SBA_Analysis

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Descriptive Analysis

```r
library(sf)
```

```
## Warning: package 'sf' was built under R version 4.4.3
## Linking to GEOS 3.13.0, GDAL 3.8.5, PROJ 9.5.1; sf_use_s2() is TRUE
```

```r
library(car)
```

```
## Loading required package: carData
```

```r
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
## The following object is masked from 'package:car':
##
##     recode
## The following objects are masked from 'package:stats':
##
##     filter, lag
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
library(spdep)
```

```
## Loading required package: spData
## To access larger datasets in this package, install the spDataLarge
## package with: `install.packages('spDataLarge',
## repos='https://nowosad.github.io/drat/', type='source')`
```

```r
library(lmtest)
```

```
## Loading required package: zoo
##
## Attaching package: 'zoo'
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```r
library(corrplot)
```

```
## corrplot 0.95 loaded
```

```r
library(stargazer)
```

```
##
## Please cite as:
```

```
##  Hlavac, Marek (2022). stargazer: Well-Formatted Regression and Summary Statistics Tables.
```

```
##  R package version 5.2.3. https://CRAN.R-project.org/package=stargazer
```

```r
SBA <- read.csv("/Users/isabellagermani/Desktop/MS THSS/data/SBA.csv", header = TRUE, stringsAsFactors =

str(SBA)
```

```
## 'data.frame':    55 obs. of  142 variables:
##  $ SBA                          : int  101 102 103 104 105 106 107 108 109 110 ...
##  $ SBA_name                     : chr  "Mott Haven/Hunts Point" "Morrisania/Belmont" "Highbridge/Sou
##  $ med_hous_inc                 : int  26090 32330 38460 37550 44000 67190 49790 74080 59760 73150 .
##  $ pct_FL_loans                 : num  30 53.4 10.3 54.8 9.6 0.9 28.6 31.9 27.3 60.6 ...
##  $ pct_FL_loans_2_LI            : num  100 100 100 100 66.7 14 63.5 11.8 50.3 46 ...
##  $ inc_div_ratio                : num  5.9 6.2 5.6 5.8 5.7 6.2 6.1 5.8 4.7 5 ...
##  $ mort_forc                    : num  70 115 38 53 25 28 252 135 147 422 ...
##  $ pov_pct                      : num  44.2 35.8 36.4 36.4 32.9 18.5 24.7 10.2 16.4 14.6 ...
##  $ pct_asian                    : num  0.3 1.3 1 1.8 7.1 4.1 8.2 3.6 9.4 2.3 ...
##  $ pct_black                    : num  28.4 32.5 27.7 24.4 11.3 11.8 30.3 28.8 19.8 67.2 ...
##  $ prob_race                    : num  0.47 0.51 0.45 0.43 0.43 0.65 0.59 0.69 0.7 0.49 ...
##  $ pct_hispan                   : num  67.2 61.8 68.8 71.1 74.1 48.8 55.4 39.9 42.3 23 ...
##  $ pct_white                    : num  3.3 3.8 1.3 1 5.1 31.5 3 25.5 26.7 5.4 ...
##  $ pop_dens                     : num  31.9 43 75 98.2 91.5 33.1 42.5 12.2 31.5 22.3 ...
##  $ priv_landL_amt               : int  2925 3174 3547 3423 3852 3906 3561 4330 4105 3882 ...
##  $ med_rti                      : num  38 34.8 38.9 41.7 41 34 34.1 28.9 37.6 34.7 ...
##  $ med_gro_rnt                  : int  1200 1280 1400 1450 1560 1720 1440 1470 1580 1720 ...
##  $ vac_rt                       : num  0.124 0.1373 0.1265 0.0842 0.0303 ...
##  $ pct_condo                    : num  0.0165 0.0176 0.0122 0 0.0101 ...
##  $ pct_coop                     : num  0.0413 0.0282 0.0857 0.0149 0.0606 ...
##  $ sound                        : num  0.963 0.877 0.971 0.896 0.944 ...
##  $ deter                        : num  0.01653 0.0493 0.00408 0.02475 0.0101 ...
##  $ rats                         : num  0.335 0.324 0.339 0.396 0.303 ...
##  $ r_aches                      : num  0.368 0.313 0.318 0.455 0.449 ...
##  $ afford                       : num  0.616 0.511 0.437 0.436 0.535 ...
##  $ unafford                     : num  0.165 0.148 0.171 0.262 0.247 ...
##  $ avg_rti                      : num  0.392 0.4 0.395 0.422 0.416 ...
##  $ avg_age                      : num  52.8 50.2 51 49.3 47.7 ...
##  $ pct_howner                   : num  0.0579 0.0775 0.0612 0.0396 0.0707 ...
##  $ pct_immigrant                : num  0.269 0.264 0.31 0.436 0.364 ...
##  $ med_year_moved_in            : num  2007 2010 2007 2009 2010 ...
##  $ med_length_res               : num  10 7 10 8 7 9 12 18.5 7 8 ...
##  $ pct_recent_moves             : num  0.463 0.549 0.461 0.564 0.596 ...
##  $ pct_fresh_moves              : num  0.273 0.37 0.29 0.356 0.439 ...
##  $ pct_displ                    : num  0.0207 0.0282 0.0245 0.0248 0.0101 ...
##  $ pct_gentr                    : num  0.0331 0.0563 0.0571 0.0495 0.0505 ...
##  $ rennov                       : num  0.0785 0.0775 0.0653 0.0594 0 ...
##  $ tot_pop                      : num  156731 171842 141400 139656 132128 ...
```

```
##  $ sq_miles                    : num  4.86 4.37 1.98 1.51 1.57 ...
##  $ t_dollar_stores             : int  12 5 7 6 3 1 4 2 5 3 ...
##  $ dollars_per_1kppl           : num  0.0766 0.0291 0.0495 0.043 0.0227 ...
##  $ dollars_per_sqm             : num  2.47 1.14 3.53 3.97 1.91 ...
##  $ liqour_per_1kppl            : num  0.2106 0.1397 0.1132 0.1289 0.0908 ...
##  $ liqour_per_sqm              : num  6.79 5.49 8.06 11.92 7.64 ...
##  $ tobacco_per_1kppl           : num  0.00638 0.04074 0.07072 0.0358 0.02271 ...
##  $ tobacco_per_sqm             : num  0.206 1.601 5.038 3.311 1.909 ...
##  $ convenience_per_1kppl       : num  0.1404 0.1397 0.1414 0.0931 0.0984 ...
##  $ convenience_per_sqm         : num  4.53 5.49 10.08 8.61 8.27 ...
##  $ ecig_per_1kppl              : num  0 0.00582 0 0 0 ...
##  $ ecig_per_sqm                : num  0 0.229 0 0 0 ...
##  $ marijuana_per_1kppl         : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ marijuana_per_sqm           : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ civsoc_per_1kppl            : num  0.128 0.128 0.141 0.122 0.136 ...
##  $ civsoc_per_sqm              : num  4.12 5.03 10.08 11.26 11.46 ...
##  $ youthorgs_per_1kppl         : num  0.0255 0.0466 0.0354 0.0286 0.0227 ...
##  $ youthorgs_per_sqm           : num  0.824 1.83 2.519 2.649 1.909 ...
##  $ vetorgs_per_1kppl           : num  0 0.00582 0.01414 0 0 ...
##  $ vetorgs_per_sqm             : num  0 0.229 1.008 0 0 ...
##  $ relig_per_1kppl             : num  0.906 1.146 0.785 0.709 0.568 ...
##  $ relig_per_sqm               : num  29.2 45.1 55.9 65.6 47.7 ...
##  $ barber_per_1kppl            : num  0.383 0.396 0.347 0.358 0.242 ...
##  $ barber_per_sqm              : num  12.4 15.6 24.7 33.1 20.4 ...
##  $ beauty_per_1kppl            : num  0.957 0.867 0.969 1.088 0.954 ...
##  $ beauty_per_sqm              : num  30.9 34.1 69 100.7 80.2 ...
##  $ laundry_per_1kppl           : num  0.223 0.169 0.134 0.158 0.204 ...
##  $ laundry_per_sqm             : num  7.21 6.63 9.57 14.57 17.18 ...
##  $ drycl_per_1kppl             : num  0.0638 0.04655 0.03536 0.00716 0.02271 ...
##  $ drycl_per_sqm               : num  2.059 1.83 2.519 0.662 1.909 ...
##  $ I.Fserv_per_1kppl           : num  0.817 0.512 0.332 0.444 0.431 ...
##  $ I.Fserv_per_sqm             : num  26.4 20.1 23.7 41.1 36.3 ...
##  $ E.Dserv_per_1kppl           : num  0.0957 0.0466 0.0212 0.0215 0.0454 ...
##  $ E.Dserv_per_sqm             : num  3.09 1.83 1.51 1.99 3.82 ...
##  $ C.Yserv_per_1kppl           : num  0.0383 0.0407 0.0283 0.0215 0.0454 ...
##  $ C.Yserv_per_sqm             : num  1.24 1.6 2.02 1.99 3.82 ...
##  $ Eserv_per_1kppl             : num  0.0319 0.0233 0.0141 0.0143 0 ...
##  $ Eserv_per_sqm               : num  1.029 0.915 1.008 1.324 0 ...
##  $ MDprog_per_1kppl            : num  0.00638 0 0 0 0 ...
##  $ MDprog_per_sqm              : num  0.206 0 0 0 0 ...
##  $ Gcouns_per_1kppl            : num  0.236 0.163 0.099 0.129 0.136 ...
##  $ Gcouns_per_sqm              : num  7.62 6.41 7.05 11.92 11.46 ...
##  $ SAcouns_per_1kppl           : num  0.01276 0.01746 0 0.00716 0.00757 ...
##  $ SAcouns_per_sqm             : num  0.412 0.686 0 0.662 0.636 ...
##  $ Dayc_per_1kppl              : num  0.555 0.594 0.467 0.652 0.621 ...
##  $ Dayc_per_sqm                : num  17.9 23.3 33.3 60.3 52.2 ...
##  $ C.Sstor_per_1kppl           : num  0.619 0.442 0.502 0.537 0.681 ...
##  $ C.Sstor_per_sqm             : num  20 17.4 35.8 49.7 57.3 ...
##  $ F.Astor_per_1kppl           : num  0.249 0.18 0.163 0.122 0.25 ...
##  $ F.Astor_per_sqm             : num  8.03 7.09 11.59 11.26 21 ...
##  $ Mstor_per_1kppl             : num  0.0957 0.0582 0.0636 0.0501 0.053 ...
##  $ Mstor_per_sqm               : num  3.09 2.29 4.53 4.64 4.46 ...
##  $ H.Gstor_per_1kppl           : num  0.0893 0.0524 0.0566 0.0573 0.0454 ...
##  $ H.Gstor_per_sqm             : num  2.88 2.06 4.03 5.3 3.82 ...
```

