

# Final\_Project

*Makoto Fukumoto*

*12/11/2016*

**Import 2012 and 2016 election data that Tony McGovern has compiled by scraping through townhall.com home page. (Official result is not yet available in county level as of December 11, 2016)**

```
# import necessary package
library(RCurl)
```

```
## Warning: package 'RCurl' was built under R version 3.2.4
```

```
## Loading required package: bitops
```

```
# Get URL
```

```
x <- getURL("https://raw.githubusercontent.com/tonmcg/County_Level_Election_Results_12-16/master/US_Cou
```

```
# Read it in CSV
```

```
y <- read.csv(text = x)
```

```
# See the summary
```

```
summary(y)
```

```
##           X           combined_fips  votes_dem_2016  votes_gop_2016
## Min.      :    0   Min.      : 1001   Min.      :    4   Min.      :   57
## 1st Qu.:  785   1st Qu.:18179   1st Qu.:   1175   1st Qu.:  3241
## Median :1570   Median :29177   Median :   3194   Median :  7268
## Mean     :1570   Mean     :30389   Mean      : 20693   Mean      : 20623
## 3rd Qu.:2355   3rd Qu.:45081   3rd Qu.:  10047   3rd Qu.: 18130
## Max.     :3140   Max.     :56045   Max.      :1893770   Max.      :620285
##
## total_votes_2016  per_dem_2016      per_gop_2016      diff_2016
## Min.      :    64   Min.      :0.03145   Min.      :0.04122   Min.      :    2
## 1st Qu.:  4870   1st Qu.:0.20537   1st Qu.:0.54586   1st Qu.:   1608
## Median : 11144   Median :0.28640   Median :0.66535   Median :   3797
## Mean     : 43569   Mean     :0.31762   Mean      :0.63516   Mean      : 11859
## 3rd Qu.: 29799   3rd Qu.:0.39808   3rd Qu.:0.75026   3rd Qu.:   8815
## Max.     :2652072   Max.      :0.92847   Max.      :0.95273   Max.      :1273485
##
## per_point_diff_2016  state_abbr      county_name
## Min.      :-0.9164    TX       : 254   Washington County:  30
## 1st Qu.: -0.5448    GA       : 159   Alaska           :  29
## Median : -0.3782    VA       : 133   Jefferson County :  25
## Mean     : -0.3175    KY       : 120   Franklin County  :  24
## 3rd Qu.: -0.1517    MO       : 115   Jackson County   :  23
## Max.      : 0.8872    KS       : 105   Lincoln County   :  23
```

```
##          (Other):2255  (Other)          :2987
##      FIPS      total_votes_2012 votes_dem_2012 votes_gop_2012
## Min.   : 1001   Min.    :    64   Min.    :    5   Min.    :   54
## 1st Qu.:18179   1st Qu.:   4766   1st Qu.:   1555   1st Qu.:   2890
## Median :29177   Median :   10732   Median :    3948   Median :   6394
## Mean   :30389   Mean    :   39506   Mean    :   19990   Mean    :  18890
## 3rd Qu.:45081   3rd Qu.:   27628   3rd Qu.:   11100   3rd Qu.:  15949
## Max.   :56045   Max.    :2427869   Max.    :1672164   Max.    :699600
##          NA's    :29      NA's    :29      NA's    :29
## county_fips  state_fips  per_dem_2012  per_gop_2012
## Min.   :  1.0   Min.   : 1.00   Min.   :0.03448   Min.   :0.06006
## 1st Qu.: 35.0   1st Qu.:19.00   1st Qu.:0.27802   1st Qu.:0.50753
## Median : 78.5   Median :29.00   Median :0.37171   Median :0.60941
## Mean   :103.2   Mean    :30.55   Mean    :0.38494   Mean    :0.59783
## 3rd Qu.:133.0   3rd Qu.:46.00   3rd Qu.:0.47530   3rd Qu.:0.70318
## Max.   :840.0   Max.    :56.00   Max.    :0.93355   Max.    :0.95862
## NA's    :29     NA's    :29     NA's    :29     NA's    :29
## diff_2012      per_point_diff_2012
## Min.   :    1   Min.   :-0.92414
## 1st Qu.: 1048   1st Qu.: -0.42556
## Median : 2566   Median : -0.23811
## Mean   :  956   Mean    : -0.21289
## 3rd Qu.: 6473   3rd Qu.: -0.03224
## Max.   :972564   Max.    : 0.87348
## NA's    :29     NA's    :29
```

## Create a couple of variables to use in the analysis

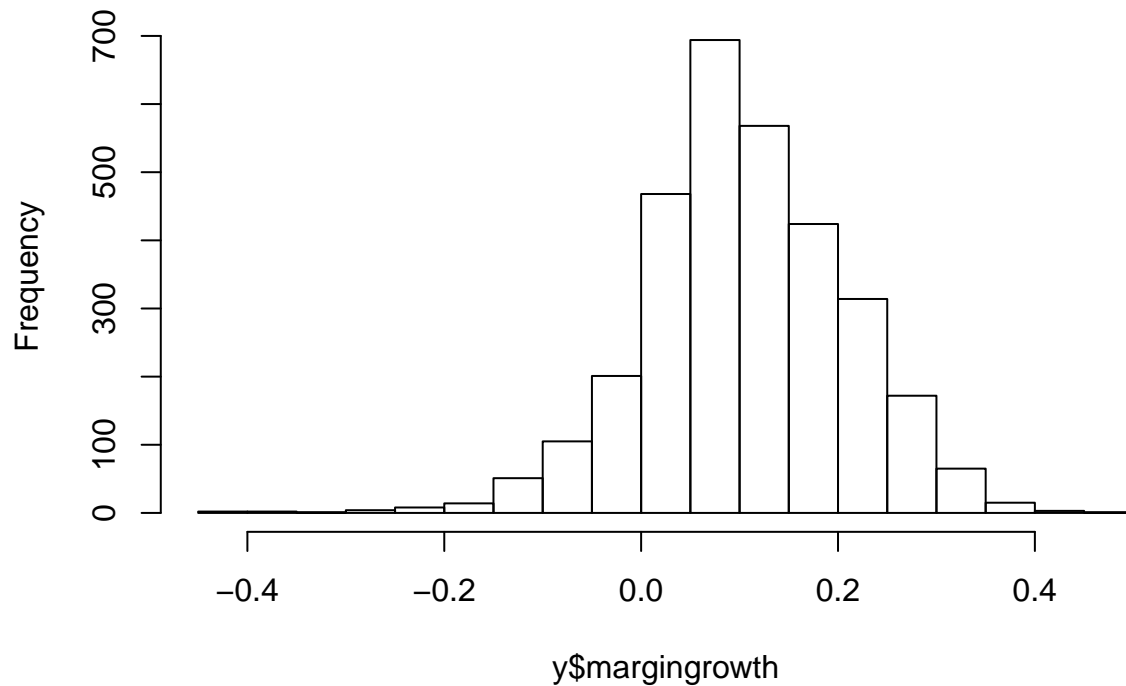
```
# The growth in the vote count
y$puregrowth <- y$votes_gop_2016 - y$votes_gop_2012

# The growth in the voting share
y$pergrowth <- y$per_gop_2016 - y$per_gop_2012

# The growth in the winning (losing) margin
y$margingrowth <- -(y$per_point_diff_2016 - y$per_point_diff_2012)

# Visualize the data
hist(y$margingrowth)
```

## Histogram of y\$margingrowth



```
summary(y$margingrowth)
```

```
##      Min.   1st Qu.   Median     Mean  3rd Qu.     Max.      NA's
## -0.41210  0.04355  0.10060  0.10620  0.17450  0.46760      29
```

```
# Alaska was not available yet, so there are 29 NAs.
```

```
# Write the arranged data into CSV file
```

```
write.csv(y, file = "election.csv")
```

## Read and clean the Census data

```
# Read the census data into R
```

```
census <- read.csv('~/.Desktop/PS239T/07_APIs/census2014.csv')
```

```
# See summary
```

```
summary(census)
```

```
##   ToOtherState      Owner      manufacture_r      active_r
##   Min.   :    0   Min.   :    2   Min.   :0.00000   Min.   :0.1848
##   1st Qu.:  163   1st Qu.:  3223   1st Qu.:0.06142   1st Qu.:0.4248
##   Median :   457   Median :   7184   Median :0.10295   Median :0.4664
##   Mean   :  2248   Mean   :  23494   Mean   :0.11149   Mean   :0.4612
##   3rd Qu.: 1431   3rd Qu.: 17906   3rd Qu.:0.15183   3rd Qu.:0.5032
##   Max.   :125660   Max.   :1503915   Max.   :0.70338   Max.   :0.8070
```

```

## NA's :80
##      county_name      state_fips      highschool_r
## Washington County: 30  Min. : 1.00  Min. :0.05943
## Jefferson County : 25  1st Qu.:19.00  1st Qu.:0.20047
## Franklin County  : 24  Median :30.00  Median :0.24019
## Jackson County   : 23  Mean  :31.29  Mean  :0.23672
## Lincoln County   : 23  3rd Qu.:46.00  3rd Qu.:0.27385
## Madison County   : 19  Max.  :72.00  Max.  :0.55056
## (Other)          :3076
## Manufacture      X65to74      White      MedianIncome
## Min. : 0  Min. : 6  Min. : 0  Min. : 8090
## 1st Qu.: 449  1st Qu.: 1066  1st Qu.: 7747  1st Qu.:20603
## Median : 1348  Median : 2393  Median : 19318  Median :23322
## Mean : 4675  Mean : 7636  Mean : 61238  Mean :23957
## 3rd Qu.: 3801  3rd Qu.: 6042  3rd Qu.: 52183  3rd Qu.:26464
## Max. :478309  Max. :628108  Max. :2711665  Max. :59876
##      NA's :78
## SameHouse      State      Management      Black
## Min. : 69  Texas : 254  Min. : 9  Min. : 0.0
## 1st Qu.: 9607  Georgia : 159  1st Qu.: 1273  1st Qu.: 95.8
## Median : 22040  Virginia: 133  Median : 2988  Median : 795.0
## Mean : 83937  Kentucky: 120  Mean : 16327  Mean : 12377.6
## 3rd Qu.: 56503  Missouri: 115  3rd Qu.: 8869  3rd Qu.: 5421.8
## Max. :8542923  Kansas : 105  Max. :1613549  Max. :1264466.0
## NA's :78  (Other) :2334
## Unemployed      Hispanic      white_r      MedianAge
## Min. : 0.0  Min. : 0  Min. :0.0000  Min. :21.60
## 1st Qu.: 381.8  1st Qu.: 298  1st Qu.:0.6466  1st Qu.:37.60
## Median : 1051.0  Median : 1029  Median :0.8434  Median :40.60
## Mean : 4388.0  Mean : 17600  Mean :0.7572  Mean :40.64
## 3rd Qu.: 2765.5  3rd Qu.: 5071  3rd Qu.:0.9352  3rd Qu.:43.60
## Max. :550073.0  Max. :4800491  Max. :0.9982  Max. :64.50
##
## NotInLabor      CountyFIPS      Bachelor      univ_r
## Min. : 11  Min. : 1  Min. : 2  Min. :0.02057
## 1st Qu.: 3310  1st Qu.: 35  1st Qu.: 1134  1st Qu.:0.09476
## Median : 7770  Median : 79  Median : 2911  Median :0.12273
## Mean : 25137  Mean :103  Mean : 19186  Mean :0.13615
## 3rd Qu.: 18724  3rd Qu.:133  3rd Qu.: 9233  3rd Qu.:0.16128
## Max. :2474535  Max. :840  Max. :1961263  Max. :0.54117
##
## homeowner_r      BornInState      FromOtherCounty      Population
## Min. :0.04348  Min. : 16  Min. : 0.0  Min. : 73
## 1st Qu.:0.67913  1st Qu.: 7513  1st Qu.: 401.0  1st Qu.: 11236
## Median :0.73123  Median : 18034  Median : 995.5  Median : 26088
## Mean :0.71747  Mean : 58708  Mean : 3141.1  Mean : 98679
## 3rd Qu.:0.77142  3rd Qu.: 45100  3rd Qu.: 2708.5  3rd Qu.: 66181
## Max. :0.92924  Max. :4993990  Max. :118303.0  Max. :9974203
##      NA's :78  NA's :78
## unemp_r      management_r      Foodstamp      FromOtherState
## Min. :0.00000  Min. :0.08681  Min. : 0.00  Min. : 0.0
## 1st Qu.:0.02812  1st Qu.:0.24184  1st Qu.: 0.00  1st Qu.: 167.0
## Median :0.03732  Median :0.27566  Median : 7.00  Median : 447.5
## Mean :0.03818  Mean :0.28632  Mean : 68.13  Mean : 2247.0

```

```
## 3rd Qu.:0.04709 3rd Qu.:0.32197 3rd Qu.: 38.00 3rd Qu.: 1418.0
## Max. :0.13535 Max. :0.67967 Max. :6229.00 Max. :133037.0
## NA's :78
## hisp_r ToOtherCounty Tenure Agriculture
## Min. :0.00000 Min. : 0 Min. : 33 Min. : 0.0
## 1st Qu.:0.01807 1st Qu.: 485 1st Qu.: 4304 1st Qu.: 264.0
## Median :0.03711 Median : 1088 Median : 9815 Median : 473.0
## Mean :0.10842 Mean : 3143 Mean : 36476 Mean : 876.2
## 3rd Qu.:0.09607 3rd Qu.: 2635 3rd Qu.: 25090 3rd Qu.: 848.0
## Max. :0.99959 Max. :183128 Max. :3242391 Max. :63901.0
## NA's :80
## Labor X18to24 agriculture_r HighSchool
## Min. : 53 Min. : 5 Min. :0.00000 Min. : 19
## 1st Qu.: 4882 1st Qu.: 910 1st Qu.:0.01667 1st Qu.: 2846
## Median : 11484 Median : 2242 Median :0.03872 Median : 6368
## Mean : 48845 Mean : 9953 Mean :0.06464 Mean : 18351
## 3rd Qu.: 30825 3rd Qu.: 6553 3rd Qu.:0.08450 3rd Qu.: 14899
## Max. :5084862 Max. :1068857 Max. :0.49917 Max. :1347268
## NA's :78
## CountyState black_r
## Abbeville County, South Carolina: 1 Min. :0.000000
## Acadia Parish, Louisiana : 1 1st Qu.:0.005991
## Accomack County, Virginia : 1 Median :0.022895
## Ada County, Idaho : 1 Mean :0.089386
## Adair County, Iowa : 1 3rd Qu.:0.102580
## Adair County, Kentucky : 1 Max. :0.859052
## (Other) :3214
```

```
# Create some new variables
```

```
census$homegrown <- census$BornInState/census$Population
census$same_house <- census$SameHouse/census$Population
```

```
# Recent move in and move out; aggregate them and divide by population
census$move_in<- (census$FromOtherState+census$FromOtherCounty) /census$Population
census$move_out <- (census$ToOtherState+census$ToOtherCounty) /census$Population
```

```
# The following variables had NAs and thus it was easier to merge in R rather than in Python
census$youth <- census$X18to24/census$Population
census$elder <- census$X65to74/census$Population
```

