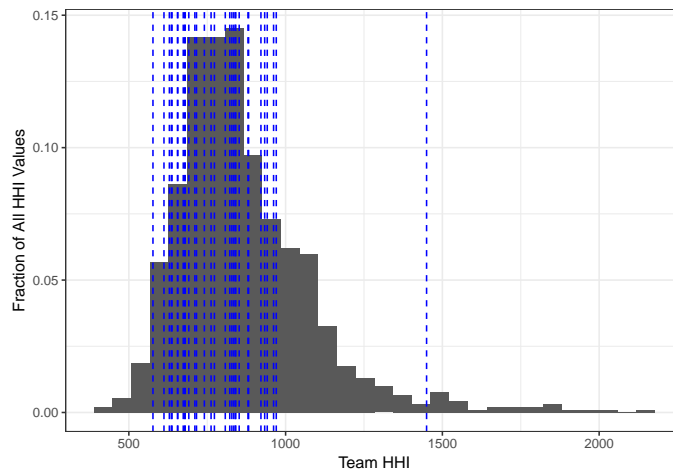
```
hhi_vs_time <- teams %>%
  group_by(yearID) %>%
  summarize(avg = mean(HHI))
```

```
ggplot(data = hhi_vs_time) +
  geom_point(aes(x = yearID, y = avg)) +
  geom_smooth(aes(x = yearID, y = avg)) +
  xlab('Year') +
  ylab('Average Team HHI')
```



```
ggplot(data = filter(teams, mean(teams$HHI) - 5 * sd(teams$HHI) <= HHI & HHI <= mean(teams$HHI) + 5 * sd(teams$HHI))) +
  geom_histogram(aes(x = HHI, y = (..count..) / sum(..count..))) +
```

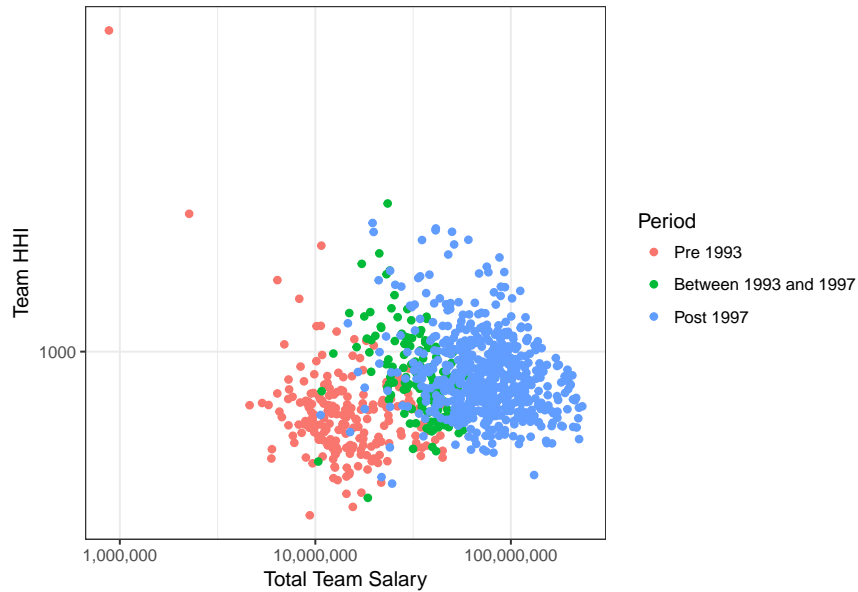
```
geom_vline(data = filter(teams, WSWin), aes(xintercept = HHI), color = 'blue', linetype = 'dashed') +
xlab('Team HHI') +
ylab('Fraction of All HHI Values')
```



```
year_to_period <- function(year) {
  if (year <= 1992) {
    return('Pre 1993')
  }
  else if (1993 <= year & year <= 1997) {
    return('Between 1993 and 1997')
  }
  else {
    return('Post 1997')
  }
}

hhi_vs_total_salary <- teams %>%
  mutate(period = year_to_period(yearID))
hhi_vs_total_salary$period <- factor(hhi_vs_total_salary$period, levels = c('Pre 1993', 'Between 1993 and 1997', 'Post 1997'))

ggplot(data = hhi_vs_total_salary) +
  geom_point(aes(x = totalSalaryMil * 1000000, y = HHI, color = period)) +
  scale_x_log10(labels = comma) +
  scale_y_log10() +
  labs(color = 'Period') +
  xlab('Total Team Salary') +
  ylab('Team HHI')
```

```
teams_new <- teams %>%
  filter(1999 <= yearID & yearID <= 2016) %>%
  mutate(normalizedYear = yearID - 1999)
```

```
salaries_new <- salaries %>%
  filter(1999 <= yearID & yearID <= 2016)
```

```
linear_fixed_new <- lm(formula = winPercentage ~ totalSalaryMil + HHI +
  normalizedYear + teamID + 0,
  data = teams_new)
summary(linear_fixed_new)$coefficients[1:3,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil  0.4631102 0.12923492  3.583476 0.0003719897
## HHI             -0.0553023 0.01424983 -3.880909 0.0001178918
## normalizedYear -1.6956041 0.71841311 -2.360208 0.0186447534
```

```
linear_random_new <- lm(formula = winPercentage ~ totalSalaryMil + HHI + normalizedYear,
  data = teams_new)
summary(linear_random_new)$coefficients[1:4,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## (Intercept)  504.53034280 15.53375065 32.479622 9.998674e-129
## totalSalaryMil  0.68988493 0.08449909  8.164406 2.324053e-15
## HHI            -0.04525471 0.01386628 -3.263651 1.169986e-03
## normalizedYear -2.52975572 0.62573170 -4.042876 6.054218e-05
```

```
log_log_fixed_new <- lm(formula = log(winPercentage) ~ log(totalSalaryMil) + log(HHI) +
  normalizedYear + teamID + 0,
  data = teams_new)
summary(log_log_fixed_new)$coefficients[1:3,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## log(totalSalaryMil)  0.097454270 0.021330706  4.568732 6.177390e-06
## log(HHI)            -0.104976526 0.030167336 -3.479808 5.452894e-04
## normalizedYear      -0.004010857 0.001459855 -2.747436 6.221456e-03
```

```
log_log_random_new <- lm(formula = log(winPercentage) ~ log(totalSalaryMil) + log(HHI) +
                          normalizedYear,
                          data = teams_new)
summary(log_log_random_new)$coefficients[1:4,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## (Intercept)    6.285422459 0.222740979 28.218528 4.704158e-108
## log(totalSalaryMil) 0.125655854 0.014620475  8.594512 9.189347e-17
## log(HHI)         -0.085180977 0.028918094 -2.945594 3.363412e-03
## normalizedYear    -0.005434256 0.001300813 -4.177585 3.439323e-05
```