```
##  $ D.Vstor_per_1kppl           : num  0.447 0.268 0.339 0.272 0.341 ...
##  $ D.Vstor_per_sqm             : num  14.4 10.5 24.2 25.2 28.6 ...
##  $ Ustor_per_1kppl             : num  0.0957 0.0989 0.0636 0.0573 0.1211 ...
##  $ Ustor_per_sqm               : num  3.09 3.89 4.53 5.3 10.18 ...
##  $ pyhs_per_1kppl              : num  0.479 0.39 0.446 0.487 1.082 ...
##  $ phys_per_sqm                : num  15.4 15.3 31.7 45 91 ...
##  $ pharm_per_1kppl             : num  0.561 0.355 0.332 0.401 0.333 ...
##   [list output truncated]
```

```
summary(SBA)
```

```
##       SBA          SBA_name          med_hous_inc     pct_FL_loans
##  Min.   :101.0   Length:55          Min.   : 25210   Min.   : 0.00
##  1st Qu.:204.5   Class :character   1st Qu.: 61240   1st Qu.: 0.15
##  Median :218.0   Mode  :character   Median : 70680   Median : 2.30
##  Mean   :274.4                      Mean   : 78978   Mean   :12.85
##  3rd Qu.:403.5                      3rd Qu.: 90315   3rd Qu.:26.45
##  Max.   :503.0                      Max.   :180320   Max.   :60.60
##  pct_FL_loans_2_LI inc_div_ratio     mort_forc         pov_pct
##  Min.   :  0.00    Min.   :3.400   Min.   :   8.0   Min.   : 6.10
##  1st Qu.:  9.85    1st Qu.:4.900   1st Qu.:  45.0   1st Qu.:10.30
##  Median : 35.50    Median :5.700   Median : 104.0   Median :16.20
##  Mean   : 37.84    Mean   :5.851   Mean   : 188.1   Mean   :18.34
##  3rd Qu.: 59.15    3rd Qu.:6.400   3rd Qu.: 261.0   3rd Qu.:23.95
##  Max.   :100.00    Max.   :9.700   Max.   :1079.0   Max.   :44.20
##    pct_asian       pct_black       prob_race        pct_hispan
##  Min.   : 0.30   Min.   : 0.90   Min.   :0.2400   Min.   : 5.70
##  1st Qu.: 4.10   1st Qu.: 4.50   1st Qu.:0.5050   1st Qu.:14.80
##  Median : 8.90   Median :12.10   Median :0.6000   Median :20.60
##  Mean   :13.95   Mean   :21.89   Mean   :0.5851   Mean   :29.27
##  3rd Qu.:17.70   3rd Qu.:29.60   3rd Qu.:0.6700   3rd Qu.:41.10
##  Max.   :54.50   Max.   :87.10   Max.   :0.8000   Max.   :74.10
##    pct_white        pop_dens       priv_landL_amt    med_rti       med_gro_rnt
##  Min.   : 1.00   Min.   :  6.20   Min.   :2925   Min.   :22.20   Min.   :1100
##  1st Qu.:12.10   1st Qu.: 27.00   1st Qu.:3730   1st Qu.:29.55   1st Qu.:1515
##  Median :26.70   Median : 40.60   Median :4336   Median :32.90   Median :1730
##  Mean   :32.01   Mean   : 44.37   Mean   :4543   Mean   :32.69   Mean   :1801
##  3rd Qu.:48.80   3rd Qu.: 55.55   3rd Qu.:5218   3rd Qu.:35.55   3rd Qu.:1910
##  Max.   :82.50   Max.   :107.80   Max.   :8507   Max.   :47.70   Max.   :3190
##      vac_rt          pct_condo          pct_coop           sound
##  Min.   :0.03030   Min.   :0.00000   Min.   :0.00000   Min.   :0.8512
##  1st Qu.:0.08035   1st Qu.:0.01566   1st Qu.:0.02895   1st Qu.:0.9006
##  Median :0.10429   Median :0.03133   Median :0.07865   Median :0.9377
##  Mean   :0.11198   Mean   :0.04883   Mean   :0.10684   Mean   :0.9279
##  3rd Qu.:0.12346   3rd Qu.:0.06601   3rd Qu.:0.15952   3rd Qu.:0.9556
##  Max.   :0.29778   Max.   :0.18310   Max.   :0.46701   Max.   :0.9937
##      deter               rats            r_aches             afford
##  Min.   :0.000000   Min.   :0.02183   Min.   :0.003717   Min.   :0.4356
##  1st Qu.:0.008187   1st Qu.:0.08500   1st Qu.:0.118657   1st Qu.:0.5160
##  Median :0.019157   Median :0.14136   Median :0.193717   Median :0.5425
##  Mean   :0.026903   Mean   :0.16868   Mean   :0.211167   Mean   :0.5566
##  3rd Qu.:0.036050   3rd Qu.:0.23640   3rd Qu.:0.295429   3rd Qu.:0.5954
##  Max.   :0.106061   Max.   :0.39604   Max.   :0.455446   Max.   :0.6782
##     unafford          avg_rti          avg_age        pct_howner
##  Min.   :0.03765   Min.   :0.2906   Min.   :43.79   Min.   :0.0396
```

```
##  1st Qu.:0.08666   1st Qu.:0.3318   1st Qu.:49.29   1st Qu.:0.1354
##  Median :0.11818   Median :0.3551   Median :51.21   Median :0.2604
##  Mean   :0.12342   Mean   :0.3557   Mean   :51.15   Mean   :0.2800
##  3rd Qu.:0.14938   3rd Qu.:0.3774   3rd Qu.:52.98   3rd Qu.:0.3862
##  Max.   :0.26238   Max.   :0.4252   Max.   :59.25   Max.   :0.6729
##  pct_immigrant    med_year_moved_in med_length_res   pct_recent_moves
##  Min.   :0.1092   Min.   :1998      Min.   : 5.000   Min.   :0.2944
##  1st Qu.:0.1806   1st Qu.:2006      1st Qu.: 7.000   1st Qu.:0.4270
##  Median :0.3102   Median :2008      Median : 9.500   Median :0.4689
##  Mean   :0.3088   Mean   :2007      Mean   : 9.609   Mean   :0.4720
##  3rd Qu.:0.3801   3rd Qu.:2010      3rd Qu.:11.500   3rd Qu.:0.5311
##  Max.   :0.6718   Max.   :2012      Max.   :18.500   Max.   :0.6130
##  pct_fresh_moves    pct_displ          pct_gentr            rennov
##  Min.   :0.1988   Min.   :0.000000   Min.   :0.008333   Min.   :0.00000
##  1st Qu.:0.2809   1st Qu.:0.008772   1st Qu.:0.036700   1st Qu.:0.01553
##  Median :0.3272   Median :0.013043   Median :0.046595   Median :0.02682
##  Mean   :0.3253   Mean   :0.014456   Mean   :0.050032   Mean   :0.03685
##  3rd Qu.:0.3757   3rd Qu.:0.020747   3rd Qu.:0.059883   3rd Qu.:0.04348
##  Max.   :0.4658   Max.   :0.031746   Max.   :0.113014   Max.   :0.21516
##     tot_pop          sq_miles      t_dollar_stores  dollars_per_1kppl
##  Min.   :107532   Min.   : 1.447   Min.   : 0.000   Min.   :0.000000
##  1st Qu.:131604   1st Qu.: 2.689   1st Qu.: 1.000   1st Qu.:0.007131
##  Median :148806   Median : 3.807   Median : 2.000   Median :0.014696
##  Mean   :153078   Mean   : 5.503   Mean   : 3.073   Mean   :0.020178
##  3rd Qu.:164332   3rd Qu.: 6.054   3rd Qu.: 4.000   3rd Qu.:0.027246
##  Max.   :242631   Max.   :24.500   Max.   :12.000   Max.   :0.077363
##  dollars_per_sqm  liqour_per_1kppl  liqour_per_sqm    tobacco_per_1kppl
##  Min.   :0.0000   Min.   :0.09082   Min.   : 0.8071   Min.   :0.006349
##  1st Qu.:0.1735   1st Qu.:0.12907   1st Qu.: 3.8901   1st Qu.:0.023808
##  Median :0.4611   Median :0.15588   Median : 6.8529   Median :0.040533
##  Mean   :0.8681   Mean   :0.18463   Mean   : 8.3457   Mean   :0.048502
##  3rd Qu.:1.1573   3rd Qu.:0.21201   3rd Qu.:10.0046   3rd Qu.:0.061812
##  Max.   :3.9732   Max.   :0.67642   Max.   :34.8156   Max.   :0.189651
##  tobacco_per_sqm  convenience_per_1kppl convenience_per_sqm ecig_per_1kppl
##  Min.   :0.0884   Min.   :0.02336       Min.   : 0.2652     Min.   :0.000000
##  1st Qu.:0.7671   1st Qu.:0.09501       1st Qu.: 3.2353     1st Qu.:0.000000
##  Median :1.3655   Median :0.13566       Median : 5.4906     Median :0.007522
##  Mean   :2.1207   Mean   :0.13218       Mean   : 5.5944     Mean   :0.013325
##  3rd Qu.:2.5445   3rd Qu.:0.16115       3rd Qu.: 6.9770     3rd Qu.:0.021744
##  Max.   :9.7614   Max.   :0.26551       Max.   :19.4599     Max.   :0.051762
##   ecig_per_sqm    marijuana_per_1kppl marijuana_per_sqm civsoc_per_1kppl
##  Min.   :0.0000   Min.   :0.0000000   Min.   :0.00000   Min.   :0.1217
##  1st Qu.:0.0000   1st Qu.:0.0000000   1st Qu.:0.00000   1st Qu.:0.1810
##  Median :0.2449   Median :0.0000000   Median :0.00000   Median :0.2621
##  Mean   :0.5195   Mean   :0.0004872   Mean   :0.02894   Mean   :0.4271
##  3rd Qu.:0.6593   3rd Qu.:0.0000000   3rd Qu.:0.00000   3rd Qu.:0.4479
##  Max.   :4.5788   Max.   :0.0128457   Max.   :0.67450   Max.   :2.8701
##  civsoc_per_sqm    youthorgs_per_1kppl youthorgs_per_sqm vetorgs_per_1kppl
##  Min.   :  1.463   Min.   :0.00000     Min.   :0.0000    Min.   :0.000000
##  1st Qu.:  5.282   1st Qu.:0.01709     1st Qu.:0.4685    1st Qu.:0.008112
##  Median :  9.221   Median :0.03100     Median :0.9617    Median :0.016856
##  Mean   : 22.238   Mean   :0.03670     Mean   :1.7693    Mean   :0.019801
##  3rd Qu.: 22.043   3rd Qu.:0.04592     3rd Qu.:2.2845    3rd Qu.:0.028107
##  Max.   :147.722   Max.   :0.18333     Max.   :9.4360    Max.   :0.057806
```