## Do the same for 2010 data

```
census2010 <- read.csv('~/.Desktop/PS239T/07_APIs/census2010.csv')

summary(census2010)
```

```
## FromOtherCounty10 ToOtherState10 highschool_r10 X65to74_10
## Min. : 0.0 Min. : 0 Min. :0.06224 Min. : 0.0
## 1st Qu.: 419.5 1st Qu.: 164 1st Qu.:0.20282 1st Qu.: 967.5
## Median : 998.0 Median : 462 Median :0.24298 Median : 2124.0
## Mean : 3170.9 Mean : 2321 Mean :0.23914 Mean : 6520.4
```

```

## 3rd Qu.: 2802.0 3rd Qu.: 1440 3rd Qu.:0.27757 3rd Qu.: 5117.0
## Max. :117528.0 Max. :156133 Max. :0.70732 Max. :539066.0
## NA's :78 NA's :82 NA's :78
## county_name state_fips HighSchool10 CountyFIPS
## Washington County: 30 Min. : 1.0 Min. : 15 Min. : 1.0
## Jefferson County : 25 1st Qu.:19.0 1st Qu.: 2900 1st Qu.: 35.0
## Franklin County : 24 Median :30.0 Median : 6434 Median : 79.0
## Jackson County : 23 Mean :31.3 Mean : 18167 Mean :103.1
## Lincoln County : 23 3rd Qu.:46.0 3rd Qu.: 14833 3rd Qu.:133.0
## Madison County : 19 Max. :72.0 Max. :1332186 Max. :840.0
## (Other) :3077
## Black10 Population10 black_r10 State10
## Min. : 0 Min. : 41 Min. :0.000000 Texas : 254
## 1st Qu.: 78 1st Qu.: 11377 1st Qu.:0.004926 Georgia : 159
## Median : 714 Median : 26076 Median :0.021155 Virginia: 134
## Mean : 11876 Mean : 95538 Mean :0.088628 Kentucky: 120
## 3rd Qu.: 5229 3rd Qu.: 65217 3rd Qu.:0.101054 Missouri: 115
## Max. :1303321 Max. :9758256 Max. :0.861355 Kansas : 105
## (Other) :2334
## BornInState10 Agriculture10 Management10 MedianAge10
## Min. : 29 Min. : 0.0 Min. : 21 Min. :18.00
## 1st Qu.: 7608 1st Qu.: 279.0 1st Qu.: 1292 1st Qu.:36.90
## Median : 18133 Median : 480.0 Median : 2927 Median :39.80
## Mean : 56733 Mean : 822.6 Mean : 15639 Mean :39.76
## 3rd Qu.: 43805 3rd Qu.: 838.0 3rd Qu.: 8518 3rd Qu.:42.70
## Max. :4714216 Max. :51017.0 Max. :1564344 Max. :62.50
## NA's :78
## Tenure10 hisp_r10 Bachelor10 SameHouse10
## Min. : 22 Min. :0.00000 Min. : 7 Min. : 38
## 1st Qu.: 4321 1st Qu.:0.01459 1st Qu.: 1062 1st Qu.: 9544
## Median : 9902 Median :0.03140 Median : 2683 Median : 21905
## Mean : 35847 Mean :0.10020 Mean : 17463 Mean : 80410
## 3rd Qu.: 24877 3rd Qu.:0.08391 3rd Qu.: 8375 3rd Qu.: 55034
## Max. :3217889 Max. :0.99906 Max. :1816606 Max. :8358706
## NA's :78
## Hispanic10 White10 ToOtherCounty10 univ_r10
## Min. : 0 Min. : 0 Min. : 0.0 Min. :0.02510
## 1st Qu.: 227 1st Qu.: 7846 1st Qu.: 491.5 1st Qu.:0.08809
## Median : 910 Median : 19377 Median : 1090.0 Median :0.11383
## Mean : 15972 Mean : 61039 Mean : 3174.9 Mean :0.12719
## 3rd Qu.: 4436 3rd Qu.: 52050 3rd Qu.: 2617.0 3rd Qu.:0.15098
## Max. :4599258 Max. :2772785 Max. :203873.0 Max. :0.52002
## NA's :82
## CountyState10 Owner10 MedianIncome10
## Abbeville County, South Carolina: 1 Min. : 0 Min. : 8536
## Acadia Parish, Louisiana : 1 1st Qu.: 3269 1st Qu.:19538
## Accomack County, Virginia : 1 Median : 7301 Median :21883
## Ada County, Idaho : 1 Mean : 23899 Mean :22664
## Adair County, Iowa : 1 3rd Qu.: 18324 3rd Qu.:25100
## Adair County, Kentucky : 1 Max. :1552091 Max. :56934
## (Other) :3215 NA's :78
## homeowner_r10 FromOtherState10 Manufacture10 white_r10
## Min. :0.0000 Min. : 0.0 Min. : 0 Min. :0.0000
## 1st Qu.:0.6952 1st Qu.: 175.5 1st Qu.: 492 1st Qu.:0.6622

```

```
## Median :0.7458 Median : 481.0 Median : 1457 Median :0.8567
## Mean :0.7330 Mean : 2317.6 Mean : 4874 Mean :0.7687
## 3rd Qu.:0.7845 3rd Qu.: 1548.5 3rd Qu.: 3981 3rd Qu.:0.9425
## Max. :0.9133 Max. :140583.0 Max. :516482 Max. :1.0000
## NA's :78
## X18to24_10 Foodstamp10
## Min. : 0.0 Min. : 0.00
## 1st Qu.: 910.5 1st Qu.: 0.00
## Median : 2205.0 Median : 4.00
## Mean : 9610.4 Mean : 51.11
## 3rd Qu.: 6315.0 3rd Qu.: 30.00
## Max. :1029622.0 Max. :4311.00
## NA's :78
```

```
census2010$homegrown10 <- census2010$BornInState10/census2010$Population10
census2010$same_house10 <- census2010$SameHouse/census2010$Population10
census2010$move_in10<- (census2010$FromOtherState10+census2010$FromOtherCounty10) /census2010$Population10
census2010$move_out10 <- (census2010$ToOtherState10+census2010$ToOtherCounty10) /census2010$Population10
census2010$youth10 <- census2010$X18to24_10/census2010$Population10
census2010$elder10 <- census2010$X65to74_10/census2010$Population10
```

Merge the files with County name and State FIPS code (tried to merge with county name and found many counties with the same name, so merged by two variables instead)

```
total<- merge(census,census2010,by=c("county_name","state_fips"))
total2 <- merge(y,total,by=c("county_name","state_fips"))
```

Create Population growth data and Income growth data, using the merged data

```
total2$pop_growth <- (total2$Population - total2$Population10)/total2$Population10
total2$income_growth <- (total2$MedianIncome - total2$MedianIncome10)/total2$MedianIncome10
summary(total2)
```

```
## county_name state_fips X combined_fips
## Washington County: 30 Min. : 1.00 Min. : 29 Min. : 1001
## Jefferson County : 25 1st Qu.:19.00 1st Qu.: 806 1st Qu.:19037
## Franklin County : 24 Median :29.00 Median :1584 Median :29207
## Jackson County : 23 Mean :30.54 Mean :1584 Mean :30648
## Lincoln County : 23 3rd Qu.:46.00 3rd Qu.:2362 3rd Qu.:46005
## Madison County : 19 Max. :56.00 Max. :3140 Max. :56045
## (Other) :2965
## votes_dem_2016 votes_gop_2016 total_votes_2016 per_dem_2016
## Min. : 4 Min. : 57 Min. : 64 Min. :0.03145
```

```

## 1st Qu.: 1166 1st Qu.: 3206 1st Qu.: 4822 1st Qu.:0.20477
## Median : 3155 Median : 7169 Median : 10948 Median :0.28462
## Mean : 20025 Mean : 19609 Mean : 41692 Mean :0.31689
## 3rd Qu.: 9597 3rd Qu.: 17421 3rd Qu.: 28786 3rd Qu.:0.39947
## Max. :1893770 Max. :620285 Max. :2652072 Max. :0.92847
##
## per_gop_2016 diff_2016 per_point_diff_2016 state_abbr
## Min. :0.04122 Min. : 2 Min. : -0.9164 TX : 254
## 1st Qu.:0.54955 1st Qu.: 1599 1st Qu.: -0.5469 GA : 159
## Median :0.66745 Median : 3745 Median : -0.3822 VA : 133
## Mean :0.63634 Mean : 11626 Mean : -0.3194 KY : 120
## 3rd Qu.:0.75144 3rd Qu.: 8510 3rd Qu.: -0.1492 MO : 115
## Max. :0.95273 Max. :1273485 Max. : 0.8872 KS : 105
## (Other):2223
## FIPS total_votes_2012 votes_dem_2012 votes_gop_2012
## Min. : 1001 Min. : 64 Min. : 5 Min. : 54
## 1st Qu.:19037 1st Qu.: 4769 1st Qu.: 1556 1st Qu.: 2890
## Median :29207 Median : 10736 Median : 3952 Median : 6398
## Mean :30648 Mean : 39519 Mean : 19996 Mean : 18898
## 3rd Qu.:46005 3rd Qu.: 27622 3rd Qu.: 11093 3rd Qu.: 15947
## Max. :56045 Max. :2427869 Max. :1672164 Max. :699600
##
## county_fips per_dem_2012 per_gop_2012 diff_2012
## Min. : 1.0 Min. :0.03448 Min. :0.07124 Min. : 1
## 1st Qu.: 35.0 1st Qu.:0.27808 1st Qu.:0.50768 1st Qu.: 1047
## Median : 79.0 Median :0.37135 Median :0.60942 Median : 2562
## Mean :103.2 Mean :0.38480 Mean :0.59798 Mean : 9569
## 3rd Qu.:133.0 3rd Qu.:0.47516 3rd Qu.:0.70309 3rd Qu.: 6473
## Max. :840.0 Max. :0.91364 Max. :0.95862 Max. :972564
##
## per_point_diff_2012 puregrowth pergrowth
## Min. : -0.9241 Min. : -80838 Min. : -0.369501
## 1st Qu.: -0.4255 1st Qu.: 72 1st Qu.: 0.008968
## Median : -0.2382 Median : 532 Median : 0.038894
## Mean : -0.2132 Mean : 711 Mean : 0.038359
## 3rd Qu.: -0.0325 3rd Qu.: 1401 3rd Qu.: 0.073051
## Max. : 0.8424 Max. : 69055 Max. : 0.233132
##
## margingrowth ToOtherState Owner manufacture_r
## Min. : -0.41209 Min. : 0.0 Min. : 12 Min. :0.0000
## 1st Qu.: 0.04361 1st Qu.: 163.0 1st Qu.: 3252 1st Qu.:0.0624
## Median : 0.10066 Median : 457.5 Median : 7211 Median :0.1042
## Mean : 0.10626 Mean : 2239.8 Mean : 23986 Mean :0.1125
## 3rd Qu.: 0.17448 3rd Qu.: 1431.2 3rd Qu.: 18155 3rd Qu.:0.1526
## Max. : 0.46758 Max. :125660.0 Max. :1503915 Max. :0.4228
## NA's :1
## active_r highschool_r Manufacture X65to74
## Min. :0.1848 Min. :0.05943 Min. : 0 Min. : 6
## 1st Qu.:0.4278 1st Qu.:0.20260 1st Qu.: 457 1st Qu.: 1097
## Median :0.4680 Median :0.24224 Median : 1394 Median : 2416
## Mean :0.4637 Mean :0.23812 Mean : 4805 Mean : 7699
## 3rd Qu.:0.5038 3rd Qu.:0.27464 3rd Qu.: 3916 3rd Qu.: 6117
## Max. :0.7640 Max. :0.55056 Max. :478309 Max. :628108
##

```



```

##      White      MedianIncome      SameHouse      State
## Min.   :    37   Min.   : 8090   Min.   :    75   Texas   : 254
## 1st Qu.: 8433   1st Qu.:20608   1st Qu.:   9697   Georgia : 159
## Median : 20484   Median :23289   Median :   22313   Virginia: 133
## Mean   : 63244   Mean   :23924   Mean   :   84577   Kentucky: 120
## 3rd Qu.: 54177   3rd Qu.:26424   3rd Qu.:   56719   Missouri: 115
## Max.   :2711665   Max.   :59876   Max.   :8542923   Kansas  : 105
##                                     (Other) :2223
##      Management      Black      Unemployed      Hispanic
## Min.   :    9   Min.   :    0   Min.   :    0   Min.   :    0
## 1st Qu.: 1280   1st Qu.:   95   1st Qu.:   375   1st Qu.:   294
## Median : 3062   Median :   793   Median :  1034   Median :   978
## Mean   : 16751   Mean   : 12716   Mean   :  4454   Mean   : 17010
## 3rd Qu.: 9096   3rd Qu.:   5607   3rd Qu.:  2758   3rd Qu.:  4547
## Max.   :1613549   Max.   :1264466   Max.   :550073   Max.   :4800491
##
##      white_r      MedianAge      NotInLabor      CountyFIPS.x
## Min.   :0.03085   Min.   :21.60   Min.   :   13   Min.   :   1.0
## 1st Qu.:0.66397   1st Qu.:37.60   1st Qu.:  3305   1st Qu.: 35.0
## Median :0.85115   Median :40.80   Median :   7659   Median : 79.0
## Mean   :0.77893   Mean   :40.76   Mean   : 25499   Mean   :103.2
## 3rd Qu.:0.93642   3rd Qu.:43.80   3rd Qu.: 18910   3rd Qu.:133.0
## Max.   :0.99823   Max.   :64.50   Max.   :2474535   Max.   :840.0
##
##      Bachelor      univ_r      homeowner_r      BornInState
## Min.   :    2   Min.   :0.02247   Min.   :0.1911   Min.   :   59
## 1st Qu.: 1132   1st Qu.:0.09462   1st Qu.:0.6797   1st Qu.: 7670
## Median : 2904   Median :0.12234   Median :0.7318   Median : 18361
## Mean   : 19634   Mean   :0.13618   Mean   :0.7186   Mean   : 59200
## 3rd Qu.: 9382   3rd Qu.:0.16153   3rd Qu.:0.7719   3rd Qu.: 45595
## Max.   :1961263   Max.   :0.54117   Max.   :0.9292   Max.   :4993990
##
##      FromOtherCounty      Population      unemp_r      management_r
## Min.   :    0   Min.   :    89   Min.   :0.00000   Min.   :0.08681
## 1st Qu.: 415   1st Qu.: 11217   1st Qu.:0.02786   1st Qu.:0.24302
## Median : 1003   Median : 26042   Median :0.03706   Median :0.27692
## Mean   : 3167   Mean   : 100719   Mean   :0.03740   Mean   :0.28773
## 3rd Qu.: 2731   3rd Qu.: 67851   3rd Qu.:0.04648   3rd Qu.:0.32297
## Max.   :118303   Max.   :9974203   Max.   :0.13535   Max.   :0.67967
##
##      Foodstamp      FromOtherState      hisp_r      ToOtherCounty
## Min.   : 0.00   Min.   :    0   Min.   :0.00000   Min.   :    0.0
## 1st Qu.: 0.00   1st Qu.:  168   1st Qu.:0.01781   1st Qu.:  490.8
## Median : 7.00   Median :   450   Median :0.03581   Median : 1100.0
## Mean   : 66.67   Mean   :  2257   Mean   :0.08680   Mean   : 3167.7
## 3rd Qu.: 38.00   3rd Qu.:  1426   3rd Qu.:0.08881   3rd Qu.: 2667.2
## Max.   :6229.00   Max.   :133037   Max.   :0.95683   Max.   :183128.0
##                                     NA's   :1
##      Tenure      Agriculture      Labor      X18to24
## Min.   :    33   Min.   : 0.0   Min.   :    68   Min.   :    5
## 1st Qu.: 4308   1st Qu.: 278.0   1st Qu.:  4898   1st Qu.:   927
## Median : 9849   Median : 485.0   Median : 11597   Median :  2268
## Mean   : 37271   Mean   : 895.3   Mean   : 50010   Mean   : 10022
## 3rd Qu.: 25847   3rd Qu.: 859.0   3rd Qu.: 31624   3rd Qu.:  6618