#Gini coef: https://en.wikipedia.org/wiki/Gini_coefficient

```
gini_coef <- salaries %>%
  group_by(yearID, teamID) %>%
  summarize(gini_coef = Gini(salary))

teams <- teams %>%
  inner_join(gini_coef)
```

```
## Joining, by = c("yearID", "teamID")
```

#Compare Gini index to HHI for old teams

```
gini_old <- teams %>%
  filter(1985 <= yearID & yearID <= 1998) %>%
  mutate(normalizedYear = yearID - 1985)
```

```
gini_fixed_old <- lm(formula = winPercentage ~ totalSalaryMil + gini_coef +
                     normalizedYear + teamID + 0,
                     data = gini_old)
summary(linear_fixed_old)$coefficients[1:3,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil    2.1493337 0.4551468  4.722287 3.404816e-06
## HHI               -0.0120376 0.0114311 -1.053057 2.930560e-01
## normalizedYear    -5.4184670 1.5790948 -3.431375 6.738811e-04
```

```
summary(gini_fixed_old)$coefficients[1:3,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil    2.262835 0.4355955  5.194809 3.522971e-07
## gini_coef         -104.028748 54.6542828 -1.903396 5.782575e-02
## normalizedYear    -4.157316 1.7635623 -2.357340 1.896763e-02
```

```
gini_random_old <- lm(formula = winPercentage ~ totalSalaryMil + gini_coef + normalizedYear,
                      data = gini_old)
summary(linear_random_old)$coefficients[1:4,]
```

```
##              Estimate Std. Error  t value    Pr(>|t|)
## (Intercept)    494.46265725 10.80464965 45.763877 2.501463e-155
## totalSalaryMil    2.27827992 0.38799272  5.871966 9.513353e-09
## HHI              -0.01402974 0.01077516 -1.302045 1.937025e-01
## normalizedYear   -6.05527713 1.38637176 -4.367715 1.627858e-05
```

```
summary(gini_random_old)$coefficients[1:4,]
```