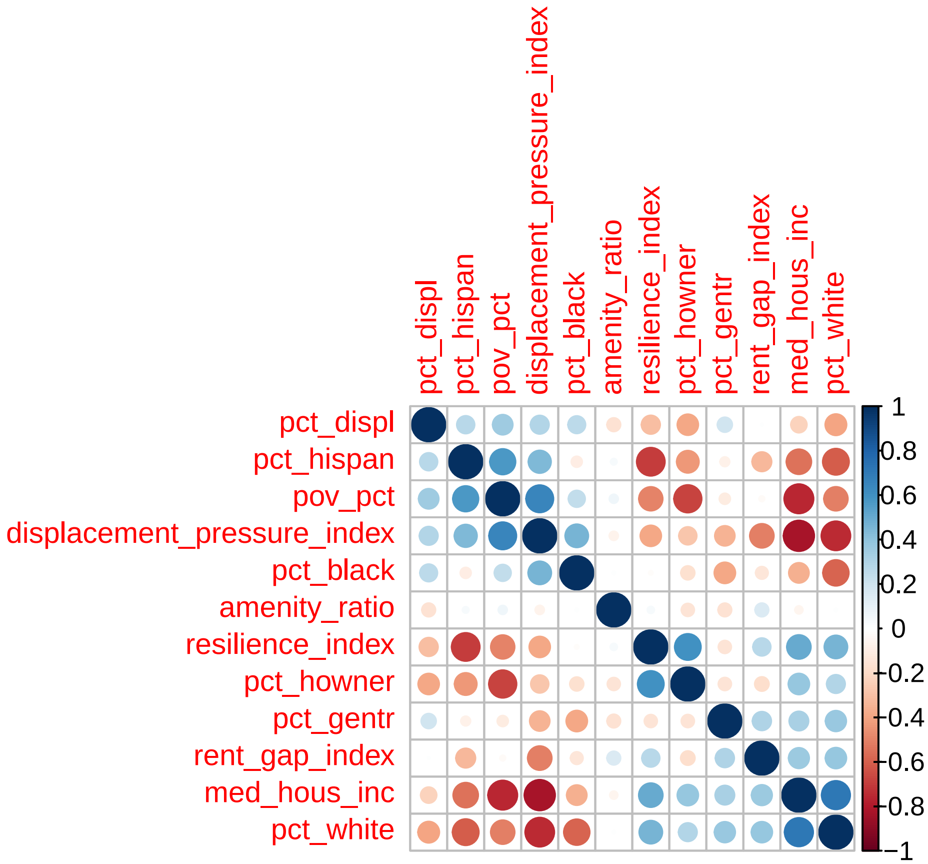
```
##  vetorgs_per_sqm  relig_per_1kppl  relig_per_sqm     barber_per_1kppl
##  Min.   :0.0000   Min.   :0.3645   Min.   :  2.449   Min.   :0.06229
##  1st Qu.:0.3009   1st Qu.:0.6896   1st Qu.: 21.224   1st Qu.:0.14771
##  Median :0.5253   Median :0.9106   Median : 29.524   Median :0.18915
##  Mean   :0.7395   Mean   :1.0689   Mean   : 47.697   Mean   :0.20332
##  3rd Qu.:0.9698   3rd Qu.:1.1861   3rd Qu.: 66.510   3rd Qu.:0.24752
##  Max.   :3.0462   Max.   :4.8063   Max.   :236.553   Max.   :0.46148
##  barber_per_sqm    beauty_per_1kppl beauty_per_sqm    laundry_per_1kppl
##  Min.   : 0.7072   Min.   :0.5762   Min.   :  5.551   Min.   :0.08565
##  1st Qu.: 4.2185   1st Qu.:0.9480   1st Qu.: 29.418   1st Qu.:0.16011
##  Median : 6.9509   Median :1.0831   Median : 47.579   Median :0.20435
##  Mean   : 9.3637   Mean   :1.2453   Mean   : 56.157   Mean   :0.22541
##  3rd Qu.:12.9680   3rd Qu.:1.3743   3rd Qu.: 66.046   3rd Qu.:0.26916
##  Max.   :33.1104   Max.   :3.7993   Max.   :199.830   Max.   :0.53672
##  laundry_per_sqm   drycl_per_1kppl   drycl_per_sqm     I.Fserv_per_1kppl
##  Min.   : 0.7347   Min.   :0.00716   Min.   : 0.1424   Min.   :0.2257
##  1st Qu.: 6.0361   1st Qu.:0.02754   1st Qu.: 0.6918   1st Qu.:0.4030
##  Median : 9.4173   Median :0.04232   Median : 1.8931   Median :0.4644
##  Mean   : 9.3841   Mean   :0.05137   Mean   : 2.5018   Mean   :0.6049
##  3rd Qu.:12.6005   3rd Qu.:0.07057   3rd Qu.: 2.8963   3rd Qu.:0.6567
##  Max.   :26.3282   Max.   :0.19539   Max.   :20.8128   Max.   :2.6867
##  I.Fserv_per_sqm   E.Dserv_per_1kppl  E.Dserv_per_sqm   C.Yserv_per_1kppl
##  Min.   :  1.592   Min.   :0.007522   Min.   : 0.1224   Min.   :0.00000
##  1st Qu.: 11.147   1st Qu.:0.045079   1st Qu.: 1.3502   1st Qu.:0.01517
##  Median : 16.368   Median :0.064196   Median : 2.1588   Median :0.03100
##  Mean   : 29.834   Mean   :0.064022   Mean   : 2.7159   Mean   :0.03719
##  3rd Qu.: 35.860   3rd Qu.:0.082876   3rd Qu.: 3.2852   3rd Qu.:0.05157
##  Max.   :138.286   Max.   :0.177008   Max.   :10.3023   Max.   :0.13908
##  C.Yserv_per_sqm  Eserv_per_1kppl    Eserv_per_sqm     MDprog_per_1kppl
##  Min.   : 0.000   Min.   :0.000000   Min.   :0.00000   Min.   :0.000000
##  1st Qu.: 0.378   1st Qu.:0.002061   1st Qu.:0.04082   1st Qu.:0.000000
##  Median : 1.186   Median :0.013218   Median :0.39527   Median :0.000000
##  Mean   : 1.915   Mean   :0.015425   Mean   :0.76168   Mean   :0.001824
##  3rd Qu.: 2.537   3rd Qu.:0.023269   3rd Qu.:1.01850   3rd Qu.:0.000000
##  Max.   :10.367   Max.   :0.057806   Max.   :4.26467   Max.   :0.022227
##  MDprog_per_sqm    Gcouns_per_1kppl  Gcouns_per_sqm    SAcouns_per_1kppl
##  Min.   :0.00000   Min.   :0.08754   Min.   : 0.7347   Min.   :0.000000
##  1st Qu.:0.00000   1st Qu.:0.12613   1st Qu.: 3.8707   1st Qu.:0.000000
##  Median :0.00000   Median :0.16545   Median : 6.1711   Median :0.005826
##  Mean   :0.08831   Mean   :0.22578   Mean   :11.3037   Mean   :0.007499
##  3rd Qu.:0.00000   3rd Qu.:0.21604   3rd Qu.:11.6878   3rd Qu.:0.008721
##  Max.   :0.97420   Max.   :1.16319   Max.   :59.8699   Max.   :0.075861
##  SAcouns_per_sqm  Dayc_per_1kppl    Dayc_per_sqm    C.Sstor_per_1kppl
##  Min.   :0.0000   Min.   :0.2369   Min.   : 1.592   Min.   : 0.2617
##  1st Qu.:0.0000   1st Qu.:0.3787   1st Qu.:10.889   1st Qu.: 0.4649
##  Median :0.1065   Median :0.4668   Median :17.911   Median : 0.6418
##  Mean   :0.3746   Mean   :0.4840   Mean   :20.898   Mean   : 0.9937
##  3rd Qu.:0.3990   3rd Qu.:0.5971   3rd Qu.:29.754   3rd Qu.: 0.9239
##  Max.   :3.9046   Max.   :0.8965   Max.   :60.261   Max.   :10.0642
##  C.Sstor_per_sqm  F.Astor_per_1kppl F.Astor_per_sqm  Mstor_per_1kppl
##  Min.   :  2.00   Min.   :0.06682   Min.   : 0.449   Min.   :0.02169
##  1st Qu.: 14.66   1st Qu.:0.14059   1st Qu.: 4.986   1st Qu.:0.05636
##  Median : 28.53   Median :0.19046   Median : 7.469   Median :0.07441
##  Mean   : 48.81   Mean   :0.22297   Mean   : 9.830   Mean   :0.11965
```

```
##  3rd Qu.: 47.78   3rd Qu.:0.26559   3rd Qu.:11.788   3rd Qu.:0.12166
##  Max.   :518.00   Max.   :1.03676   Max.   :53.362   Max.   :0.80286
##  Mstor_per_sqm     H.Gstor_per_1kppl H.Gstor_per_sqm   D.Vstor_per_1kppl
##  Min.   : 0.1513   Min.   :0.02148   Min.   : 0.3531   Min.   :0.1946
##  1st Qu.: 1.7691   1st Qu.:0.04806   1st Qu.: 1.2071   1st Qu.:0.3232
##  Median : 2.9524   Median :0.06028   Median : 2.5541   Median :0.3906
##  Mean   : 5.9374   Mean   :0.07130   Mean   : 3.1309   Mean   :0.4923
##  3rd Qu.: 7.1341   3rd Qu.:0.08650   3rd Qu.: 4.1562   3rd Qu.:0.4941
##  Max.   :41.3232   Max.   :0.25919   Max.   :13.3406   Max.   :2.7879
##  D.Vstor_per_sqm   Ustor_per_1kppl   Ustor_per_sqm     pyhs_per_1kppl
##  Min.   :  1.469   Min.   :0.01470   Min.   : 0.1768   Min.   :0.248
##  1st Qu.:  9.946   1st Qu.:0.04334   1st Qu.: 1.5008   1st Qu.:0.718
##  Median : 16.350   Median :0.06808   Median : 3.0172   Median :1.029
##  Mean   : 22.637   Mean   :0.11090   Mean   : 5.7390   Mean   :1.464
##  3rd Qu.: 25.456   3rd Qu.:0.11440   3rd Qu.: 4.6444   3rd Qu.:1.593
##  Max.   :143.492   Max.   :0.74596   Max.   :48.0677   Max.   :7.574
##   phys_per_sqm     pharm_per_1kppl  pharm_per_sqm    post_per_1kppl
##  Min.   :  6.531   Min.   :0.1875   Min.   : 1.265   Min.   :0.006349
##  1st Qu.: 17.195   1st Qu.:0.2845   1st Qu.: 7.781   1st Qu.:0.017024
##  Median : 36.761   Median :0.3393   Median :16.089   Median :0.024803
##  Mean   : 74.253   Mean   :0.3703   Mean   :16.714   Mean   :0.026199
##  3rd Qu.: 66.948   3rd Qu.:0.4288   3rd Qu.:22.709   3rd Qu.:0.034749
##  Max.   :806.745   Max.   :0.8281   Max.   :42.647   Max.   :0.082182
##   post_per_sqm    banks_per_1kppl   banks_per_sqm     R.Pcent_per_1kppl
##  Min.   :0.1009   Min.   :0.03349   Min.   :  1.238   Min.   :0.04074
##  1st Qu.:0.5829   1st Qu.:0.09807   1st Qu.:  3.141   1st Qu.:0.09601
##  Median :0.7724   Median :0.17832   Median :  5.290   Median :0.15699
##  Mean   :1.0397   Mean   :0.23685   Mean   : 10.843   Mean   :0.20617
##  3rd Qu.:1.1798   3rd Qu.:0.25352   3rd Qu.:  9.491   3rd Qu.:0.20473
##  Max.   :4.2299   Max.   :1.99134   Max.   :102.495   Max.   :1.25802
##  R.Pcent_per_sqm  G.Drang_per_1kppl  G.Drang_per_sqm  SK.SW.Tcourt_per_1kppl
##  Min.   : 0.884   Min.   :0.000000   Min.   :0.0000   Min.   :0.000000
##  1st Qu.: 2.661   1st Qu.:0.000000   1st Qu.:0.0000   1st Qu.:0.000000
##  Median : 5.516   Median :0.000000   Median :0.0000   Median :0.004617
##  Mean   :10.008   Mean   :0.003134   Mean   :0.1042   Mean   :0.005584
##  3rd Qu.: 9.598   3rd Qu.:0.006608   3rd Qu.:0.1037   3rd Qu.:0.007838
##  Max.   :64.751   Max.   :0.031609   Max.   :1.6269   Max.   :0.026436
##  SK.SW.Tcourt_per_sqm Members_per_1kppl Members_per_sqm  TotRec_per_1kppl
##  Min.   :0.00000      Min.   :0.07539   Min.   : 0.898   Min.   :0.1612
##  1st Qu.:0.00000      1st Qu.:0.13685   1st Qu.: 3.401   1st Qu.:0.3069
##  Median :0.05044      Median :0.16074   Median : 5.740   Median :0.4002
##  Mean   :0.25295      Mean   :0.19252   Mean   : 8.996   Mean   :0.5130
##  3rd Qu.:0.39252      3rd Qu.:0.22372   3rd Qu.:12.035   3rd Qu.:0.5678
##  Max.   :1.48663      Max.   :0.82814   Max.   :42.625   Max.   :2.6994
##  TotRec_per_sqm    Share_Priv_Rec   Arts.E_per_1kppl  Arts.E_per_sqm
##  Min.   :  2.939   Min.   :0.2115   Min.   :0.00000   Min.   :  0.000
##  1st Qu.:  7.857   1st Qu.:0.3380   1st Qu.:0.07896   1st Qu.:  2.099
##  Median : 14.002   Median :0.3898   Median :0.11385   Median :  4.385
##  Mean   : 23.960   Mean   :0.4193   Mean   :0.28900   Mean   : 15.720
##  3rd Qu.: 24.674   3rd Qu.:0.4871   3rd Qu.:0.26758   3rd Qu.: 12.997
##  Max.   :138.937   Max.   :0.7755   Max.   :3.16086   Max.   :162.690
##  Hotels_per_1kppl  Hotels_per_sqm     MTAStops_per_sqm  Wavg_download_sp
##  Min.   :0.01077   Min.   :  0.2857   Min.   :  0.000   Min.   : 28.33
##  1st Qu.:0.05661   1st Qu.:  1.5891   1st Qu.:  5.471   1st Qu.:144.87
```

```
##  Median :0.08596   Median :  2.8321   Median : 37.172   Median :222.40
##  Mean   :0.20543   Mean   : 10.7484   Mean   : 36.695   Mean   :283.04
##  3rd Qu.:0.14024   3rd Qu.:  7.0604   3rd Qu.: 60.321   3rd Qu.:376.02
##  Max.   :3.25568   Max.   :167.5705   Max.   :100.087   Max.   :701.90
##  Wavg_upload_sp     aff_30_pre      aff_30_post       aff_80_pre
##  Min.   : 27.66   Min.   : 0.000   Min.   : 0.900   Min.   : 7.70
##  1st Qu.:144.29   1st Qu.: 3.300   1st Qu.: 4.300   1st Qu.:39.45
##  Median :221.83   Median : 5.400   Median : 5.400   Median :54.60
##  Mean   :282.47   Mean   : 6.742   Mean   : 7.204   Mean   :52.45
##  3rd Qu.:375.48   3rd Qu.: 7.350   3rd Qu.: 9.100   3rd Qu.:70.50
##  Max.   :701.68   Max.   :27.300   Max.   :29.900   Max.   :92.60
##   aff_80_post     aff_120_pre      aff_120_post     vac_rnt_pct_pre
##  Min.   :13.20   Min.   : 23.90   Min.   : 31.30   Min.   :1.400
##  1st Qu.:35.75   1st Qu.: 81.00   1st Qu.: 87.65   1st Qu.:2.300
##  Median :54.60   Median : 94.80   Median : 94.80   Median :2.900
##  Mean   :54.00   Mean   : 84.36   Mean   : 87.19   Mean   :3.373
##  3rd Qu.:70.95   3rd Qu.: 98.65   3rd Qu.: 98.15   3rd Qu.:4.100
##  Max.   :93.10   Max.   :100.00   Max.   :100.00   Max.   :8.200
##  vac_rnt_pct_post housing_quality   inv_med_gro_rnt   avg_age_grouped
##  Min.   :0.900    Min.   :-1.1371   Min.   :0.3135   Length:55
##  1st Qu.:2.300    1st Qu.:-0.7156   1st Qu.:0.5238   Class :character
##  Median :3.200    Median :-0.1055   Median :0.5780   Mode  :character
##  Mean   :3.455    Mean   : 0.0000   Mean   :0.5866
##  3rd Qu.:3.900    3rd Qu.: 0.5368   3rd Qu.:0.6601
##  Max.   :8.400    Max.   : 1.7812   Max.   :0.9091
##  avg_surrounding_median_income raceth_group       resilience_index
##  Min.   : 31990                Length:55          Min.   :  1.818
##  1st Qu.: 64115                Class :character   1st Qu.: 26.364
##  Median : 77145                Mode  :character   Median : 50.909
##  Mean   : 79917                                   Mean   : 50.909
##  3rd Qu.: 92368                                   3rd Qu.: 75.455
##  Max.   :158133                                   Max.   :100.000
##   family_index    necessary_amenities_index unnecessary_amenities_index
##  Min.   :  0.00   Min.   :  0.000           Min.   :  0.000
##  1st Qu.: 17.52   1st Qu.:  6.731           1st Qu.:  2.945
##  Median : 25.51   Median : 38.994           Median :  3.904
##  Mean   : 29.57   Mean   : 38.042           Mean   :  8.799
##  3rd Qu.: 37.97   3rd Qu.: 61.851           3rd Qu.:  6.848
##  Max.   :100.00   Max.   :100.000           Max.   :100.000
##  amenity_ratio       rent_gap_index   displacement_pressure_index
##  Min.   :  0.00000   Min.   :  0.00   Min.   :  0.00
##  1st Qu.:  0.06529   1st Qu.: 21.65   1st Qu.: 35.55
##  Median :  0.21593   Median : 34.03   Median : 48.50
##  Mean   :  2.98816   Mean   : 37.38   Mean   : 49.57
##  3rd Qu.:  0.73905   3rd Qu.: 51.82   3rd Qu.: 69.58
##  Max.   :100.00000   Max.   :100.00   Max.   :100.00
```