```

```

## Max. :3242391 Max. :63901.0 Max. :5084862 Max. :1068857
##
## agriculture_r HighSchool
## Min. :0.00000 Min. : 49
## 1st Qu.:0.01742 1st Qu.: 2859
## Median :0.03961 Median : 6470
## Mean :0.06570 Mean : 18746
## 3rd Qu.:0.08593 3rd Qu.: 15213
## Max. :0.49917 Max. :1347268
##
## CountyState black_r
## Abbeville County, South Carolina: 1 Min. :0.000000
## Acadia Parish, Louisiana : 1 1st Qu.:0.005915
## Accomack County, Virginia : 1 Median :0.021944
## Ada County, Idaho : 1 Mean :0.090728
## Adair County, Iowa : 1 3rd Qu.:0.104980
## Adair County, Kentucky : 1 Max. :0.859052
## (Other) :3103
## homegrown same_house move_in move_out
## Min. :0.1566 Min. :0.4791 Min. :0.001894 Min. :0.00000
## 1st Qu.:0.5936 1st Qu.:0.8318 1st Qu.:0.044710 1st Qu.:0.04883
## Median :0.7071 Median :0.8598 Median :0.057402 Median :0.05916
## Mean :0.6765 Mean :0.8549 Mean :0.062941 Mean :0.06354
## 3rd Qu.:0.7844 3rd Qu.:0.8839 3rd Qu.:0.074758 3rd Qu.:0.07349
## Max. :0.9425 Max. :0.9897 Max. :0.376583 Max. :0.44640
## NA's :1
## youth elder FromOtherCounty10 ToOtherState10
## Min. :0.004258 Min. :0.02178 Min. : 0 Min. : 0.0
## 1st Qu.:0.072735 1st Qu.:0.07830 1st Qu.: 426 1st Qu.: 165.0
## Median :0.082649 Median :0.09085 Median : 1015 Median : 464.5
## Mean :0.090160 Mean :0.09308 Mean : 3197 Mean : 2319.7
## 3rd Qu.:0.095749 3rd Qu.:0.10438 3rd Qu.: 2823 3rd Qu.: 1440.5
## Max. :0.565364 Max. :0.31486 Max. :117528 Max. :156133.0
## NA's :3
## highschool_r10 X65to74_10 HighSchool10 CountyFIPS.y
## Min. :0.06224 Min. : 0 Min. : 15 Min. : 1.0
## 1st Qu.:0.20713 1st Qu.: 994 1st Qu.: 2923 1st Qu.: 35.0
## Median :0.24475 Median : 2144 Median : 6514 Median : 79.0
## Mean :0.24129 Mean : 6576 Mean : 18576 Mean :103.2
## 3rd Qu.:0.27902 3rd Qu.: 5185 3rd Qu.: 15173 3rd Qu.:133.0
## Max. :0.70732 Max. :539066 Max. :1332186 Max. :840.0
##
## Black10 Population10 black_r10 State10
## Min. : 0 Min. : 41 Min. :0.000000 Texas : 254
## 1st Qu.: 75 1st Qu.: 11372 1st Qu.:0.004769 Georgia : 159
## Median : 715 Median : 25995 Median :0.020785 Virginia: 133
## Mean : 12206 Mean : 97471 Mean :0.090104 Kentucky: 120
## 3rd Qu.: 5435 3rd Qu.: 66520 3rd Qu.:0.102571 Missouri: 115
## Max. :1303321 Max. :9758256 Max. :0.861355 Kansas : 105
## (Other) :2223
## BornInState10 Agriculture10 Management10 MedianAge10
## Min. : 35 Min. : 0.0 Min. : 21 Min. :21.7
## 1st Qu.: 7740 1st Qu.: 289.0 1st Qu.: 1305 1st Qu.:37.1
## Median : 18378 Median : 491.0 Median : 3022 Median :39.9

```

```

## Mean      : 57232      Mean      : 840.6      Mean      : 16046      Mean      :39.9
## 3rd Qu.: 44146      3rd Qu.: 850.0      3rd Qu.: 8743      3rd Qu.:42.8
## Max.      :4714216    Max.      :51017.0    Max.      :1564344    Max.      :61.4
##
##      Tenure10      hisp_r10      Bachelor10      SameHouse10
## Min.      : 22      Min.      :0.00000    Min.      : 7      Min.      : 38
## 1st Qu.: 4335      1st Qu.:0.01440    1st Qu.: 1062      1st Qu.: 9738
## Median : 10001      Median :0.03024    Median : 2686      Median : 22153
## Mean      : 36637      Mean      :0.07842    Mean      : 17876      Mean      : 81056
## 3rd Qu.: 25583      3rd Qu.:0.07700    3rd Qu.: 8639      3rd Qu.: 55467
## Max.      :3217889    Max.      :0.98328    Max.      :1816606    Max.      :8358706
##
##      Hispanic10      White10      ToOtherCounty10      univ_r10
## Min.      : 0      Min.      : 32      Min.      : 0.0      Min.      :0.02510
## 1st Qu.: 223      1st Qu.: 8557      1st Qu.: 502.2      1st Qu.:0.08808
## Median : 843      Median : 20509      Median : 1107.0      Median :0.11434
## Mean      : 15297      Mean      : 63059      Mean      : 3200.3      Mean      :0.12745
## 3rd Qu.: 3917      3rd Qu.: 54000      3rd Qu.: 2625.2      3rd Qu.:0.15122
## Max.      :4599258    Max.      :2772785    Max.      :203873.0      Max.      :0.52002
##
##      NA's      :3
##
##      CountyState10      Owner10      MedianIncome10
## Abbeville County, South Carolina: 1      Min.      : 10      Min.      : 8536
## Acadia Parish, Louisiana      : 1      1st Qu.: 3287      1st Qu.:19542
## Accomack County, Virginia      : 1      Median : 7361      Median :21874
## Ada County, Idaho      : 1      Mean      : 24405      Mean      :22637
## Adair County, Iowa      : 1      3rd Qu.: 18549      3rd Qu.:25062
## Adair County, Kentucky      : 1      Max.      :1552091      Max.      :56934
## (Other)      :3103
##
## homeowner_r10      FromOtherState10      Manufacture10      white_r10
## Min.      :0.2070      Min.      : 0      Min.      : 0      Min.      :0.0121
## 1st Qu.:0.6959      1st Qu.: 178      1st Qu.: 494      1st Qu.:0.6798
## Median :0.7462      Median : 482      Median : 1493      Median :0.8636
## Mean      :0.7339      Mean      : 2328      Mean      : 5005      Mean      :0.7908
## 3rd Qu.:0.7846      3rd Qu.: 1558      3rd Qu.: 4114      3rd Qu.:0.9440
## Max.      :0.9133      Max.      :140583      Max.      :516482      Max.      :1.0000
##
##
##      X18to24_10      Foodstamp10      homegrown10      same_house10
## Min.      : 0      Min.      : 0.00      Min.      :0.0852      Min.      :0.5148
## 1st Qu.: 926      1st Qu.: 0.00      1st Qu.:0.5963      1st Qu.:0.8223
## Median : 2229      Median : 4.00      Median :0.7118      Median :0.8537
## Mean      : 9681      Mean      : 49.82      Mean      :0.6796      Mean      :0.8481
## 3rd Qu.: 6388      3rd Qu.: 29.00      3rd Qu.:0.7891      3rd Qu.:0.8797
## Max.      :1029622      Max.      :4311.00      Max.      :0.9751      Max.      :0.9836
##
##
##      move_in10      move_out10      youth10      elder10
## Min.      :0.00000      Min.      :0.00000      Min.      :0.00000      Min.      :0.00000
## 1st Qu.:0.04614      1st Qu.:0.04959      1st Qu.:0.07157      1st Qu.:0.06933
## Median :0.05966      Median :0.06063      Median :0.08210      Median :0.08140
## Mean      :0.06543      Mean      :0.06508      Mean      :0.08964      Mean      :0.08320
## 3rd Qu.:0.07784      3rd Qu.:0.07493      3rd Qu.:0.09633      3rd Qu.:0.09413
## Max.      :0.37771      Max.      :0.52005      Max.      :0.47408      Max.      :0.26445
##
##      NA's      :3
##
##      pop_growth      income_growth
## Min.      : -0.324353      Min.      : -0.40644

```

```
## 1st Qu.: -0.012620 1st Qu.: 0.01226
## Median : 0.004154 Median : 0.05150
## Mean : 0.011169 Mean : 0.06211
## 3rd Qu.: 0.027613 3rd Qu.: 0.10139
## Max. : 1.190871 Max. : 0.51532
##
```

## Retrieve the data for 8 swing states

```
virginia2 <- total2[which(total2$State=='Virginia'),]
michigan2 <- total2[which(total2$State=='Michigan'),]
penn2 <- total2[which(total2$State=='Pennsylvania'),]
florida2 <- total2[which(total2$State=='Florida'),]
wisconsin2 <- total2[which(total2$State=='Wisconsin'),]
ohio2 <- total2[which(total2$State=='Ohio'),]
nc2 <- total2[which(total2$State=='North Carolina'),]
nh2 <- total2[which(total2$State=='New Hampshire'),]
swing2 <- rbind(virginia2,michigan2,penn2,florida2,wisconsin2,ohio2,nc2,nh2)
```

## Visualization

```
# Import the packages necessary for visualization
```

```
require(ggplot2)
```

```
## Loading required package: ggplot2
```

```
## Warning: package 'ggplot2' was built under R version 3.2.5
```

```
require(gridExtra)
```

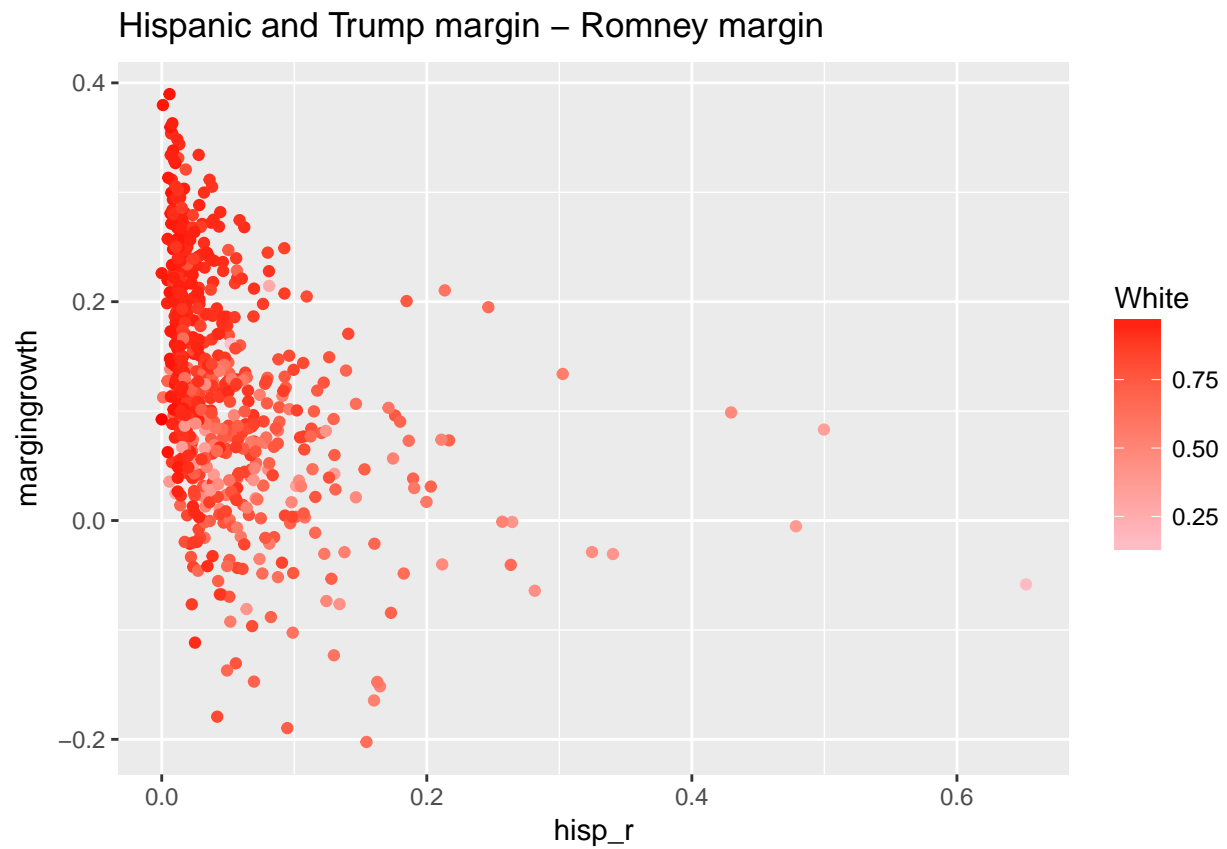
```
## Loading required package: gridExtra
```

```
## Warning: package 'gridExtra' was built under R version 3.2.4
```

Covariates and Trump margin - Romney margin; Note that aside from education, not many variables are correlated with the increase in GOP margin.

```
# Hispanic * Trump
```

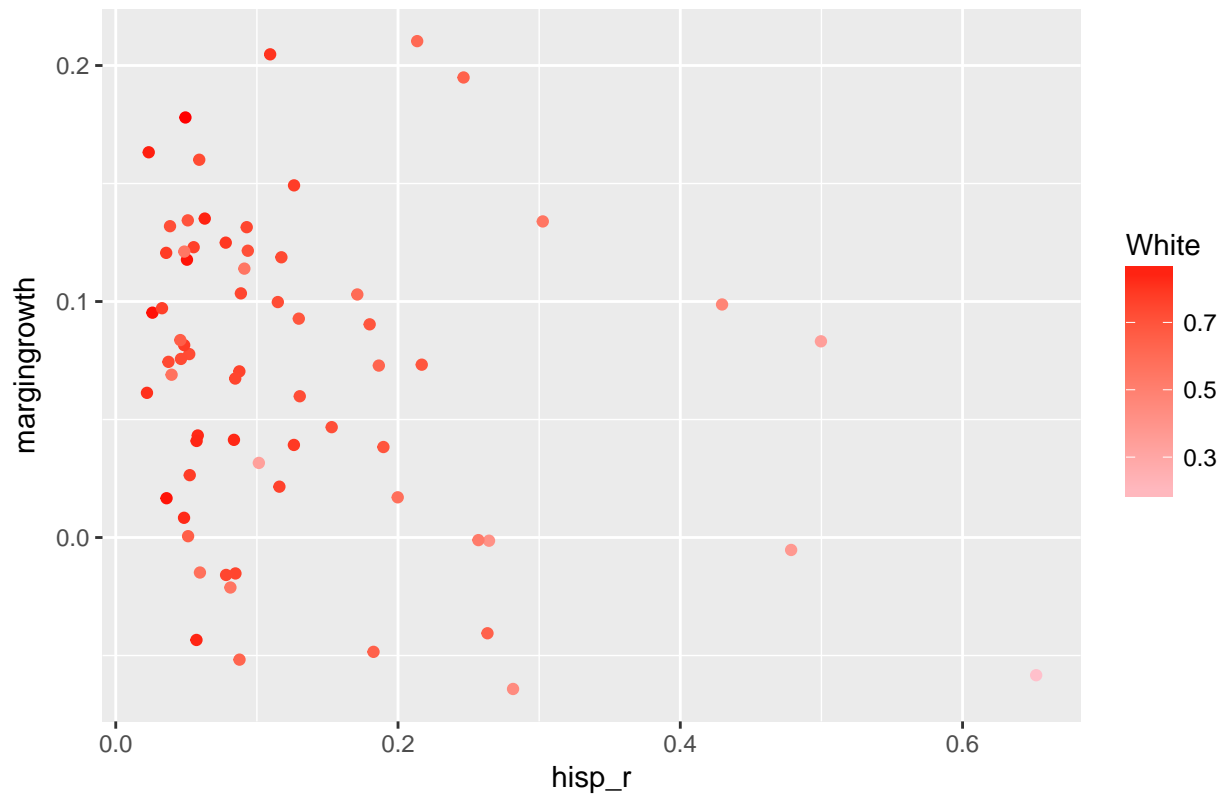
```
ggplot(swing2, aes(x = hisp_r, y = margingrowth)) +
  ggtitle("Hispanic and Trump margin - Romney margin") +
  geom_point(aes(colour = white_r)) +
  scale_color_continuous(name="White", low = 'pink', high = "red")
```