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

```
## (Intercept)      527.992023 23.0401409 22.916180 3.100474e-73
## totalSalaryMil   2.416147  0.3673199  6.577771 1.612213e-10
## gini_coef       -103.866289 51.3895821 -2.021155 4.397572e-02
## normalizedYear  -4.902923  1.5679844 -3.126895 1.904905e-03

#Compare Gini coef to HHI results for new teams
gini_new <- teams %>%
  filter(1999 <= yearID & yearID <= 2016) %>%
  mutate(normalizedYear = yearID - 1999)

gini_fixed_new <- lm(formula = winPercentage ~ totalSalaryMil + gini_coef +
                     normalizedYear + teamID + 0,
                     data = gini_new)
summary(linear_fixed_new)$coefficients[1:3,]

##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil  0.4631102 0.12923492  3.583476 0.0003719897
## HHI            -0.0553023 0.01424983 -3.880909 0.0001178918
## normalizedYear -1.6956041 0.71841311 -2.360208 0.0186447534

summary(gini_fixed_new)$coefficients[1:3,]

##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil   0.6281101 0.1245166  5.044390 6.360300e-07
## gini_coef       -218.7929279 57.2642160 -3.820762 1.496533e-04
## normalizedYear  -2.4408281 0.7019932 -3.476997 5.509010e-04

gini_random_new <- lm(formula = winPercentage ~ totalSalaryMil + gini_coef + normalizedYear,
                     data = gini_new)
summary(linear_random_new)$coefficients[1:4,]

##              Estimate Std. Error  t value    Pr(>|t|)
## (Intercept)    504.53034280 15.53375065 32.479622 9.998674e-129
## totalSalaryMil   0.68988493 0.08449909  8.164406 2.324053e-15
## HHI            -0.04525471 0.01386628 -3.263651 1.169986e-03
## normalizedYear  -2.52975572 0.62573170 -4.042876 6.054218e-05

summary(gini_random_new)$coefficients[1:4,]

##              Estimate Std. Error  t value    Pr(>|t|)
## (Intercept)    549.1432252 31.91235511 17.207856 3.696148e-53
## totalSalaryMil   0.8000791 0.08001395  9.999245 1.064405e-21
## gini_coef       -157.6448205 54.47411009 -2.893940 3.959278e-03
## normalizedYear  -3.0444465 0.61530279 -4.947883 1.005962e-06

#Atkinson index: https://en.wikipedia.org/wiki/Atkinson\_index

atkinson <- salaries %>%
  group_by(yearID, teamID) %>%
  summarize(atk = Atkinson(salary))

teams <- teams %>%
  inner_join(atkinson)

## Joining, by = c("yearID", "teamID")

#Compare Atkinson index to HHI for old teams
atk_old <- teams %>%
```

```

filter(1985 <= yearID & yearID <= 1998) %>%
mutate(normalizedYear = yearID - 1985)

atk_fixed_old <- lm(formula = winPercentage ~ totalSalaryMil + atk +
                    normalizedYear + teamID + 0,
                    data = atk_old)
summary(linear_fixed_old)$coefficients[1:3,]

##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil  2.1493337  0.4551468  4.722287 3.404816e-06
## HHI            -0.0120376  0.0114311 -1.053057 2.930560e-01
## normalizedYear -5.4184670  1.5790948 -3.431375 6.738811e-04
summary(atk_fixed_old)$coefficients[1:3,]

##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil  2.317058  0.4338155  5.341113 1.685884e-07
## atk            -160.707657  62.6106249 -2.566779 1.068848e-02
## normalizedYear  -3.608512  1.7404320 -2.073343 3.888651e-02
atk_random_old <- lm(formula = winPercentage ~ totalSalaryMil + atk + normalizedYear,
                    data = atk_old)
summary(linear_random_old)$coefficients[1:4,]

##              Estimate Std. Error  t value    Pr(>|t|)
## (Intercept)    494.46265725 10.80464965 45.763877 2.501463e-155
## totalSalaryMil  2.27827992  0.38799272  5.871966 9.513353e-09
## HHI            -0.01402974  0.01077516 -1.302045 1.937025e-01
## normalizedYear -6.05527713  1.38637176 -4.367715 1.627858e-05
summary(atk_random_old)$coefficients[1:4,]

##              Estimate Std. Error  t value    Pr(>|t|)
## (Intercept)    507.606294 11.1055361 45.707500 3.699328e-155
## totalSalaryMil  2.466697  0.3657446  6.744315 5.854225e-11
## atk            -158.773514  58.4157921 -2.717990 6.873638e-03
## normalizedYear  -4.369086  1.5444774 -2.828844 4.923322e-03
#Compare Atkinson coef to HHI results for new teams
atk_new <- teams %>%
  filter(1999 <= yearID & yearID <= 2016) %>%
  mutate(normalizedYear = yearID - 1999)

atk_fixed_new <- lm(formula = winPercentage ~ totalSalaryMil + atk +
                    normalizedYear + teamID + 0,
                    data = atk_new)
summary(linear_fixed_new)$coefficients[1:3,]

##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil  0.4631102  0.12923492  3.583476 0.0003719897
## HHI            -0.0553023  0.01424983 -3.880909 0.0001178918
## normalizedYear -1.6956041  0.71841311 -2.360208 0.0186447534
summary(atk_fixed_new)$coefficients[1:3,]

##              Estimate Std. Error  t value    Pr(>|t|)
## totalSalaryMil  0.6614581  0.1244206  5.316308 1.593890e-07