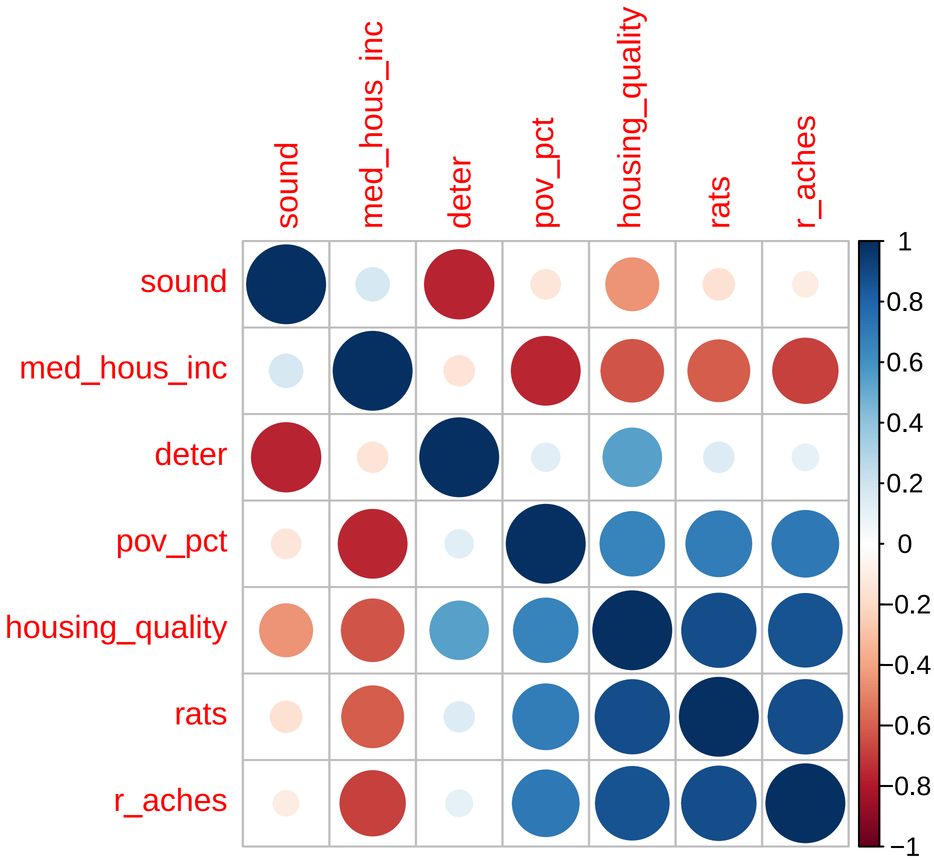
```r
# Correlation matrix of some important variables
vars <- c("pct_gentr", "pct_displ", "med_hous_inc", "pov_pct", "pct_black", "pct_hispan","pct_white", "

cor_matrix <- cor(SBA[vars], use = "complete.obs")
corrplot(cor_matrix, method = "circle",
         order = "hclust", tl.cex = 0.9)
```




```r
# corr matrix of rats, r_aches, & deter
vars <- c("rats","r_aches","deter","housing_quality","pov_pct","sound","med_hous_inc")

cor_matrix <- cor(SBA[vars], use = "complete.obs")
corrplot(cor_matrix, method = "circle",
         order = "hclust")
```