*# Just for Florida*

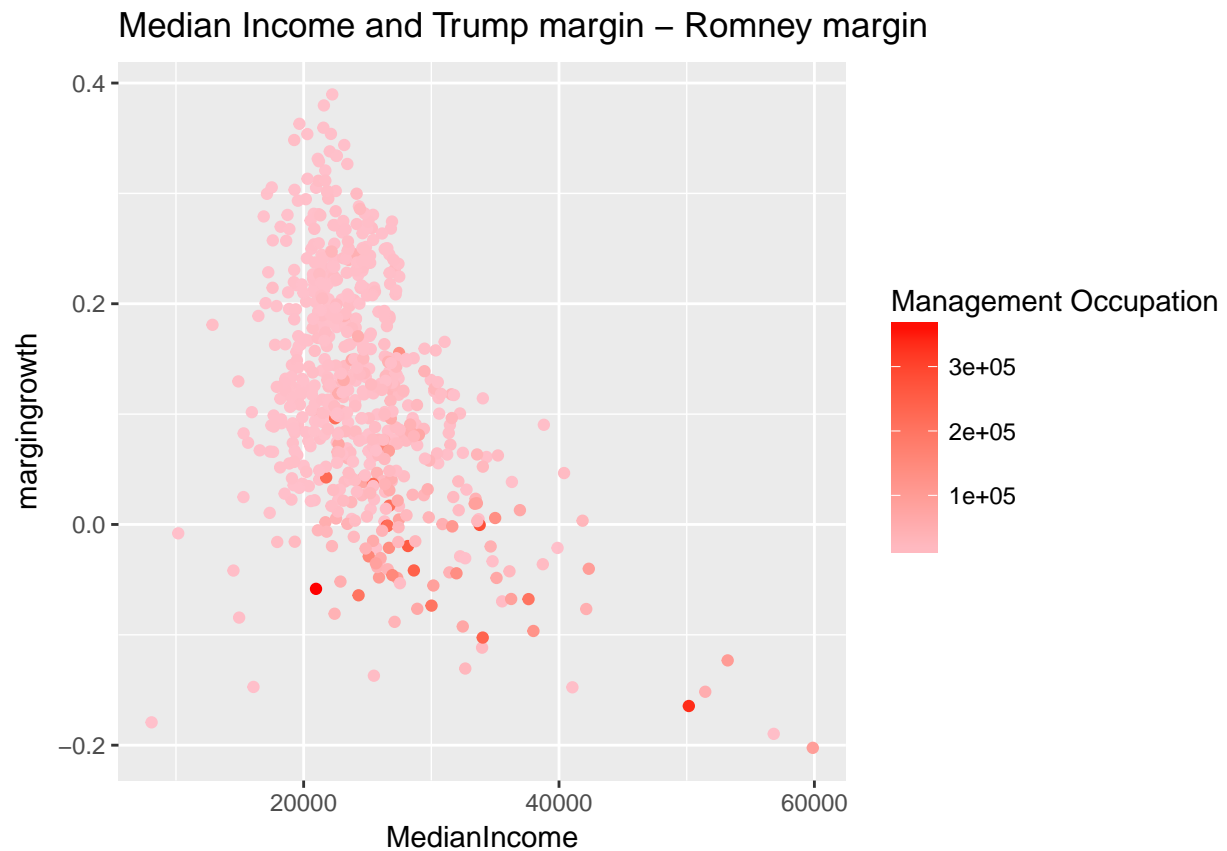
```
ggplot(florida2, aes(x = hisp_r, y = margingrowth)) +  
  ggtitle("Florida: Hispanic and Trump margin – Romney margin") +  
  geom_point(aes(colour = white_r) )+  
  scale_color_continuous(name="White", low = 'pink', high = "red")
```

### Florida: Hispanic and Trump margin – Romney margin



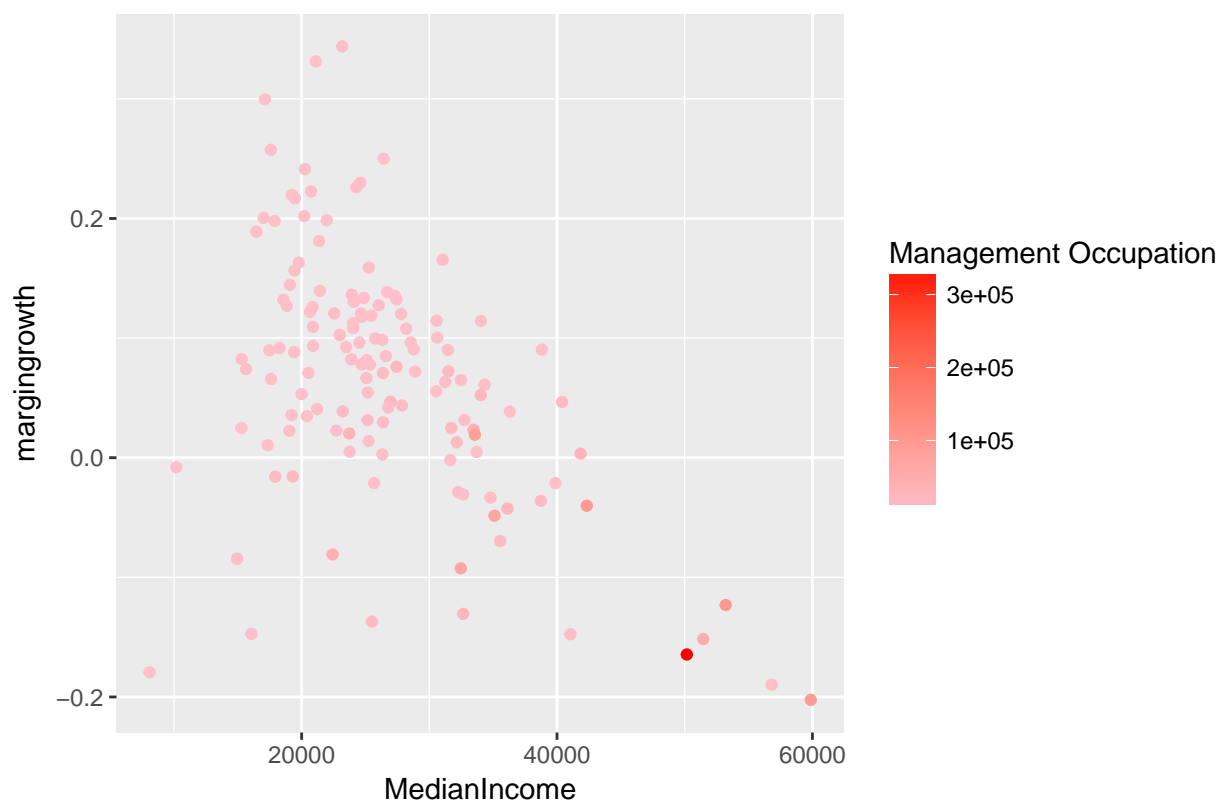
```
# Median Income * Trump
```

```
ggplot(swing2, aes(x = MedianIncome, y = margingrowth)) +  
  ggtitle("Median Income and Trump margin - Romney margin") +  
  geom_point(aes(colour = Management)) +  
  scale_color_continuous(name="Management Occupation", low = 'pink', high = "red")
```



```
# Just for Virginia  
ggplot(virginia2, aes(x = MedianIncome, y = margingrowth)) +  
  ggtitle("Virginia: Median Income and Trump margin - Romney margin") +  
  geom_point(aes(colour = Management)) +  
  scale_color_continuous(name="Management Occupation", low = 'pink', high = "red")
```

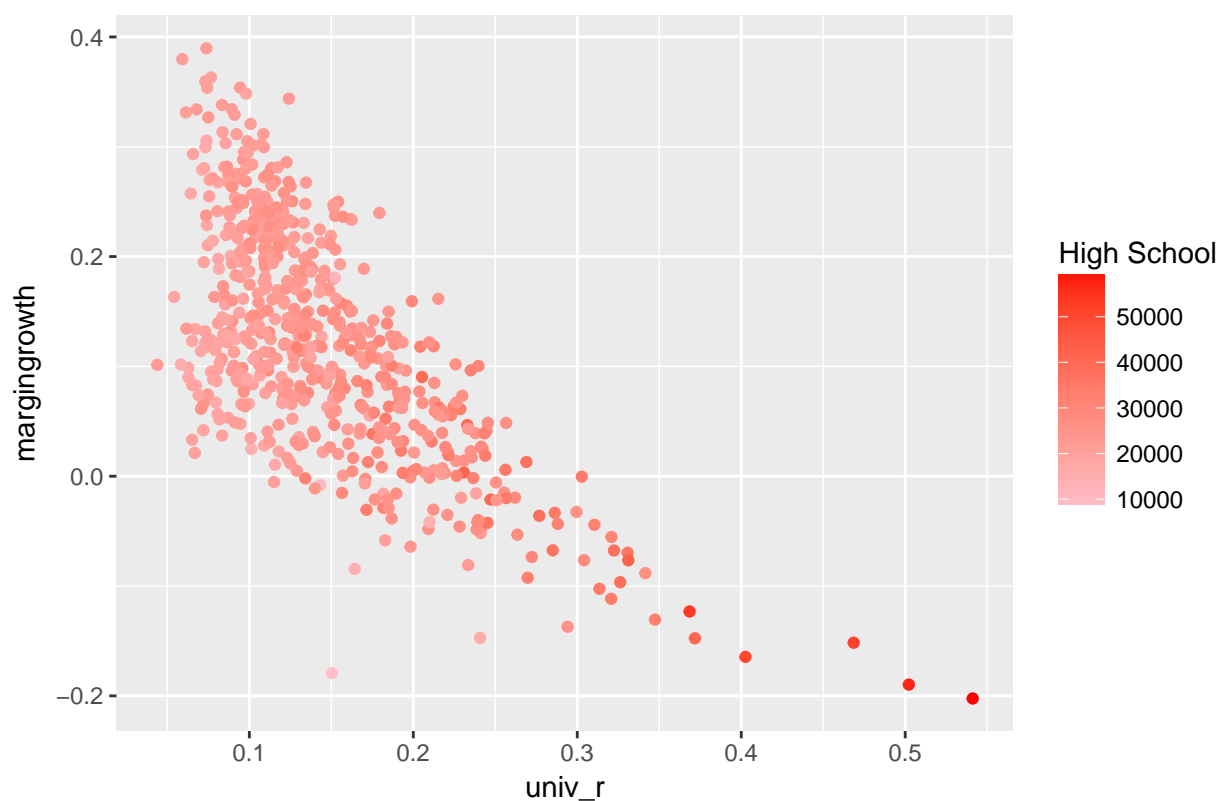
### Virginia: Median Income and Trump margin – Romney margin



```
# Education * Trump
ggplot(swing2, aes(x = univ_r, y = margingrowth)) +
  ggtitle("Bachelor degree holder's share and Trump's margin compared to Romney's") +
  geom_point(aes(colour = MedianIncome)) +
  scale_color_continuous(name="High School", low = 'pink', high = "red")
```

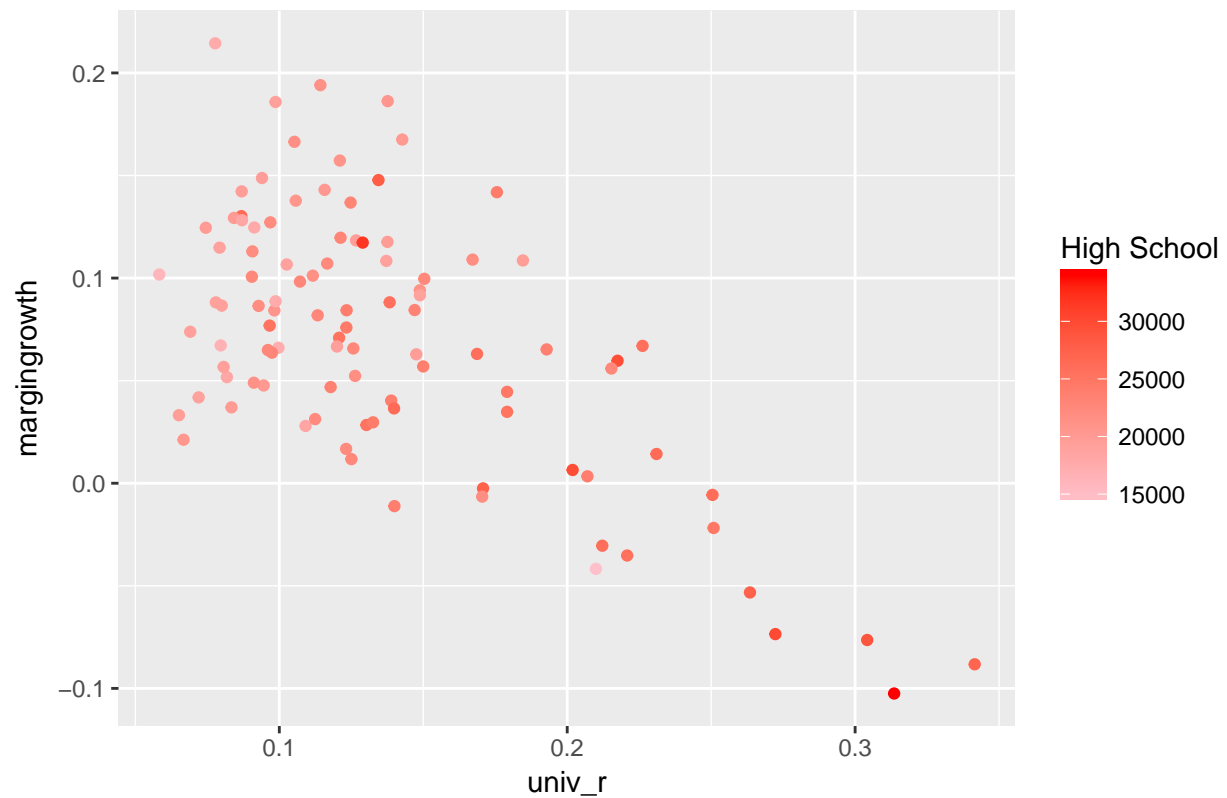


Bachelor degree holder's share and Trump's margin compared to Romney



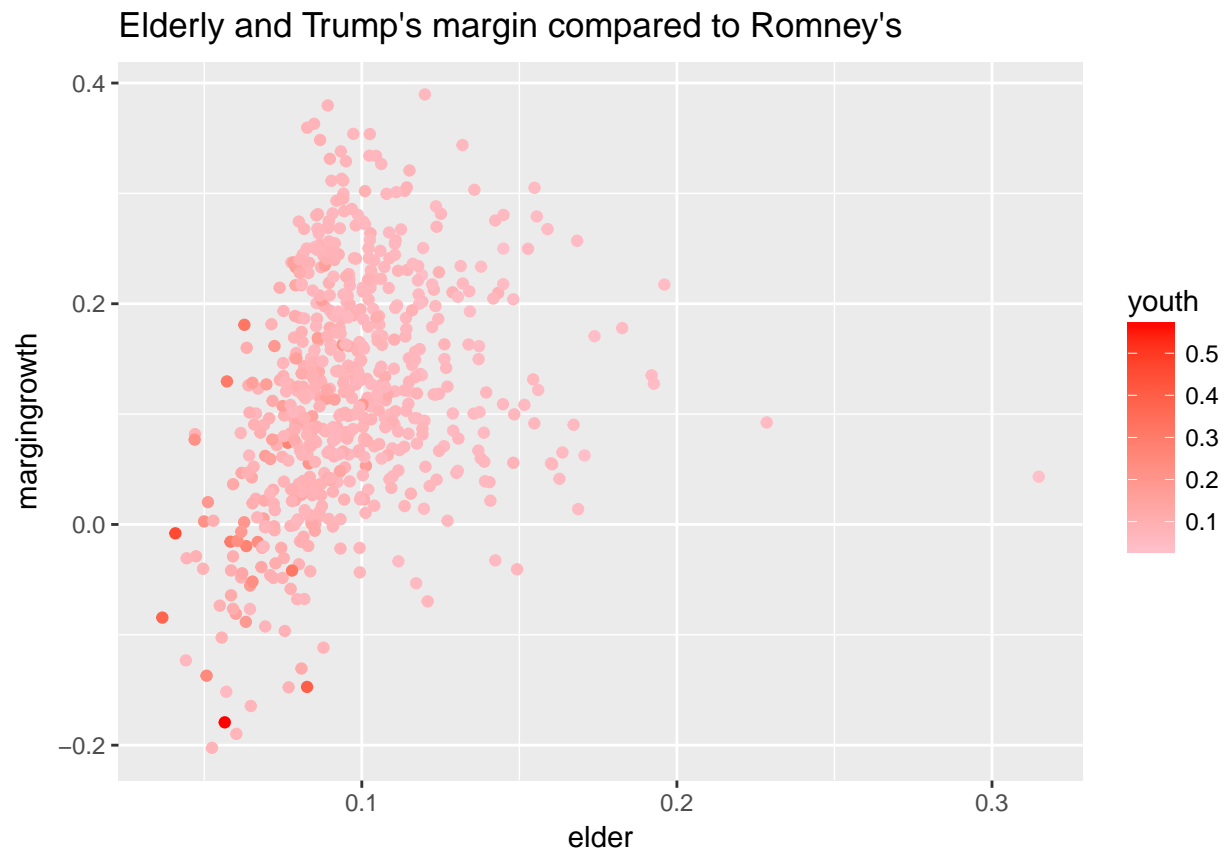
```
# Just for North Carolina  
ggplot(nc2, aes(x = univ_r, y = maringrowth)) +  
  ggtitle("NC: Bachelor degree holder's share and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = MedianIncome)) +  
  scale_color_continuous(name="High School", low = 'pink', high = "red")
```