```

```
## atk          -266.8747740 59.7878811 -4.463693 9.947429e-06
## normalizedYear -2.5541688 0.6997320 -3.650210 2.893752e-04

atk_random_new <- lm(formula = winPercentage ~ totalSalaryMil + atk + normalizedYear,
                     data = atk_new)
summary(linear_random_new)$coefficients[1:4,]

##              Estimate Std. Error  t value      Pr(>|t|)
## (Intercept)  504.53034280 15.53375065 32.479622 9.998674e-129
## totalSalaryMil 0.68988493 0.08449909 8.164406 2.324053e-15
## HHI          -0.04525471 0.01386628 -3.263651 1.169986e-03
## normalizedYear -2.52975572 0.62573170 -4.042876 6.054218e-05

summary(atk_random_new)$coefficients[1:4,]

##              Estimate Std. Error  t value      Pr(>|t|)
## (Intercept)  511.3855826 17.06645524 29.964370 1.289423e-116
## totalSalaryMil 0.8331637 0.08100541 10.285285 9.120505e-23
## atk          -191.2920214 57.10547571 -3.349802 8.656120e-04
## normalizedYear -3.1749323 0.61664294 -5.148737 3.688606e-07
```

Extension Notes

- note that minimum salary has increased over time: https://www.baseball-reference.com/bullpen/Minimum_salary

Extension Analysis

Postface

The following is a list of all packages used to generate these results.

```
sessionInfo()

## R version 3.4.3 (2017-11-30)
## Platform: x86_64-apple-darwin15.6.0 (64-bit)
## Running under: macOS Sierra 10.12.6
##
## Matrix products: default
## BLAS: /Library/Frameworks/R.framework/Versions/3.4/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/3.4/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  base
##
## other attached packages:
## [1] bindrcpp_0.2      ineq_0.2-13      forcats_0.3.0    stringr_1.3.0
## [5] dplyr_0.7.4       purrr_0.2.4      readr_1.1.1      tidyr_0.8.0
## [9] tibble_1.4.2      ggplot2_2.2.1    tidyverse_1.2.1  scales_0.5.0
## [13] here_0.1
##
```

```
## loaded via a namespace (and not attached):
## [1] Rcpp_0.12.15      cellranger_1.1.0 compiler_3.4.3  pillar_1.2.1
## [5] plyr_1.8.4        bindr_0.1        methods_3.4.3  tools_3.4.3
## [9] digest_0.6.15     lubridate_1.7.3  jsonlite_1.5    gtable_0.2.0
## [13] evaluate_0.10.1   nlme_3.1-131     lattice_0.20-35 pkgconfig_2.0.1
## [17] rlang_0.2.0        psych_1.7.8      cli_1.0.0       rstudioapi_0.7
## [21] yaml_2.1.17        parallel_3.4.3   haven_1.1.1     xml2_1.2.0
## [25] httr_1.3.1         knitr_1.20        hms_0.4.1       rprojroot_1.3-2
## [29] grid_3.4.3         glue_1.2.0        R6_2.2.2        readxl_1.0.0
## [33] foreign_0.8-69     rmarkdown_1.9     modelr_0.1.1     reshape2_1.4.3
## [37] magrittr_1.5        backports_1.1.2   htmltools_0.3.6 rvest_0.3.2
## [41] assertthat_0.2.0   mnormt_1.5-5      colorspace_1.3-2 labeling_0.3
## [45] stringi_1.1.6      lazyeval_0.2.1    munsell_0.4.3    broom_0.4.3
## [49] crayon_1.3.4
```