For general corrplot… Poverty rate correlates positively with hispanic & black populations and negatively with homeownership, median household income, & white populations- which all are somewhat expected. Its also positively correlated with displacemt pressures which is reassuring because it reflects that displacement pressures tend to be higher in poorer,non-white neighborhoods.

Similarly, median household income has a very strong negative relationship with displacement pressures indicating again that wealthier neighborhoods tend to be subject to less displacement pressures. Its also negatively correlated with black & hispanic populations, & incoming displacees.

Community resilience being very negatively related to poverty rates goes against my assumptions, unless in 2017 certain neighborhoods were already at a later stage of gentrification that displaces community members and exibits a loss of community networks, or the resilience index doesn't reflect the same local resources that provide effective buffers to gentrification

For rats/r_aches corrplot… Expected extreme negative relationship between sound & deter, and also with housing_quality since deter is the main variable in its calculation. Its somewhat interesting that the percent of sound units doesn't really correlate with the presence of rats/r_aches but "sound" may refer more to a basic structural safety that may not reflect its cleanliness as well. Poverty rate is positively related to both rats & r_aches, and negatively with med_hous_inc which also makes sense if displacees are heavily constrained to move into neighborhoods that have yet to be reinvested in, which might reflect the livability of those neighborhoods.

Rats is highly correlated with r_aches which is expected but not so much with sound/deter which would support the idea that sound/deter are markers of more basic structural compliances rather than livability/cleanlinesss so i might remove it from housing quality measure (but r_aches also doesn't correlate with sound/deter all that much so do i drop both or forget about that index?). Sound/deter & rats/r_aches measuring two very different things that dont seem to relate with one another.

```r
# converting raceth_group to factor where reference category = white
SBA$raceth_group <- factor(SBA$raceth_group,
                           levels = c("White", "Black", "Hispanic", "Asian"))

# check
levels(SBA$raceth_group)
```

```
## [1] "White"    "Black"    "Hispanic" "Asian"
```

Regressions:

```r
# MODEL1
model1 <- lm(pct_gentr ~ aff_30_pre + rent_gap_index + resilience_index + pov_pct, data = SBA)
# summary(model1)

# MODEL2
model2 <- lm(pct_gentr ~ aff_30_pre + rent_gap_index + resilience_index + pov_pct + raceth_group, data =
# summary(model2)

# MODEL3
model3 <- lm(pct_gentr ~ aff_30_pre + rent_gap_index + pov_pct + resilience_index*raceth_group, data = S
# summary(model3)

stargazer(model1, model2, model3, type = "text")
```

```
##
## ==============================================================================================
##                                                           Dependent variable:
##                                         ------------------------------------------------------
##                                                                pct_gentr
##                                                    (1)            (2)              (3)
## ----------------------------------------------------------------------------------------------
## aff_30_pre                                     -0.001**         -0.001           -0.001
##                                                 (0.001)         (0.001)          (0.001)
##
## rent_gap_index                                 0.0004***       0.0003***        0.0003***
##                                                (0.0001)        (0.0001)         (0.0001)
##
## resilience_index                               -0.0003**      -0.0003***        -0.0003
##                                                (0.0001)        (0.0001)         (0.0002)
##
## pov_pct                                         0.00002         0.0001          0.00003
##                                                (0.0004)        (0.0004)         (0.0005)
##
## raceth_groupBlack                                               -0.012           -0.017
##                                                                 (0.008)          (0.020)
##
## raceth_groupHispanic                                            -0.016*          -0.009
##                                                                 (0.008)          (0.015)
##
## raceth_groupAsian                                                0.001            0.033
##                                                                 (0.009)          (0.028)
##
## resilience_index:raceth_groupBlack                                               0.0001
##                                                                                 (0.0003)
```

```
##
## resilience_index:raceth_groupHispanic                                                                -0.0001
##                                                                                                      (0.0003)
##
## resilience_index:raceth_groupAsian                                                                   -0.0005
##                                                                                                      (0.0004)
##
## Constant                                        0.057***              0.067***              0.064***
##                                                 (0.010)               (0.011)               (0.013)
##
## ---------------------------------------------------------------------------------------------------------
## Observations                                       55                    55                    55
## R2                                               0.278                 0.351                 0.380
## Adjusted R2                                      0.220                 0.255                 0.239
## Residual Std. Error                        0.019 (df = 50)       0.018 (df = 47)       0.018 (df = 44)
## F Statistic                           4.815*** (df = 4; 50) 3.634*** (df = 7; 47) 2.699** (df = 10; 4
## =========================================================================================================
## Note:                                                                         *p<0.1; **p<0.05; ***p<0
```