## NC: Bachelor degree holder's share and Trump's margin compared to Ror



*# Elderly \* Trump*

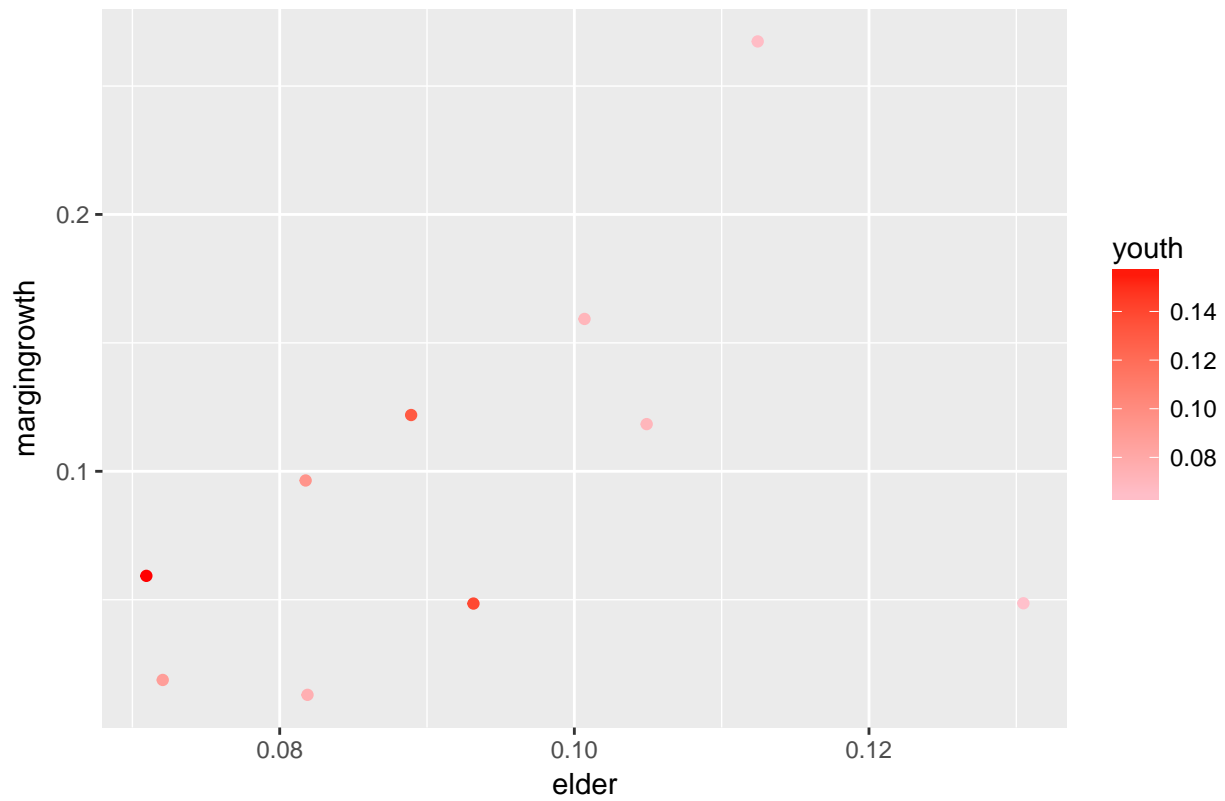
```
ggplot(swing2, aes(x = elder, y = margingrowth)) +  
  ggtitle("Elderly and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = youth)) +  
  scale_color_continuous(name="youth", low = 'pink', high = "red")
```



*# Just for New Hampshire*

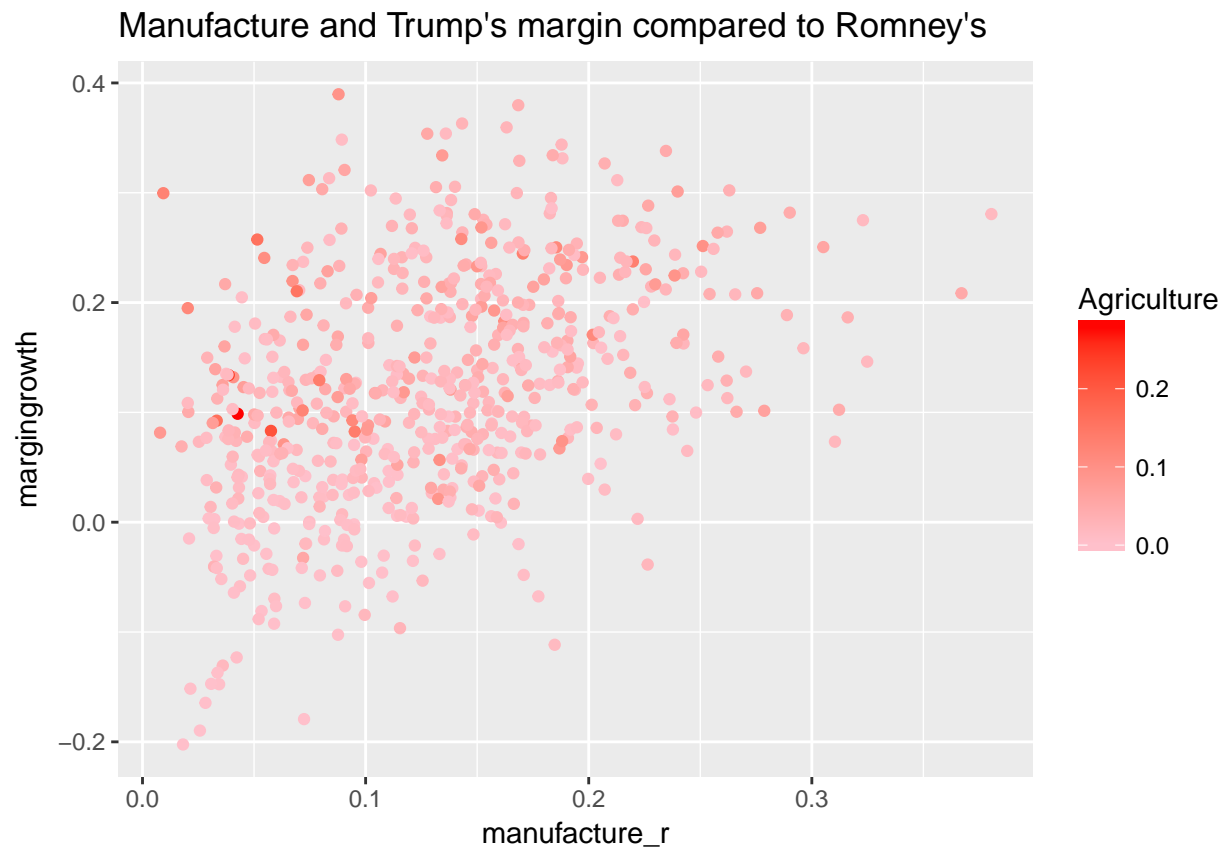
```
ggplot(nh2, aes(x = elder, y = margingrowth)) +  
  ggtitle("Elderly and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = youth)) +  
  scale_color_continuous(name="youth", low = 'pink', high = "red")
```

## Elderly and Trump's margin compared to Romney's



```
# Manufacture * Trump
```

```
ggplot(swing2, aes(x = manufacture_r, y = margingrowth)) +  
  ggtitle("Manufacture and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = agriculture_r)) +  
  scale_color_continuous(name="Agriculture", low = 'pink', high = "red")
```



*# Just for Michigan*

```
ggplot(michigan2, aes(x = manufacture_r, y = margingrowth)) +  
  ggtitle("Michigan: Manufacture and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = agriculture_r)) +  
  scale_color_continuous(name="Agriculture", low = 'pink', high = "red")
```

## Michigan: Manufacture and Trump's margin compared to Romney's



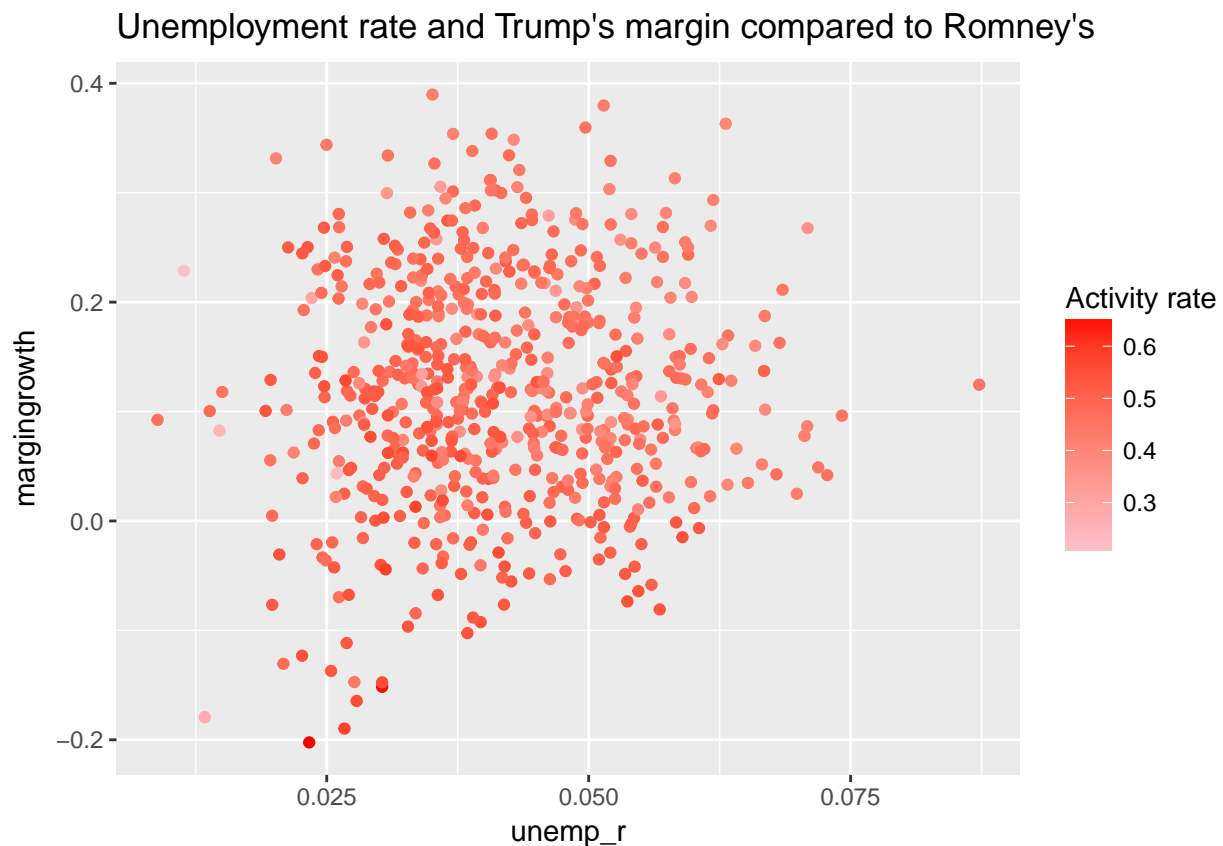
```
ls(total2)
```

```
## [1] "active_r"           "Agriculture"         "agriculture_r"
## [4] "Agriculture10"      "Bachelor"            "Bachelor10"
## [7] "Black"              "black_r"             "black_r10"
## [10] "Black10"            "BornInState"         "BornInState10"
## [13] "combined_fips"      "county_fips"         "county_name"
## [16] "CountyFIPS.x"       "CountyFIPS.y"        "CountyState"
## [19] "CountyState10"      "diff_2012"           "diff_2016"
## [22] "elder"              "elder10"             "FIPS"
## [25] "Foodstamp"          "Foodstamp10"         "FromOtherCounty"
## [28] "FromOtherCounty10"  "FromOtherState"      "FromOtherState10"
## [31] "HighSchool"         "highschool_r"        "highschool_r10"
## [34] "HighSchool10"       "hisp_r"              "hisp_r10"
## [37] "Hispanic"           "Hispanic10"          "homegrown"
## [40] "homegrown10"        "homeowner_r"         "homeowner_r10"
## [43] "income_growth"      "Labor"               "Management"
## [46] "management_r"       "Management10"        "Manufacture"
## [49] "manufacture_r"      "Manufacture10"       "maringrowth"
## [52] "MedianAge"          "MedianAge10"         "MedianIncome"
## [55] "MedianIncome10"     "move_in"             "move_in10"
## [58] "move_out"           "move_out10"          "NotInLabor"
## [61] "Owner"              "Owner10"             "per_dem_2012"
## [64] "per_dem_2016"       "per_gop_2012"        "per_gop_2016"
## [67] "per_point_diff_2012" "per_point_diff_2016" "pergrowth"
## [70] "pop_growth"         "Population"           "Population10"
```

```
## [73] "puregrowth"      "same_house"      "same_house10"
## [76] "SameHouse"       "SameHouse10"    "State"
## [79] "state_abbr"      "state_fips"     "State10"
## [82] "Tenure"          "Tenure10"       "ToOtherCounty"
## [85] "ToOtherCounty10" "ToOtherState"   "ToOtherState10"
## [88] "total_votes_2012" "total_votes_2016" "unemp_r"
## [91] "Unemployed"      "univ_r"         "univ_r10"
## [94] "votes_dem_2012"  "votes_dem_2016" "votes_gop_2012"
## [97] "votes_gop_2016"  "White"          "white_r"
## [100] "white_r10"       "White10"        "X"
## [103] "X18to24"         "X18to24_10"     "X65to74"
## [106] "X65to74_10"     "youth"          "youth10"
```

```
# Unemployment rate * Trump
```