Story…

Multicollinearity checks:

```r
vif(model1)
```

```
##       aff_30_pre   rent_gap_index resilience_index          pov_pct
##         2.128219         1.106720         1.495766         2.648185
```

```r
vif(model2)
```

```
##                      GVIF Df GVIF^(1/(2*Df))
## aff_30_pre       2.538483  1        1.593262
## rent_gap_index   1.185959  1        1.089017
## resilience_index 1.859763  1        1.363731
## pov_pct          2.827371  1        1.681479
## raceth_group     2.207230  3        1.141059
```

```r
vif(model3, type = "predictor") # to handle interaction
```

```
## GVIFs computed for predictors

##                      GVIF Df GVIF^(1/(2*Df))   Interacts With
## aff_30_pre       2.659353  1        1.630752               --
## rent_gap_index   1.263942  1        1.124252               --
## pov_pct          3.134486  1        1.770448               --
## resilience_index 2.599039  7        1.070606     raceth_group
## raceth_group     2.599039  7        1.070606 resilience_index
##                                                   Other Predictors
## aff_30_pre          rent_gap_index, pov_pct, resilience_index, raceth_group
## rent_gap_index          aff_30_pre, pov_pct, resilience_index, raceth_group
## pov_pct          aff_30_pre, rent_gap_index, resilience_index, raceth_group
## resilience_index                        aff_30_pre, rent_gap_index, pov_pct
## raceth_group                            aff_30_pre, rent_gap_index, pov_pct
```

Blurb here…

F-test:

```r
# RESTRICTED model: just the effect of pre-period affordable housing,  poverty rate, rent_gap, & commun
restricted_model <- lm(pct_gentr ~ aff_30_pre + rent_gap_index + resilience_index + pov_pct, data = SBA

# Comparing with FULL model: the additional effect of the dominant race/ethnicity group of each neighbo
f_test <- anova(restricted_model, model3)

stargazer(restricted_model, model3, type = "text", title = "F-test", column.labels = c("Restricted", "Fu
```

```
##
## F-test
## ================================================================================
##                                                  Dependent variable:
##                                         ------------------------------------------
##                                                       pct_gentr
##                                             Restricted                Full
##                                                (1)                     (2)
## --------------------------------------------------------------------------------
## aff_30_pre                                   -0.001**                -0.001
##                                              (0.001)                 (0.001)
##
## rent_gap_index                              0.0004***               0.0003***
##                                             (0.0001)                (0.0001)
##
## resilience_index                            -0.0003**                -0.0003
##                                             (0.0001)                (0.0002)
##
## raceth_groupBlack                                                    -0.017
##                                                                      (0.020)
##
## raceth_groupHispanic                                                 -0.009
##                                                                      (0.015)
##
## raceth_groupAsian                                                     0.033
##                                                                      (0.028)
##
## resilience_index:raceth_groupBlack                                   0.0001
##                                                                     (0.0003)
##
## resilience_index:raceth_groupHispanic                                -0.0001
##                                                                     (0.0003)
##
## resilience_index:raceth_groupAsian                                   -0.0005
##                                                                     (0.0004)
##
## pov_pct                                      0.00002                 0.00003
##                                             (0.0004)                (0.0005)
##
## Constant                                     0.057***               0.064***
##                                              (0.010)                 (0.013)
##
## --------------------------------------------------------------------------------
## Observations                                    55                      55
## R2                                            0.278                   0.380
## Adjusted R2                                   0.220                   0.239
```

```
## Residual Std. Error                          0.019 (df = 50)       0.018 (df = 44)
## F Statistic                             4.815*** (df = 4; 50) 2.699** (df = 10; 44)
## ==================================================================================
## Note:                                                 *p<0.1; **p<0.05; ***p<0.01
```

blurb here...

Heteroskedasticity test:

```r
bptest(model3)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  model3
## BP = 5.1067, df = 10, p-value = 0.8839
```

Not heteroskedastic (since p value is not less than 0.05, theres not enough evidence to reject the null that errors aren't equally distributed)

Loading Geo dta

```r
GEO <- st_read("/Users/isabellagermani/Desktop/MS THSS/data/SBA_GEO.geojson", stringsAsFactors = FALSE,
```

```
## Reading layer `SBA_GEO' from data source
##   `/Users/isabellagermani/Desktop/MS THSS/data/SBA_GEO.geojson'
##   using driver `GeoJSON'
## Simple feature collection with 55 features and 144 fields
## Geometry type: MULTIPOLYGON
## Dimension:     XY
## Bounding box:  xmin: 913175.1 ymin: 120128.4 xmax: 1067383 ymax: 272844.3
## Projected CRS: NAD83 / New York Long Island (ftUS)
```

```r
str(GEO)
```

```
## Classes 'sf' and 'data.frame':   55 obs. of  145 variables:
##  $ Shape_Leng                  : num  90062 68718 35003 37375 51815 ...
##  $ Shape_Area                  : num  1.38e+08 1.22e+08 5.59e+07 4.23e+07 4.39e+07 ...
##  $ SBA                         : int  101 102 103 104 105 106 107 108 109 110 ...
##  $ SBA_name                    : chr  "Mott Haven/Hunts Point" "Morrisania/Belmont" "Highbridge/Sou
##  $ med_hous_inc                : int  26090 32330 38460 37550 44000 67190 49790 74080 59760 73150 .
##  $ pct_FL_loans                : num  30 53.4 10.3 54.8 9.6 0.9 28.6 31.9 27.3 60.6 ...
##  $ pct_FL_loans_2_LI           : num  100 100 100 100 66.7 14 63.5 11.8 50.3 46 ...
##  $ inc_div_ratio               : num  5.9 6.2 5.6 5.8 5.7 6.2 6.1 5.8 4.7 5 ...
##  $ mort_forc                   : num  70 115 38 53 25 28 252 135 147 422 ...
##  $ pov_pct                     : num  44.2 35.8 36.4 36.4 32.9 18.5 24.7 10.2 16.4 14.6 ...
##  $ pct_asian                   : num  0.3 1.3 1 1.8 7.1 4.1 8.2 3.6 9.4 2.3 ...
##  $ pct_black                   : num  28.4 32.5 27.7 24.4 11.3 11.8 30.3 28.8 19.8 67.2 ...
##  $ prob_race                   : num  0.47 0.51 0.45 0.43 0.43 0.65 0.59 0.69 0.7 0.49 ...
##  $ pct_hispan                  : num  67.2 61.8 68.8 71.1 74.1 48.8 55.4 39.9 42.3 23 ...
##  $ pct_white                   : num  3.3 3.8 1.3 1 5.1 31.5 3 25.5 26.7 5.4 ...
##  $ pop_dens                    : num  31.9 43 75 98.2 91.5 33.1 42.5 12.2 31.5 22.3 ...
##  $ priv_landL_amt              : int  2925 3174 3547 3423 3852 3906 3561 4330 4105 3882 ...
##  $ med_rti                     : num  38 34.8 38.9 41.7 41 34 34.1 28.9 37.6 34.7 ...
##  $ med_gro_rnt                 : int  1200 1280 1400 1450 1560 1720 1440 1470 1580 1720 ...
##  $ vac_rt                      : num  0.124 0.1373 0.1265 0.0842 0.0303 ...
##  $ pct_condo                   : num  0.0165 0.0176 0.0122 0 0.0101 ...
##  $ pct_coop                    : num  0.0413 0.0282 0.0857 0.0149 0.0606 ...
```

```
##  $ sound                     : num  0.963 0.877 0.971 0.896 0.944 ...
##  $ deter                     : num  0.01653 0.0493 0.00408 0.02475 0.0101 ...
##  $ rats                      : num  0.335 0.324 0.339 0.396 0.303 ...
##  $ r_aches                   : num  0.368 0.313 0.318 0.455 0.449 ...
##  $ afford                    : num  0.616 0.511 0.437 0.436 0.535 ...
##  $ unafford                  : num  0.165 0.148 0.171 0.262 0.247 ...
##  $ avg_rti                   : num  0.392 0.4 0.395 0.422 0.416 ...
##  $ avg_age                   : num  52.8 50.2 51 49.3 47.7 ...
##  $ pct_howner                : num  0.0579 0.0775 0.0612 0.0396 0.0707 ...
##  $ pct_immigrant             : num  0.269 0.264 0.31 0.436 0.364 ...
##  $ med_year_moved_in         : num  2007 2010 2007 2009 2010 ...
##  $ med_length_res            : num  10 7 10 8 7 9 12 18.5 7 8 ...
##  $ pct_recent_moves          : num  0.463 0.549 0.461 0.564 0.596 ...
##  $ pct_fresh_moves           : num  0.273 0.37 0.29 0.356 0.439 ...
##  $ pct_displ                 : num  0.0207 0.0282 0.0245 0.0248 0.0101 ...
##  $ pct_gentr                 : num  0.0331 0.0563 0.0571 0.0495 0.0505 ...
##  $ rennov                    : num  0.0785 0.0775 0.0653 0.0594 0 ...
##  $ tot_pop                   : num  156731 171842 141400 139656 132128 ...
##  $ sq_miles                  : num  4.86 4.37 1.98 1.51 1.57 ...
##  $ t_dollar_stores           : int  12 5 7 6 3 1 4 2 5 3 ...
##  $ dollars_per_1kppl         : num  0.0766 0.0291 0.0495 0.043 0.0227 ...
##  $ dollars_per_sqm           : num  2.47 1.14 3.53 3.97 1.91 ...
##  $ liqour_per_1kppl          : num  0.2106 0.1397 0.1132 0.1289 0.0908 ...
##  $ liqour_per_sqm            : num  6.79 5.49 8.06 11.92 7.64 ...
##  $ tobacco_per_1kppl         : num  0.00638 0.04074 0.07072 0.0358 0.02271 ...
##  $ tobacco_per_sqm           : num  0.206 1.601 5.038 3.311 1.909 ...
##  $ convenience_per_1kppl     : num  0.1404 0.1397 0.1414 0.0931 0.0984 ...
##  $ convenience_per_sqm       : num  4.53 5.49 10.08 8.61 8.27 ...
##  $ ecig_per_1kppl            : num  0 0.00582 0 0 0 ...
##  $ ecig_per_sqm              : num  0 0.229 0 0 0 ...
##  $ marijuana_per_1kppl       : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ marijuana_per_sqm         : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ civsoc_per_1kppl          : num  0.128 0.128 0.141 0.122 0.136 ...
##  $ civsoc_per_sqm            : num  4.12 5.03 10.08 11.26 11.46 ...
##  $ youthorgs_per_1kppl       : num  0.0255 0.0466 0.0354 0.0286 0.0227 ...
##  $ youthorgs_per_sqm         : num  0.824 1.83 2.519 2.649 1.909 ...
##  $ vetorgs_per_1kppl         : num  0 0.00582 0.01414 0 0 ...
##  $ vetorgs_per_sqm           : num  0 0.229 1.008 0 0 ...
##  $ relig_per_1kppl           : num  0.906 1.146 0.785 0.709 0.568 ...
##  $ relig_per_sqm             : num  29.2 45.1 55.9 65.6 47.7 ...
##  $ barber_per_1kppl          : num  0.383 0.396 0.347 0.358 0.242 ...
##  $ barber_per_sqm            : num  12.4 15.6 24.7 33.1 20.4 ...
##  $ beauty_per_1kppl          : num  0.957 0.867 0.969 1.088 0.954 ...
##  $ beauty_per_sqm            : num  30.9 34.1 69 100.7 80.2 ...
##  $ laundry_per_1kppl         : num  0.223 0.169 0.134 0.158 0.204 ...
##  $ laundry_per_sqm           : num  7.21 6.63 9.57 14.57 17.18 ...
##  $ drycl_per_1kppl           : num  0.0638 0.04655 0.03536 0.00716 0.02271 ...
##  $ drycl_per_sqm             : num  2.059 1.83 2.519 0.662 1.909 ...
##  $ I.Fserv_per_1kppl         : num  0.817 0.512 0.332 0.444 0.431 ...
##  $ I.Fserv_per_sqm           : num  26.4 20.1 23.7 41.1 36.3 ...
##  $ E.Dserv_per_1kppl         : num  0.0957 0.0466 0.0212 0.0215 0.0454 ...
##  $ E.Dserv_per_sqm           : num  3.09 1.83 1.51 1.99 3.82 ...
##  $ C.Yserv_per_1kppl         : num  0.0383 0.0407 0.0283 0.0215 0.0454 ...
##  $ C.Yserv_per_sqm           : num  1.24 1.6 2.02 1.99 3.82 ...
```

```
##  $ Eserv_per_1kppl             : num  0.0319 0.0233 0.0141 0.0143 0 ...
##  $ Eserv_per_sqm               : num  1.029 0.915 1.008 1.324 0 ...
##  $ MDprog_per_1kppl            : num  0.00638 0 0 0 0 ...
##  $ MDprog_per_sqm              : num  0.206 0 0 0 0 ...
##  $ Gcouns_per_1kppl            : num  0.236 0.163 0.099 0.129 0.136 ...
##  $ Gcouns_per_sqm              : num  7.62 6.41 7.05 11.92 11.46 ...
##  $ SAcouns_per_1kppl           : num  0.01276 0.01746 0 0.00716 0.00757 ...
##  $ SAcouns_per_sqm             : num  0.412 0.686 0 0.662 0.636 ...
##  $ Dayc_per_1kppl              : num  0.555 0.594 0.467 0.652 0.621 ...
##  $ Dayc_per_sqm                : num  17.9 23.3 33.3 60.3 52.2 ...
##  $ C.Sstor_per_1kppl           : num  0.619 0.442 0.502 0.537 0.681 ...
##  $ C.Sstor_per_sqm             : num  20 17.4 35.8 49.7 57.3 ...
##  $ F.Astor_per_1kppl           : num  0.249 0.18 0.163 0.122 0.25 ...
##  $ F.Astor_per_sqm             : num  8.03 7.09 11.59 11.26 21 ...
##  $ Mstor_per_1kppl             : num  0.0957 0.0582 0.0636 0.0501 0.053 ...
##  $ Mstor_per_sqm               : num  3.09 2.29 4.53 4.64 4.46 ...
##  $ H.Gstor_per_1kppl           : num  0.0893 0.0524 0.0566 0.0573 0.0454 ...
##  $ H.Gstor_per_sqm             : num  2.88 2.06 4.03 5.3 3.82 ...
##  $ D.Vstor_per_1kppl           : num  0.447 0.268 0.339 0.272 0.341 ...
##  $ D.Vstor_per_sqm             : num  14.4 10.5 24.2 25.2 28.6 ...
##  $ Ustor_per_1kppl             : num  0.0957 0.0989 0.0636 0.0573 0.1211 ...
##  $ Ustor_per_sqm               : num  3.09 3.89 4.53 5.3 10.18 ...
##  $ pyhs_per_1kppl              : num  0.479 0.39 0.446 0.487 1.082 ...
##   [list output truncated]
##  - attr(*, "sf_column")= chr "geometry"
##  - attr(*, "agr")= Factor w/ 3 levels "constant","aggregate",..: NA NA NA NA NA NA NA NA NA NA ...
##   ..- attr(*, "names")= chr [1:144] "Shape_Leng" "Shape_Area" "SBA" "SBA_name" ...
```