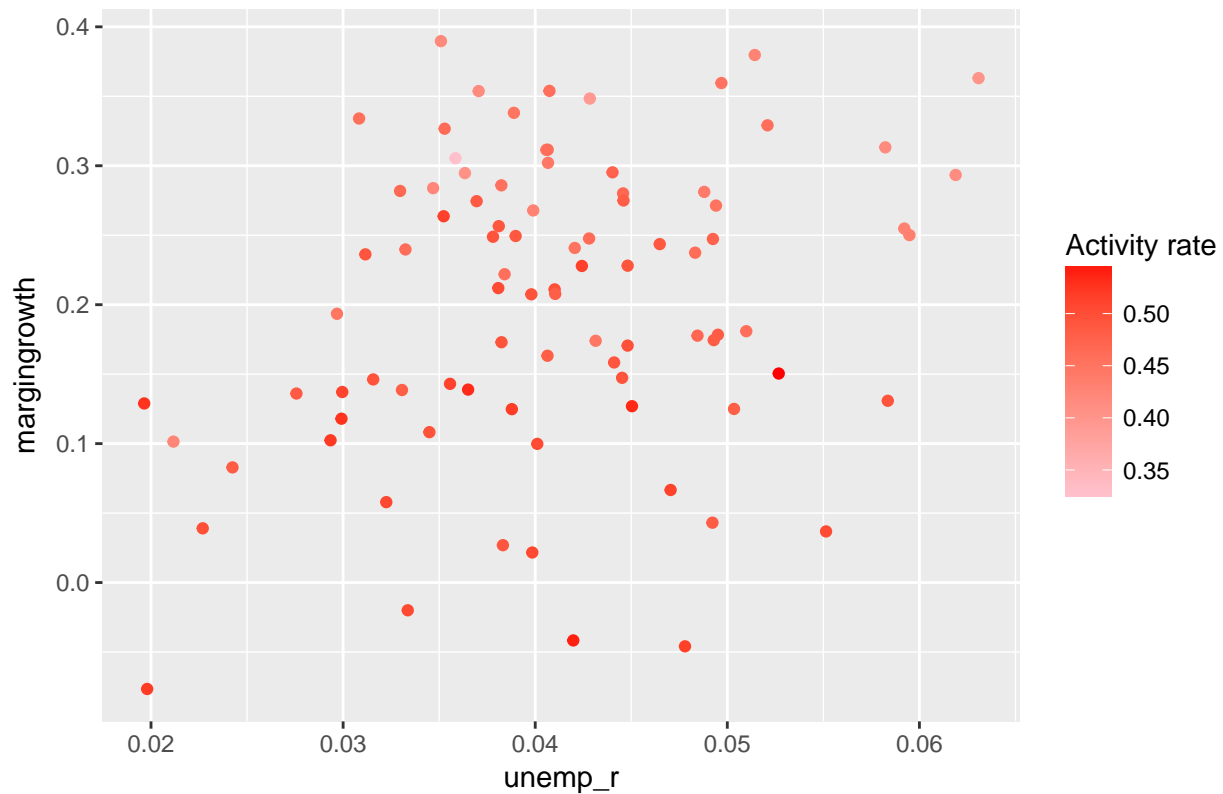
```
ggplot(swing2, aes(x = unemp_r, y = margingrowth)) +
  ggtitle("Unemployment rate and Trump's margin compared to Romney's") +
  geom_point(aes(colour = active_r)) +
  scale_color_continuous(name="Activity rate", low = 'pink', high = "red")
```



```
# Just for Ohio
```

```
ggplot(ohio2, aes(x = unemp_r, y = margingrowth)) +
  ggtitle("Ohio: Unemployment rate and Trump's margin compared to Romney's") +
  geom_point(aes(colour = active_r)) +
  scale_color_continuous(name="Activity rate", low = 'pink', high = "red")
```

## Ohio: Unemployment rate and Trump's margin compared to Romney's

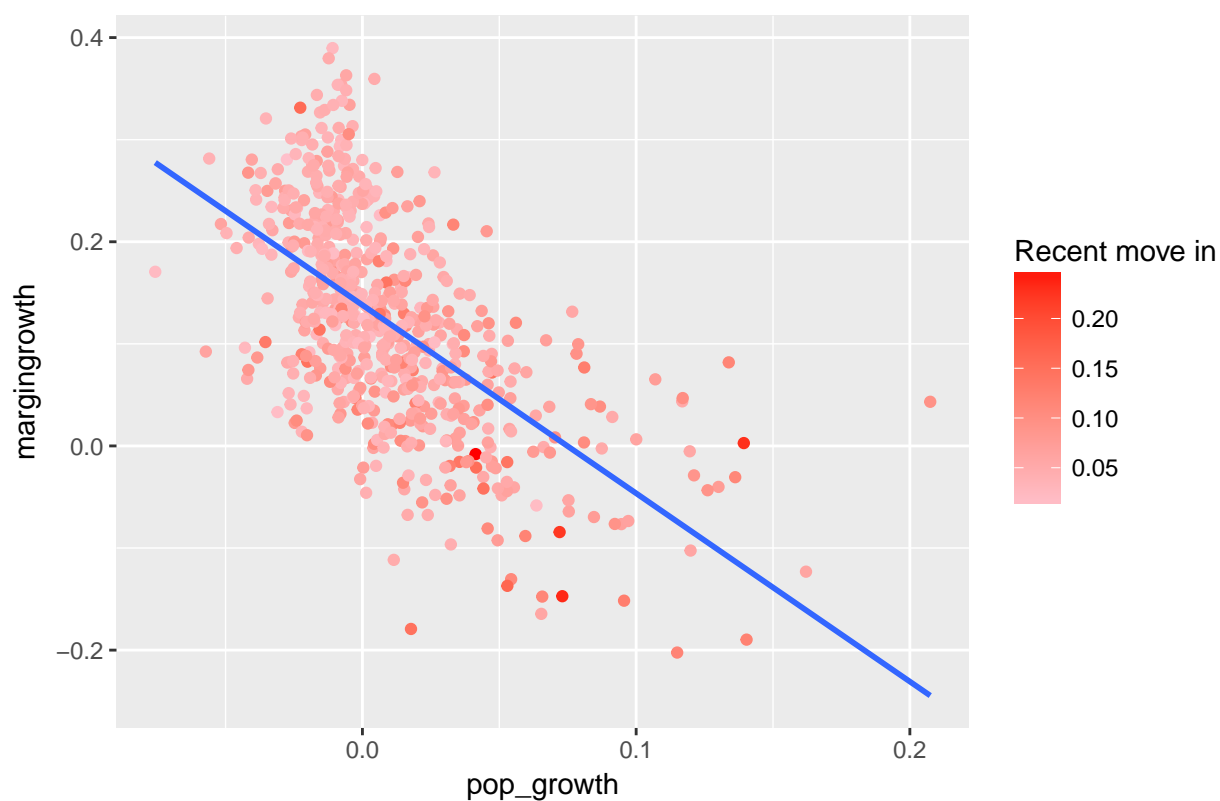


**Main point: Population growth and increasing margin**

```
# Population growth * Trump vote
ggplot(swing2, aes(x = pop_growth, y = margingrowth)) +
  ggtitle("Population growth and Trump's margin compared to Romney's") +
  geom_point(aes(colour = move_in)) +
  scale_color_continuous(name="Recent move in", low = 'pink', high = "red") +
  geom_smooth(method = "lm", se = FALSE)
```



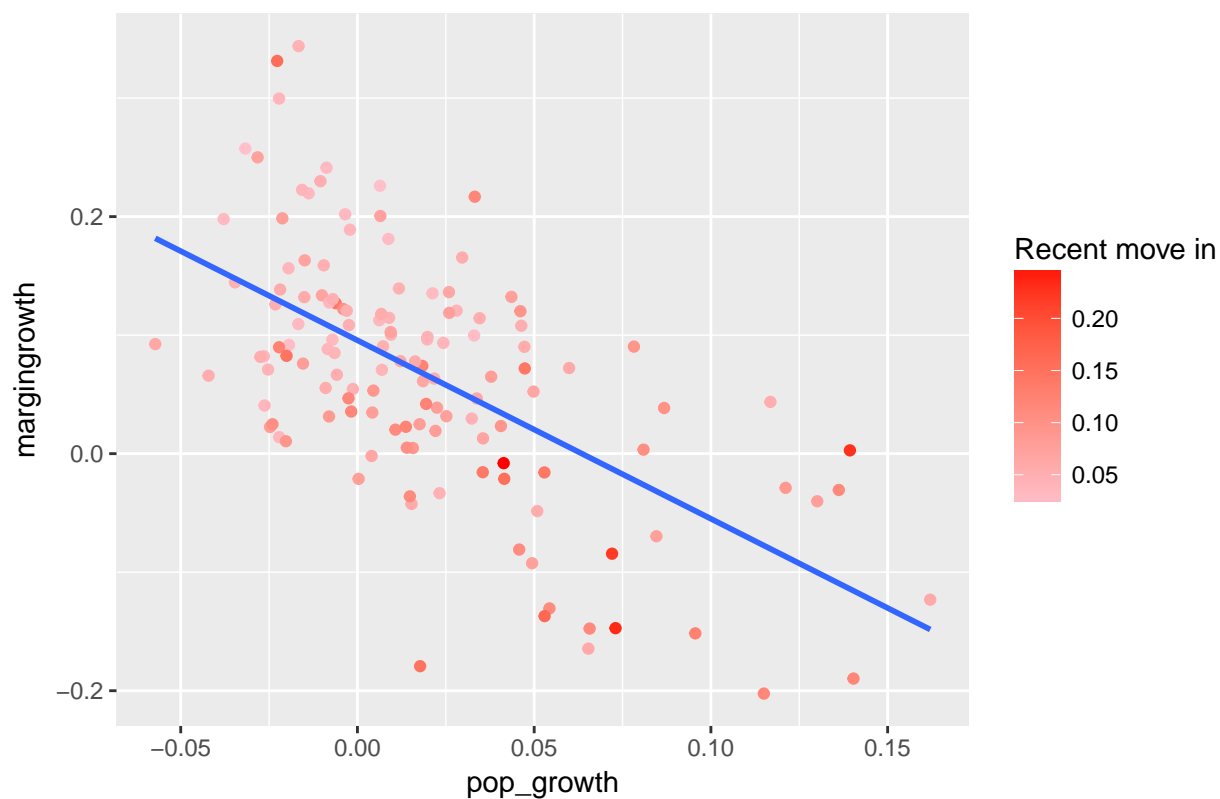
Population growth and Trump's margin compared to Romney's



*# Just for Virginia*

```
ggplot(virginia2, aes(x = pop_growth, y = margingrowth)) +  
  ggtitle("Virginia: Population growth and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = move_in)) +  
  scale_color_continuous(name="Recent move in", low = 'pink', high = "red") +  
  geom_smooth(method = "lm", se = FALSE)
```

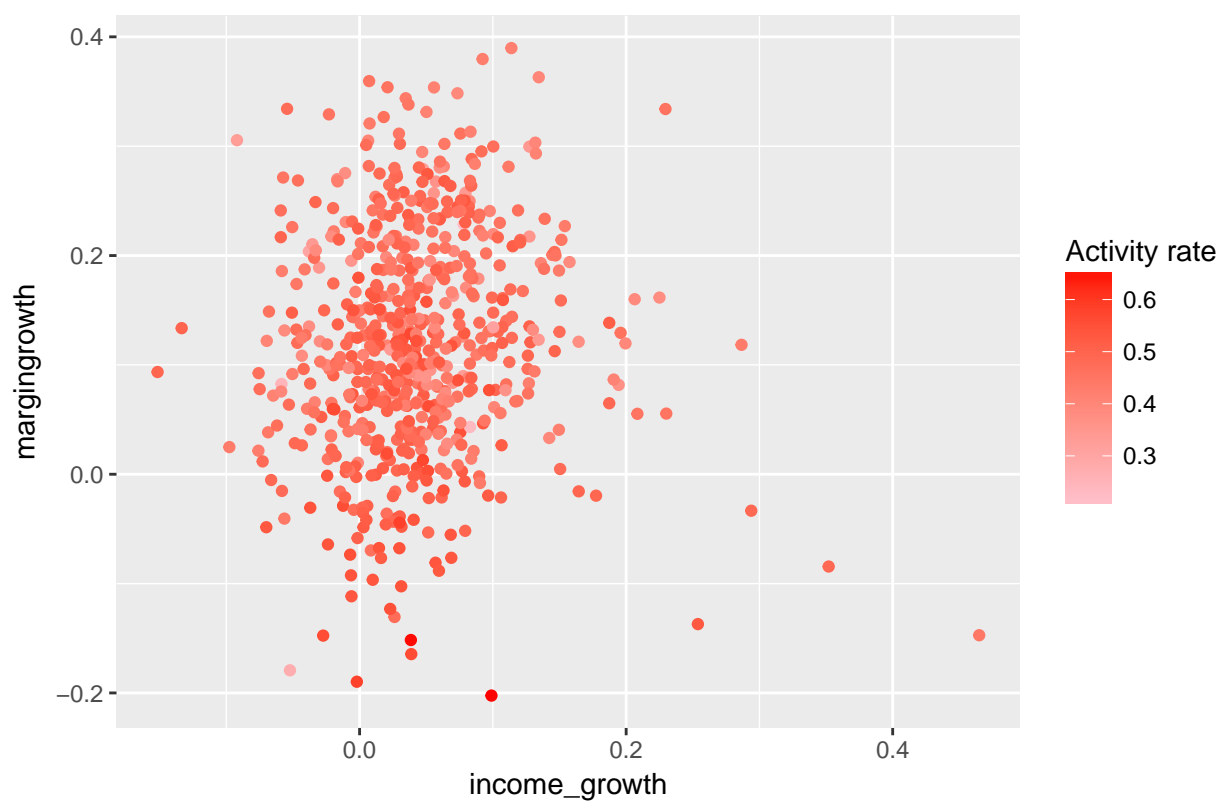
## Virginia: Population growth and Trump's margin compared to Romney's



```
# Income growth * Trump vote
```

```
ggplot(swing2, aes(x = income_growth, y = margingrowth)) +  
  ggtitle("Median Income growth and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = active_r)) +  
  scale_color_continuous(name="Activity rate", low = 'pink', high = "red")
```

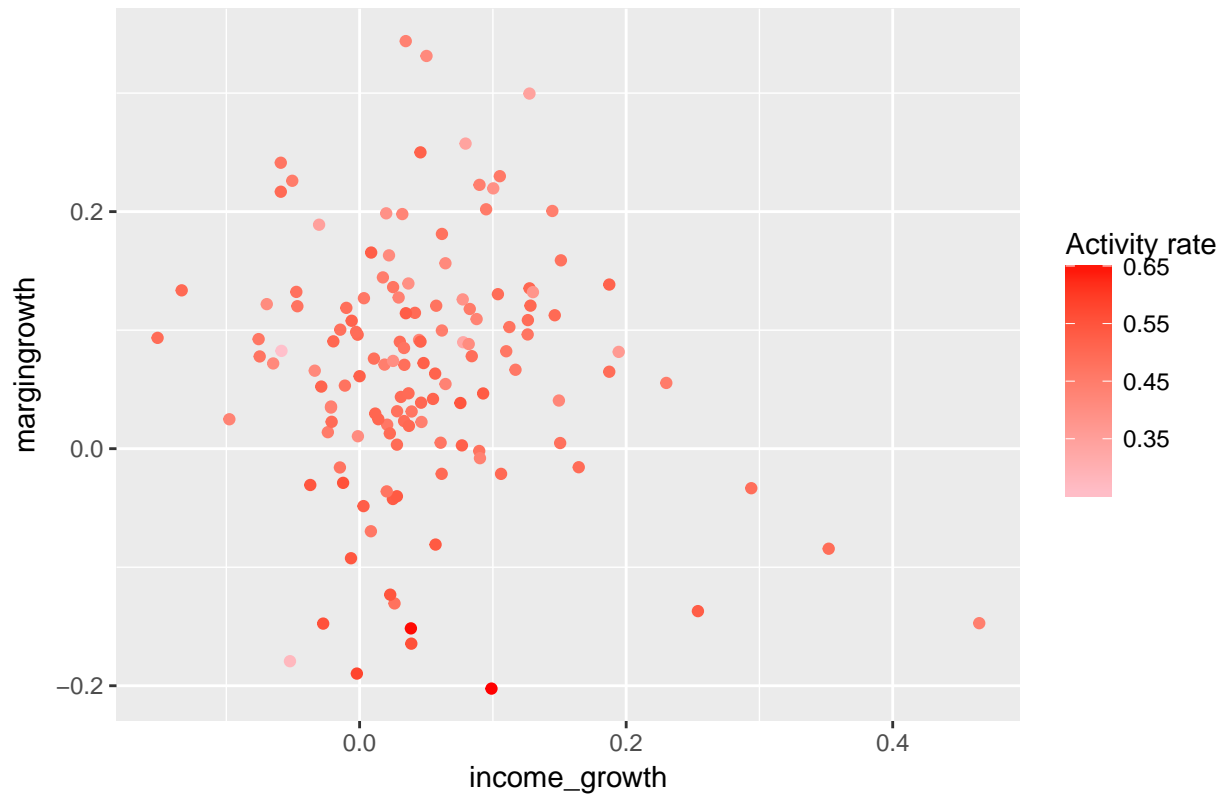
Median Income growth and Trump's margin compared to Romney's