Spatial Autocorrelation check:

```r
# merging
MERGE <- merge(GEO, SBA,
                by.x = "SBA",
                by.y = "SBA",
                all.x = FALSE)  # Keep only matched rows

str(MERGE)
```

```
## Classes 'sf' and 'data.frame':   55 obs. of  286 variables:
##  $ SBA                         : int  101 102 103 104 105 106 107 108 109 110 ...
##  $ Shape_Leng                  : num  90062 68718 35003 37375 51815 ...
##  $ Shape_Area                  : num  1.38e+08 1.22e+08 5.59e+07 4.23e+07 4.39e+07 ...
##  $ SBA_name.x                  : chr  "Mott Haven/Hunts Point" "Morrisania/Belmont" "Highbridge/S
##  $ med_hous_inc.x              : int  26090 32330 38460 37550 44000 67190 49790 74080 59760 73150
##  $ pct_FL_loans.x              : num  30 53.4 10.3 54.8 9.6 0.9 28.6 31.9 27.3 60.6 ...
##  $ pct_FL_loans_2_LI.x         : num  100 100 100 100 66.7 14 63.5 11.8 50.3 46 ...
##  $ inc_div_ratio.x             : num  5.9 6.2 5.6 5.8 5.7 6.2 6.1 5.8 4.7 5 ...
##  $ mort_forc.x                 : num  70 115 38 53 25 28 252 135 147 422 ...
##  $ pov_pct.x                   : num  44.2 35.8 36.4 36.4 32.9 18.5 24.7 10.2 16.4 14.6 ...
##  $ pct_asian.x                 : num  0.3 1.3 1 1.8 7.1 4.1 8.2 3.6 9.4 2.3 ...
##  $ pct_black.x                 : num  28.4 32.5 27.7 24.4 11.3 11.8 30.3 28.8 19.8 67.2 ...
##  $ prob_race.x                 : num  0.47 0.51 0.45 0.43 0.43 0.65 0.59 0.69 0.7 0.49 ...
##  $ pct_hispan.x                : num  67.2 61.8 68.8 71.1 74.1 48.8 55.4 39.9 42.3 23 ...
##  $ pct_white.x                 : num  3.3 3.8 1.3 1 5.1 31.5 3 25.5 26.7 5.4 ...
##  $ pop_dens.x                  : num  31.9 43 75 98.2 91.5 33.1 42.5 12.2 31.5 22.3 ...
```

```
##  $ priv_landL_amt.x            : int  2925 3174 3547 3423 3852 3906 3561 4330 4105 3882 ...
##  $ med_rti.x                   : num  38 34.8 38.9 41.7 41 34 34.1 28.9 37.6 34.7 ...
##  $ med_gro_rnt.x               : int  1200 1280 1400 1450 1560 1720 1440 1470 1580 1720 ...
##  $ vac_rt.x                    : num  0.124 0.1373 0.1265 0.0842 0.0303 ...
##  $ pct_condo.x                 : num  0.0165 0.0176 0.0122 0 0.0101 ...
##  $ pct_coop.x                  : num  0.0413 0.0282 0.0857 0.0149 0.0606 ...
##  $ sound.x                     : num  0.963 0.877 0.971 0.896 0.944 ...
##  $ deter.x                     : num  0.01653 0.0493 0.00408 0.02475 0.0101 ...
##  $ rats.x                      : num  0.335 0.324 0.339 0.396 0.303 ...
##  $ r_aches.x                   : num  0.368 0.313 0.318 0.455 0.449 ...
##  $ afford.x                    : num  0.616 0.511 0.437 0.436 0.535 ...
##  $ unafford.x                  : num  0.165 0.148 0.171 0.262 0.247 ...
##  $ avg_rti.x                   : num  0.392 0.4 0.395 0.422 0.416 ...
##  $ avg_age.x                   : num  52.8 50.2 51 49.3 47.7 ...
##  $ pct_howner.x                : num  0.0579 0.0775 0.0612 0.0396 0.0707 ...
##  $ pct_immigrant.x             : num  0.269 0.264 0.31 0.436 0.364 ...
##  $ med_year_moved_in.x         : num  2007 2010 2007 2009 2010 ...
##  $ med_length_res.x            : num  10 7 10 8 7 9 12 18.5 7 8 ...
##  $ pct_recent_moves.x          : num  0.463 0.549 0.461 0.564 0.596 ...
##  $ pct_fresh_moves.x           : num  0.273 0.37 0.29 0.356 0.439 ...
##  $ pct_displ.x                 : num  0.0207 0.0282 0.0245 0.0248 0.0101 ...
##  $ pct_gentr.x                 : num  0.0331 0.0563 0.0571 0.0495 0.0505 ...
##  $ rennov.x                    : num  0.0785 0.0775 0.0653 0.0594 0 ...
##  $ tot_pop.x                   : num  156731 171842 141400 139656 132128 ...
##  $ sq_miles.x                  : num  4.86 4.37 1.98 1.51 1.57 ...
##  $ t_dollar_stores.x           : int  12 5 7 6 3 1 4 2 5 3 ...
##  $ dollars_per_1kppl.x         : num  0.0766 0.0291 0.0495 0.043 0.0227 ...
##  $ dollars_per_sqm.x           : num  2.47 1.14 3.53 3.97 1.91 ...
##  $ liqour_per_1kppl.x          : num  0.2106 0.1397 0.1132 0.1289 0.0908 ...
##  $ liqour_per_sqm.x            : num  6.79 5.49 8.06 11.92 7.64 ...
##  $ tobacco_per_1kppl.x         : num  0.00638 0.04074 0.07072 0.0358 0.02271 ...
##  $ tobacco_per_sqm.x           : num  0.206 1.601 5.038 3.311 1.909 ...
##  $ convenience_per_1kppl.x     : num  0.1404 0.1397 0.1414 0.0931 0.0984 ...
##  $ convenience_per_sqm.x       : num  4.53 5.49 10.08 8.61 8.27 ...
##  $ ecig_per_1kppl.x            : num  0 0.00582 0 0 0 ...
##  $ ecig_per_sqm.x              : num  0 0.229 0 0 0 ...
##  $ marijuana_per_1kppl.x       : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ marijuana_per_sqm.x         : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ civsoc_per_1kppl.x          : num  0.128 0.128 0.141 0.122 0.136 ...
##  $ civsoc_per_sqm.x            : num  4.12 5.03 10.08 11.26 11.46 ...
##  $ youthorgs_per_1kppl.x       : num  0.0255 0.0466 0.0354 0.0286 0.0227 ...
##  $ youthorgs_per_sqm.x         : num  0.824 1.83 2.519 2.649 1.909 ...
##  $ vetorgs_per_1kppl.x         : num  0 0.00582 0.01414 0 0 ...
##  $ vetorgs_per_sqm.x           : num  0 0.229 1.008 0 0 ...
##  $ relig_per_1kppl.x           : num  0.906 1.146 0.785 0.709 0.568 ...
##  $ relig_per_sqm.x             : num  29.2 45.1 55.9 65.6 47.7 ...
##  $ barber_per_1kppl.x          : num  0.383 0.396 0.347 0.358 0.242 ...
##  $ barber_per_sqm.x            : num  12.4 15.6 24.7 33.1 20.4 ...
##  $ beauty_per_1kppl.x          : num  0.957 0.867 0.969 1.088 0.954 ...
##  $ beauty_per_sqm.x            : num  30.9 34.1 69 100.7 80.2 ...
##  $ laundry_per_1kppl.x         : num  0.223 0.169 0.134 0.158 0.204 ...
##  $ laundry_per_sqm.x           : num  7.21 6.63 9.57 14.57 17.18 ...
##  $ drycl_per_1kppl.x           : num  0.0638 0.04655 0.03536 0.00716 0.02271 ...
##  $ drycl_per_sqm.x             : num  2.059 1.83 2.519 0.662 1.909 ...
```

```
##  $ I.Fserv_per_1kppl.x           : num  0.817 0.512 0.332 0.444 0.431 ...
##  $ I.Fserv_per_sqm.x             : num  26.4 20.1 23.7 41.1 36.3 ...
##  $ E.Dserv_per_1kppl.x           : num  0.0957 0.0466 0.0212 0.0215 0.0454 ...
##  $ E.Dserv_per_sqm.x             : num  3.09 1.83 1.51 1.99 3.82 ...
##  $ C.Yserv_per_1kppl.x           : num  0.0383 0.0407 0.0283 0.0215 0.0454 ...
##  $ C.Yserv_per_sqm.x             : num  1.24 1.6 2.02 1.99 3.82 ...
##  $ Eserv_per_1kppl.x             : num  0.0319 0.0233 0.0141 0.0143 0 ...
##  $ Eserv_per_sqm.x               : num  1.029 0.915 1.008 1.324 0 ...
##  $ MDprog_per_1kppl.x            : num  0.00638 0 0 0 0 ...
##  $ MDprog_per_sqm.x              : num  0.206 0 0 0 0 ...
##  $ Gcouns_per_1kppl.x            : num  0.236 0.163 0.099 0.129 0.136 ...
##  $ Gcouns_per_sqm.x              : num  7.62 6.41 7.05 11.92 11.46 ...
##  $ SAcouns_per_1kppl.x           : num  0.01276 0.01746 0 0.00716 0.00757 ...
##  $ SAcouns_per_sqm.x             : num  0.412 0.686 0 0.662 0.636 ...
##  $ Dayc_per_1kppl.x              : num  0.555 0.594 0.467 0.652 0.621 ...
##  $ Dayc_per_sqm.x                : num  17.9 23.3 33.3 60.3 52.2 ...
##  $ C.Sstor_per_1kppl.x           : num  0.619 0.442 0.502 0.537 0.681 ...
##  $ C.Sstor_per_sqm.x             : num  20 17.4 35.8 49.7 57.3 ...
##  $ F.Astor_per_1kppl.x           : num  0.249 0.18 0.163 0.122 0.25 ...
##  $ F.Astor_per_sqm.x             : num  8.03 7.09 11.59 11.26 21 ...
##  $ Mstor_per_1kppl.x             : num  0.0957 0.0582 0.0636 0.0501 0.053 ...
##  $ Mstor_per_sqm.x               : num  3.09 2.29 4.53 4.64 4.46 ...
##  $ H.Gstor_per_1kppl.x           : num  0.0893 0.0524 0.0566 0.0573 0.0454 ...
##  $ H.Gstor_per_sqm.x             : num  2.88 2.06 4.03 5.3 3.82 ...
##  $ D.Vstor_per_1kppl.x           : num  0.447 0.268 0.339 0.272 0.341 ...
##  $ D.Vstor_per_sqm.x             : num  14.4 10.5 24.2 25.2 28.6 ...
##  $ Ustor_per_1kppl.x             : num  0.0957 0.0989 0.0636 0.0573 0.1211 ...
##  $ Ustor_per_sqm.x               : num  3.09 3.89 4.53 5.3 10.18 ...
##  $ pyhs_per_1kppl.x              : num  0.479 0.39 0.446 0.487 1.082 ...
##   [list output truncated]
##  - attr(*, "sf_column")= chr "geometry"
##  - attr(*, "agr")= Factor w/ 3 levels "constant","aggregate",..: NA NA NA NA NA NA NA NA NA NA ...
##   ..- attr(*, "names")= chr [1:285] "SBA" "Shape_Leng" "Shape_Area" "SBA_name.x" ...
```

```r
# Specifying how to define neighbors (using queen, where SBAs share either a border or corner)
neighbors <- poly2nb(MERGE, queen = TRUE)
```

```
## Warning in poly2nb(MERGE, queen = TRUE): neighbour object has 2 sub-graphs;
## if this sub-graph count seems unexpected, try increasing the snap argument.
```

```r
# matrix where rows & columns = 55 SBAs & columns (converting neighbors to weights)
nmtx <- nb2listw(neighbors, style = "W") # Cell[i,j] = weight of j's influence on i (0 if not neighbor)

# Test - is gentrification in neighborhood i related to gentrification in its neighbors
result <- moran.test(MERGE$pct_gentr.y, nmtx)
print(result)
```

```
##
##  Moran I test under randomisation
##
## data:  MERGE$pct_gentr.y
## weights: nmtx
##
## Moran I statistic standard deviate = 1.8087, p-value = 0.03525
## alternative hypothesis: greater
```

```
## sample estimates:
## Moran I statistic       Expectation          Variance
##       0.146919789      -0.018518519       0.008366233
```