*# Just for Virginia*

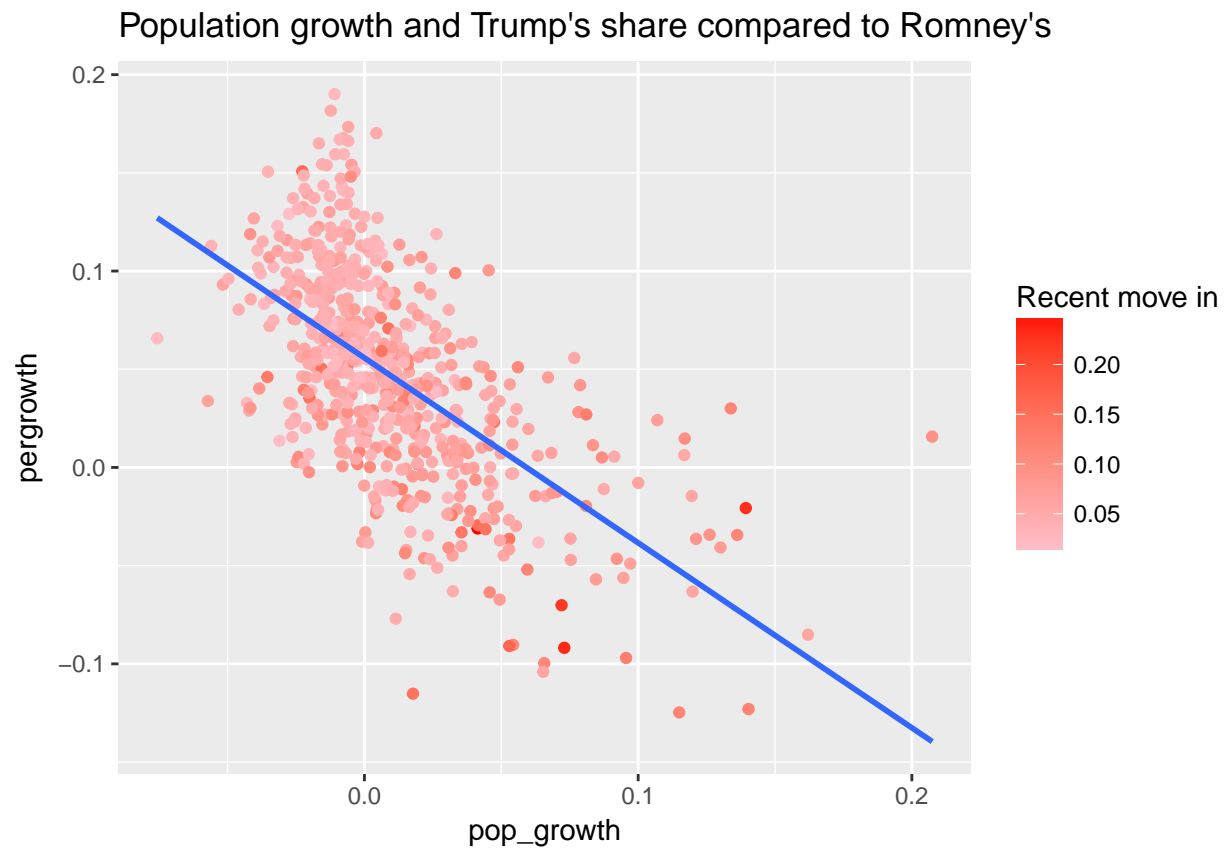
```
ggplot(virginia2, aes(x = income_growth, y = margingrowth)) +  
  ggtitle("Virginia: Median Income growth and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = active_r)) +  
  scale_color_continuous(name="Activity rate", low = 'pink', high = "red")
```

## Virginia: Median Income growth and Trump's margin compared to Romney

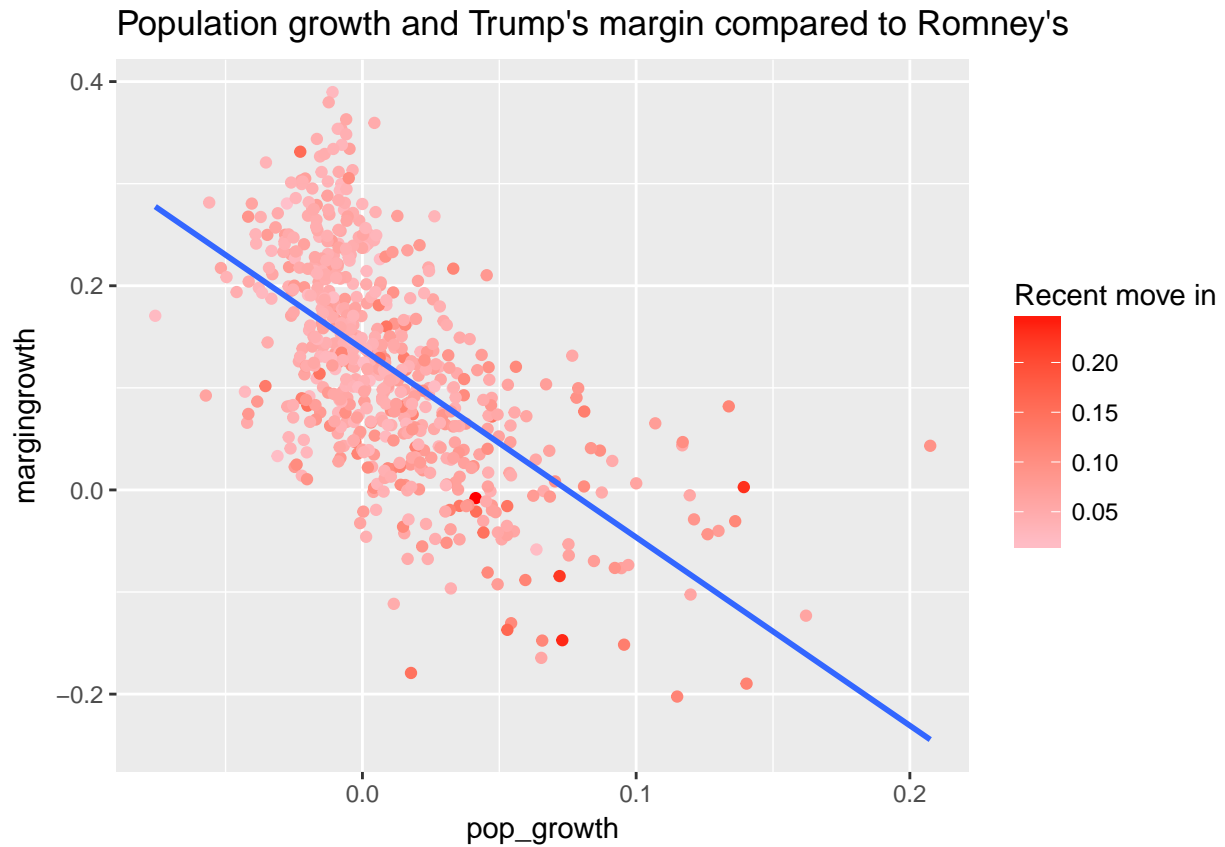


## Use dependent variables other than margins

```
# Voting share
ggplot(swing2, aes(x = pop_growth, y = pergrowth)) +
  ggtitle("Population growth and Trump's share compared to Romney's") +
  geom_point(aes(colour = move_in)) +
  scale_color_continuous(name="Recent move in", low = 'pink', high = "red") +
  geom_smooth(method = "lm", se = FALSE)
```



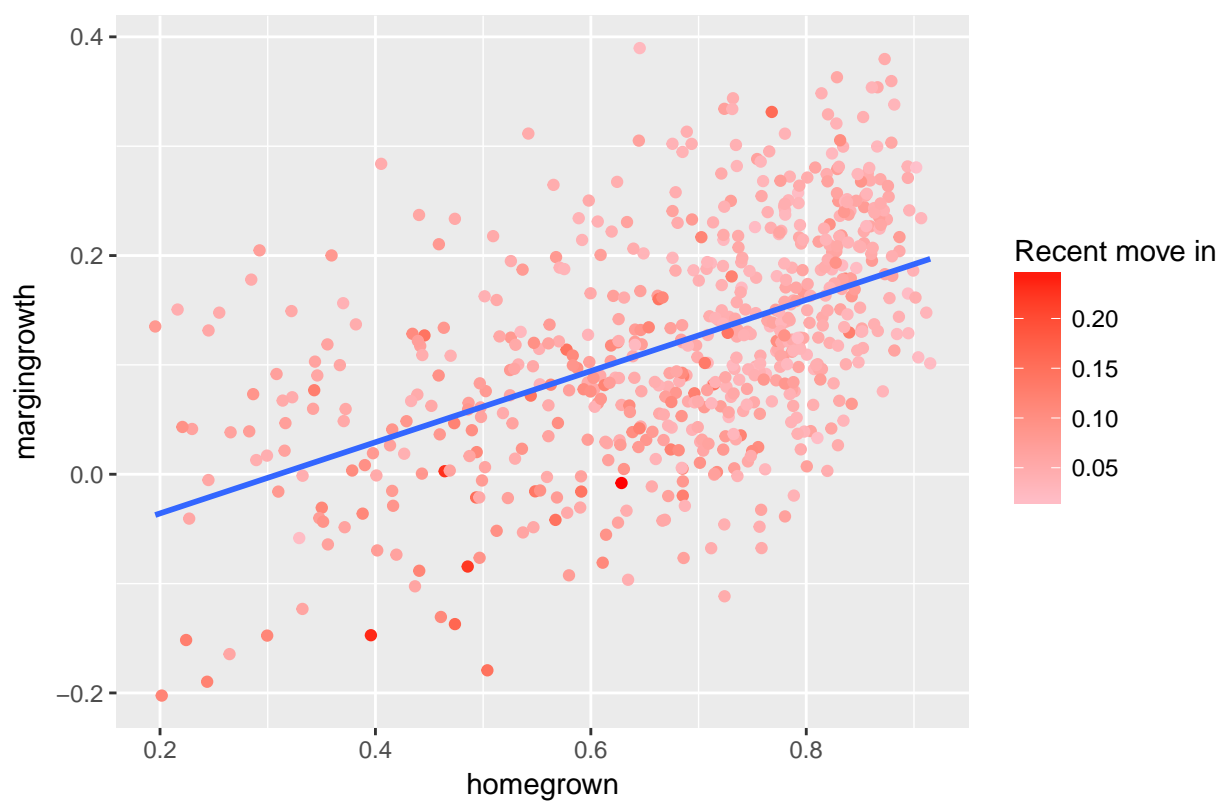
```
# Vote count  
ggplot(swing2, aes(x = pop_growth, y = margingrowth)) +  
  ggtitle("Population growth and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = move_in)) +  
  scale_color_continuous(name="Recent move in", low = 'pink', high = "red") +  
  geom_smooth(method = "lm", se = FALSE)
```



Go deeper than “population decrease”

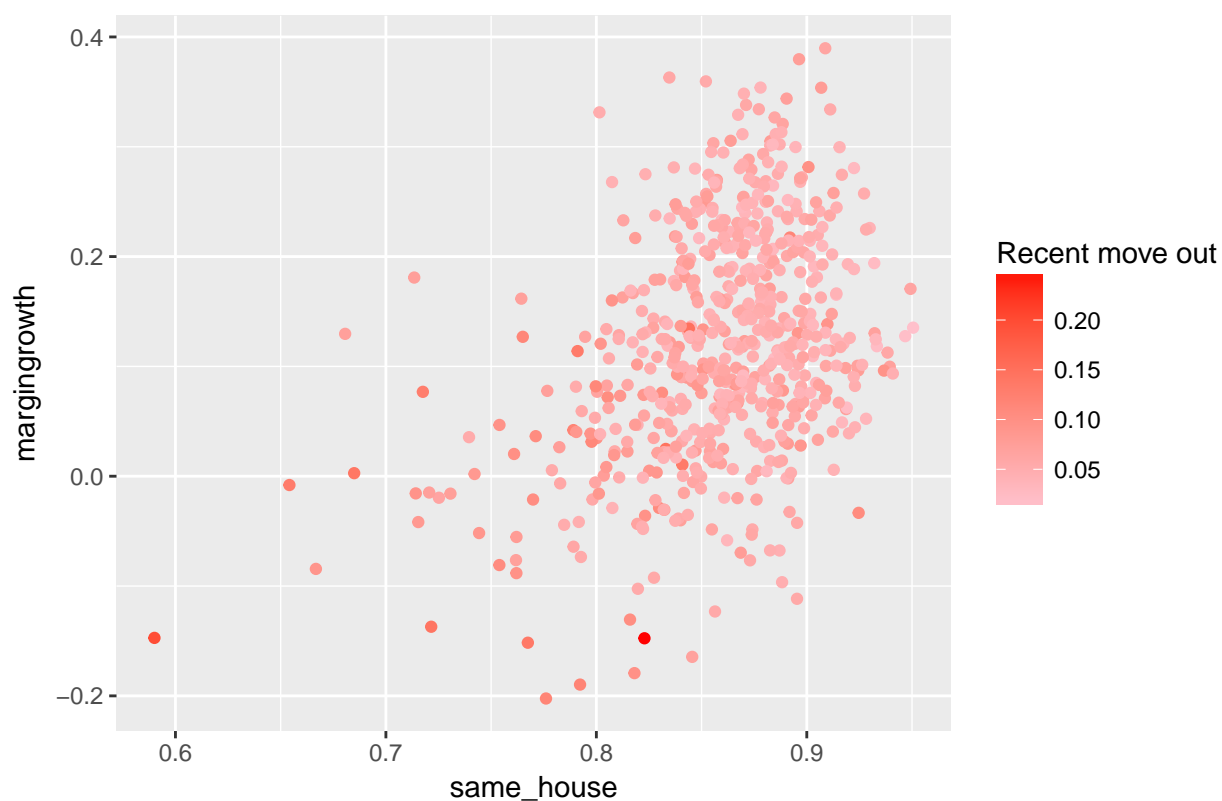
```
ggplot(swing2, aes(x = homegrown, y = margingrowth)) +  
  ggtitle("Population born in the state and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = move_in)) +  
  scale_color_continuous(name="Recent move in", low = 'pink', high = "red") +  
  geom_smooth(method = "lm", se = FALSE)
```

Population born in the state and Trump's margin compared to Romney's



```
ggplot(swing2, aes(x = same_house, y = margingrowth)) +  
  ggtitle("Population living in the Same house 1 year ago and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = move_out)) +  
  scale_color_continuous(name="Recent move out", low = 'pink', high = "red")
```

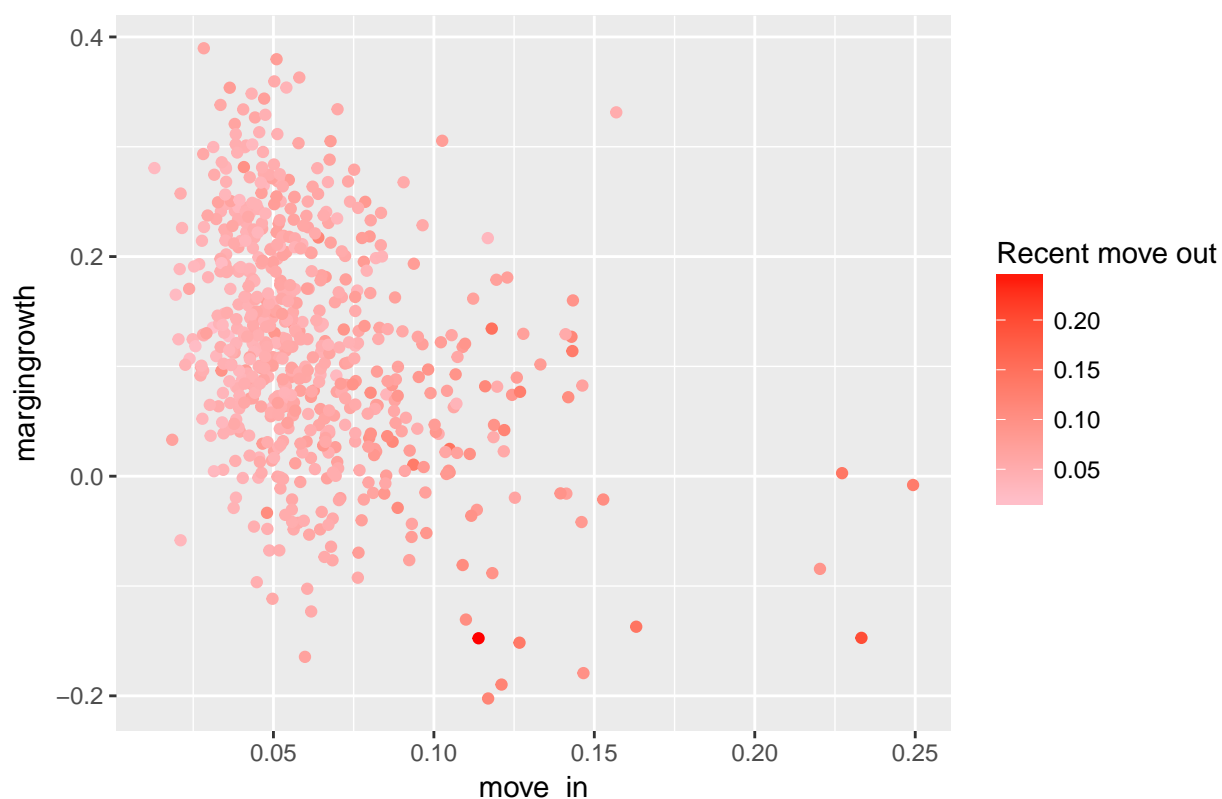
Population living in the Same house 1 year ago and Trump's margin comp



```
ggplot(swing2, aes(x = move_in, y = margingrowth)) +  
  ggtitle("Population recently moved in and Trump's margin compared to Romney's") +  
  geom_point(aes(colour = move_out)) +  
  scale_color_continuous(name="Recent move out", low = 'pink', high = "red")
```



## Population recently moved in and Trump's margin compared to Romney's



## Multivaraiate regression

```
library(stargazer)
```

```
##
```

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

```
## Hlavac, Marek (2015). stargazer: Well-Formatted Regression and Summary Statistics Tables.
```

```
## R package version 5.2. http://CRAN.R-project.org/package=stargazer
```

```
# Full model
```

```
lm0 <- lm(maringrowth~pop_growth+income_growth+homegrown+same_house+move_in+move_out+
          univ_r+highschool_r+white_r+hisp_r+black_r+unemp_r+active_r+elder+youth+manufacture_r+agric
          data=swing2)
summary(lm0)
```

```
##
```

```
## Call:
```

```
## lm(formula = maringrowth ~ pop_growth + income_growth + homegrown +
##     same_house + move_in + move_out + univ_r + highschool_r +
```

```
##      white_r + hisp_r + black_r + unemp_r + active_r + elder +
##      youth + manufacture_r + agriculture_r + management_r + MedianIncome +
##      MedianAge + homeowner_r + Foodstamp, data = swing2)
##
## Residuals:
##      Min        1Q      Median        3Q        Max
## -0.141007 -0.030884  0.001548  0.029294  0.188229
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.056e-01  1.166e-01   2.622  0.00897 **
## pop_growth    -2.175e-01  1.039e-01  -2.094  0.03665 *
## income_growth -1.524e-03  3.618e-02  -0.042  0.96643
## homegrown     -1.851e-02  2.061e-02  -0.898  0.36934
## same_house    -1.896e-01  1.178e-01  -1.609  0.10821
## move_in       -1.639e-01  1.596e-01  -1.027  0.30471
## move_out       4.491e-02  1.320e-01   0.340  0.73383
## univ_r        -7.937e-01  1.169e-01  -6.788 2.75e-11 ***
## highschool_r   4.377e-01  7.761e-02   5.639 2.64e-08 ***
## white_r       -2.907e-02  5.417e-02  -0.537  0.59174
## hisp_r        -3.262e-01  6.914e-02  -4.718 2.97e-06 ***
## black_r       -3.118e-01  5.520e-02  -5.649 2.50e-08 ***
## unemp_r        6.747e-01  2.495e-01   2.704  0.00704 **
## active_r      -4.868e-02  7.295e-02  -0.667  0.50482
## elder         -5.926e-01  2.698e-01  -2.196  0.02845 *
## youth         -6.648e-02  1.135e-01  -0.586  0.55826
## manufacture_r -7.504e-03  4.512e-02  -0.166  0.86797
## agriculture_r  1.901e-01  8.567e-02   2.219  0.02687 *
## management_r  -5.447e-02  1.004e-01  -0.543  0.58763
## MedianIncome   1.731e-06  1.093e-06   1.583  0.11388
## MedianAge      4.397e-03  1.928e-03   2.281  0.02289 *
## homeowner_r  -1.075e-01  4.965e-02  -2.166  0.03073 *
## Foodstamp      2.045e-05  8.671e-06   2.359  0.01867 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04991 on 597 degrees of freedom
## Multiple R-squared:  0.7761, Adjusted R-squared:  0.7679
## F-statistic: 94.08 on 22 and 597 DF,  p-value: < 2.2e-16
```

*# Omit some variables that are closely related to each other*

```
lm1 <- lm(margingrowth~pop_growth+income_growth+
          univ_r+hisp_r+black_r+unemp_r+active_r+elder+youth+manufacture_r+agriculture_r+MedianIncome+
          data=swing2)
summary(lm1)
```

```
##
## Call:
## lm(formula = margingrowth ~ pop_growth + income_growth + univ_r +
##      hisp_r + black_r + unemp_r + active_r + elder + youth + manufacture_r +
##      agriculture_r + MedianIncome + MedianAge + homeowner_r +
##      Foodstamp, data = swing2)
##
```

```
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.145835 -0.033955 -0.000744  0.029613  0.176516
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.090e-01  6.903e-02   3.028 0.002566 **
## pop_growth    -2.699e-01  1.004e-01  -2.689 0.007374 **
## income_growth  1.161e-02  3.641e-02   0.319 0.749853
## univ_r        -1.103e+00  7.214e-02 -15.288 < 2e-16 ***
## hisp_r        -3.026e-01  4.279e-02  -7.073 4.21e-12 ***
## black_r       -3.348e-01  1.971e-02 -16.989 < 2e-16 ***
## unemp_r        5.652e-01  2.324e-01   2.432 0.015309 *
## active_r      -6.365e-02  6.828e-02  -0.932 0.351612
## elder        -6.413e-01  2.563e-01  -2.503 0.012595 *
## youth        -8.627e-02  1.040e-01  -0.829 0.407173
## manufacture_r -5.531e-03  4.349e-02  -0.127 0.898847
## agriculture_r  1.845e-01  8.656e-02   2.131 0.033484 *
## MedianIncome   2.435e-06  9.987e-07   2.438 0.015036 *
## MedianAge      6.545e-03  1.719e-03   3.808 0.000154 ***
## homeowner_r  -1.894e-01  4.466e-02  -4.242 2.57e-05 ***
## Foodstamp      2.093e-05  7.947e-06   2.634 0.008654 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.05132 on 604 degrees of freedom
## Multiple R-squared:  0.7606, Adjusted R-squared:  0.7546
## F-statistic: 127.9 on 15 and 604 DF, p-value: < 2.2e-16
```

```
lm2 <- lm(margingrowth~pop_growth+income_growth+homegrown+move_in+
          univ_r+hisp_r+black_r+active_r+elder+manufacture_r+agriculture_r+MedianIncome+MedianAge+homeowner_r+Foodstamp,
          data=swing2)
summary(lm2)
```

```
##
## Call:
## lm(formula = margingrowth ~ pop_growth + income_growth + homegrown +
##      move_in + univ_r + hisp_r + black_r + active_r + elder +
##      manufacture_r + agriculture_r + MedianIncome + MedianAge +
##      homeowner_r + Foodstamp, data = swing2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.183985 -0.032629  0.000297  0.030700  0.168702
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   1.892e-01  5.421e-02   3.490 0.000518 ***
## pop_growth    -2.668e-01  1.005e-01  -2.653 0.008176 **
## income_growth -3.982e-03  3.630e-02  -0.110 0.912688
## homegrown      1.140e-02  2.060e-02   0.553 0.580243
## move_in       -2.149e-02  1.002e-01  -0.214 0.830294
## univ_r        -1.144e+00  6.645e-02 -17.222 < 2e-16 ***
## hisp_r        -2.616e-01  4.595e-02  -5.694 1.93e-08 ***
```

```
## black_r      -3.200e-01  1.906e-02 -16.795 < 2e-16 ***
## active_r     -5.411e-02  6.921e-02  -0.782 0.434590
## elder        -7.165e-01  2.415e-01  -2.967 0.003124 **
## manufacture_r -2.569e-02  4.499e-02  -0.571 0.568157
## agriculture_r 1.295e-01  8.347e-02   1.552 0.121273
## MedianIncome  2.397e-06  8.334e-07   2.876 0.004174 **
## MedianAge     7.539e-03  1.287e-03   5.859 7.67e-09 ***
## homeowner_r -1.917e-01  4.563e-02  -4.201 3.06e-05 ***
## Foodstamp     2.229e-05  8.053e-06   2.768 0.005817 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.05163 on 604 degrees of freedom
## Multiple R-squared:  0.7576, Adjusted R-squared:  0.7516
## F-statistic: 125.9 on 15 and 604 DF,  p-value: < 2.2e-16
```

```
# USA as a whole, not Swing states
```

```
lm3 <- lm(margingrowth~pop_growth+income_growth+
          univ_r+hisp_r+black_r+unemp_r+active_r+elder+youth+manufacture_r+agriculture_r+MedianIncome+
          data=total2)
summary(lm3)
```

```
##
## Call:
## lm(formula = margingrowth ~ pop_growth + income_growth + univ_r +
##      hisp_r + black_r + unemp_r + active_r + elder + youth + manufacture_r +
##      agriculture_r + MedianIncome + MedianAge + homeowner_r +
##      Foodstamp, data = total2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.44324 -0.04097 -0.00216  0.04172  0.28083
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.283e-01  2.976e-02  -4.312 1.67e-05 ***
## pop_growth   -1.621e-01  2.623e-02  -6.179 7.28e-10 ***
## income_growth 1.012e-01  1.566e-02   6.466 1.17e-10 ***
## univ_r        -1.125e+00  3.923e-02 -28.685 < 2e-16 ***
## hisp_r        -1.610e-01  1.065e-02 -15.127 < 2e-16 ***
## black_r       -2.148e-01  1.023e-02 -21.005 < 2e-16 ***
## unemp_r        1.748e-01  1.097e-01   1.593 0.111265
## active_r       1.231e-01  3.538e-02   3.480 0.000509 ***
## elder        -9.681e-01  1.277e-01  -7.579 4.56e-14 ***
## youth         3.307e-01  5.587e-02   5.920 3.57e-09 ***
## manufacture_r  6.780e-02  2.499e-02   2.714 0.006691 **
## agriculture_r -1.919e-01  2.461e-02  -7.797 8.63e-15 ***
## MedianIncome  1.728e-06  4.972e-07   3.476 0.000517 ***
## MedianAge     1.124e-02  6.831e-04  16.454 < 2e-16 ***
## homeowner_r -1.120e-01  2.210e-02  -5.068 4.25e-07 ***
## Foodstamp     -7.832e-06  4.687e-06  -1.671 0.094794 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.06721 on 3093 degrees of freedom
## Multiple R-squared: 0.5719, Adjusted R-squared: 0.5698
## F-statistic: 275.5 on 15 and 3093 DF, p-value: < 2.2e-16
```

```
stargazer(lm0, lm1, lm2, lm3, type = "text", title="Regression Results")
```

```
##
## Regression Results
## =====
##                                     Dependent variable:
## -----
##                                     margingrowth
##                                     (1)          (2)          (3)
## -----
## pop_growth          -0.218**          -0.270***          -0.267***
##                     (0.104)          (0.100)          (0.101)
##
## income_growth       -0.002            0.012            -0.004
##                     (0.036)          (0.036)          (0.036)
##
## homegrown           -0.019            0.011
##                     (0.021)          (0.021)
##
## same_house          -0.190
##                     (0.118)
##
## move_in             -0.164            -0.021
##                     (0.160)          (0.100)
##
## move_out            0.045
##                     (0.132)
##
## univ_r              -0.794***          -1.103***          -1.144***
##                     (0.117)          (0.072)          (0.066)
##
## highschool_r        0.438***
##                     (0.078)
##
## white_r             -0.029
##                     (0.054)
##
## hisp_r              -0.326***          -0.303***          -0.262***
##                     (0.069)          (0.043)          (0.046)
##
## black_r             -0.312***          -0.335***          -0.320***
##                     (0.055)          (0.020)          (0.019)
##
## unemp_r             0.675***          0.565**
##                     (0.250)          (0.232)
##
## active_r            -0.049            -0.064            -0.054
##                     (0.073)          (0.068)          (0.069)
##
```

## elder	-0.593**	-0.641**	-0.716***
##	(0.270)	(0.256)	(0.241)
##			
## youth	-0.066	-0.086	
##	(0.114)	(0.104)	
##			
## manufacture_r	-0.008	-0.006	-0.026
##	(0.045)	(0.043)	(0.045)
##			
## agriculture_r	0.190**	0.184**	0.130
##	(0.086)	(0.087)	(0.083)
##			
## management_r	-0.054		
##	(0.100)		
##			
## MedianIncome	0.00000	0.00000**	0.00000***
##	(0.00000)	(0.00000)	(0.00000)
##			
## MedianAge	0.004**	0.007***	0.008***
##	(0.002)	(0.002)	(0.001)
##			
## homeowner_r	-0.108**	-0.189***	-0.192***
##	(0.050)	(0.045)	(0.046)
##			
## Foodstamp	0.00002**	0.00002***	0.00002***
##	(0.00001)	(0.00001)	(0.00001)
##			
## Constant	0.306***	0.209***	0.189***
##	(0.117)	(0.069)	(0.054)
##			
## -----			
## Observations	620	620	620
## R2	0.776	0.761	0.758
## Adjusted R2	0.768	0.755	0.752
## Residual Std. Error	0.050 (df = 597)	0.051 (df = 604)	0.052 (df = 604)
## F Statistic	94.083*** (df = 22; 597)	127.899*** (df = 15; 604)	125.854*** (df = 15; 604)
## =====			
## Note:			*p<0