Exfel and Poverty

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```
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 3.6.3
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(plm)
```

```
## Warning: package 'plm' was built under R version 3.6.3
```

```
##
## Attaching package: 'plm'
```

```
## The following objects are masked from 'package:dplyr':
##
##     between, lag, lead
```

```
library(lmtest)
```

```
## Warning: package 'lmtest' was built under R version 3.6.3
```

```
## Loading required package: zoo
```

```
## Warning: package 'zoo' was built under R version 3.6.3
```

```
##
## Attaching package: 'zoo'
```

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

```
fe <- read.csv(file="FE_final.csv", header=T)

fe.ov <- fe %>% select(YEAR, STATENAME, STATEFIP, p6.pop,
                       popshare.16.25, popshare.26.35, popshare.36.45,
                       popshare.46.55, popshare.56.65, popshare.66.plus, t.unemp.rate,
                       t_1.unemp.rate, t_2.unemp.rate, t_3.unemp.rate, p6.y1.notemployed.rate,
                       p6.y2.unemployed.rate, p6.y3.idle.rate,
                       p6.y4.cfw.rate,p6.disab.rate, ssi.rate,
```

```
                       p6.marriage.rate, pctexfel, ssdi.rate, effective.wage,
                       TANF.mu, z_labor_unemployment_compensatio,
                       p6.degree.rate, p6.poverty.rate, time.indicator) %>%
                      mutate(ssi.rate=ssi.rate, norm.weight = p6.pop/(sum(p6.pop)/1550))
```

Poverty Test

```
#testing exfel on poverty
fe.ov <- fe.ov %>%
  group_by(STATENAME) %>%
  mutate(pctexfel_t1 = dplyr::lag(pctexfel,1),
         pctexfel_t2 = dplyr::lag(pctexfel,2),
         pctexfel_t3 = dplyr::lag(pctexfel,3),
         p6.y1.notemployed.rate_t1 = dplyr::lag(p6.y1.notemployed.rate,1))


#FE bivariate models of poverty
mod.pov.t0 <- lm(p6.poverty.rate~pctexfel+
              as.factor(STATENAME)+as.factor(YEAR),
                  data = fe.ov[fe.ov$YEAR >= 1988,])
summary(mod.pov.t0)
```

```
##
## Call:
## lm(formula = p6.poverty.rate ~ pctexfel + as.factor(STATENAME) +
##     as.factor(YEAR), data = fe.ov[fe.ov$YEAR >= 1988, ])
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.3457 -0.9551 -0.0567  0.9229  5.7498
##
## Coefficients:
##                                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      13.54066    0.45818  29.553  < 2e-16 ***
## pctexfel                          0.12805    0.08131   1.575 0.115587
## as.factor(STATENAME)Alaska       -5.07092    0.45183 -11.223  < 2e-16 ***
## as.factor(STATENAME)Arizona      -0.54355    0.45181  -1.203 0.229220
## as.factor(STATENAME)Arkansas      0.99888    0.46658   2.141 0.032511 *
## as.factor(STATENAME)California   -1.23097    0.46292  -2.659 0.007950 **
## as.factor(STATENAME)Colorado     -4.53049    0.45182 -10.027  < 2e-16 ***
## as.factor(STATENAME)Connecticut  -7.16192    0.46726 -15.327  < 2e-16 ***
## as.factor(STATENAME)Delaware     -6.14204    0.45471 -13.508  < 2e-16 ***
## as.factor(STATENAME)Florida      -2.72327    0.58333  -4.669 3.42e-06 ***
## as.factor(STATENAME)Georgia      -3.03438    0.51494  -5.893 5.08e-09 ***
## as.factor(STATENAME)Hawaii       -4.66252    0.45443 -10.260  < 2e-16 ***
## as.factor(STATENAME)Idaho        -2.55752    0.45192  -5.659 1.95e-08 ***
## as.factor(STATENAME)Illinois     -3.58174    0.45296  -7.907 6.47e-15 ***
## as.factor(STATENAME)Indiana      -4.36974    0.46917  -9.314  < 2e-16 ***
## as.factor(STATENAME)Iowa         -4.52275    0.46188  -9.792  < 2e-16 ***
## as.factor(STATENAME)Kansas       -3.51148    0.45439  -7.728 2.50e-14 ***
## as.factor(STATENAME)Kentucky      0.49171    0.46020   1.068 0.285548
```

```
## as.factor(STATENAME)Louisiana       2.56302    0.45204   5.670 1.83e-08 ***
## as.factor(STATENAME)Maine          -3.17236    0.46592  -6.809 1.63e-11 ***
## as.factor(STATENAME)Maryland       -6.38176    0.45541 -14.013  < 2e-16 ***
## as.factor(STATENAME)Massachusetts  -5.09944    0.45300 -11.257  < 2e-16 ***
## as.factor(STATENAME)Michigan       -3.09487    0.45613  -6.785 1.91e-11 ***
## as.factor(STATENAME)Minnesota      -5.62492    0.45343 -12.405  < 2e-16 ***
## as.factor(STATENAME)Mississippi     3.39195    0.45474   7.459 1.79e-13 ***
## as.factor(STATENAME)Missouri       -3.12494    0.45212  -6.912 8.19e-12 ***
## as.factor(STATENAME)Montana         0.32097    0.45906   0.699 0.484591
## as.factor(STATENAME)Nebraska       -4.55289    0.46189  -9.857  < 2e-16 ***
## as.factor(STATENAME)Nevada         -4.73476    0.46621 -10.156  < 2e-16 ***
## as.factor(STATENAME)New Hampshire  -7.78519    0.47716 -16.316  < 2e-16 ***
## as.factor(STATENAME)New Jersey     -6.72584    0.45211 -14.877  < 2e-16 ***
## as.factor(STATENAME)New Mexico      3.71748    0.45181   8.228 5.45e-16 ***
## as.factor(STATENAME)New York       -0.93804    0.47925  -1.957 0.050568 .
## as.factor(STATENAME)North Carolina -2.44500    0.45663  -5.354 1.05e-07 ***
## as.factor(STATENAME)North Dakota   -2.60218    0.46965  -5.541 3.79e-08 ***
## as.factor(STATENAME)Ohio           -3.62431    0.45192  -8.020 2.75e-15 ***
## as.factor(STATENAME)Oklahoma       -0.44822    0.46600  -0.962 0.336345
## as.factor(STATENAME)Oregon         -2.47726    0.45657  -5.426 7.13e-08 ***
## as.factor(STATENAME)Pennsylvania   -4.07174    0.48476  -8.400  < 2e-16 ***
## as.factor(STATENAME)Rhode Island   -4.96160    0.45258 -10.963  < 2e-16 ***
## as.factor(STATENAME)South Carolina -1.66520    0.45573  -3.654 0.000271 ***
## as.factor(STATENAME)South Dakota   -1.92231    0.45266  -4.247 2.36e-05 ***
## as.factor(STATENAME)Tennessee      -0.63414    0.45712  -1.387 0.165654
## as.factor(STATENAME)Texas          -0.34208    0.45440  -0.753 0.451728
## as.factor(STATENAME)Utah           -5.54835    0.48462 -11.449  < 2e-16 ***
## as.factor(STATENAME)Vermont        -5.23084    0.45447 -11.510  < 2e-16 ***
## as.factor(STATENAME)Virginia       -5.46230    0.45370 -12.039  < 2e-16 ***
## as.factor(STATENAME)Washington     -4.12476    0.45262  -9.113  < 2e-16 ***
## as.factor(STATENAME)West Virginia   2.47679    0.51008   4.856 1.38e-06 ***
## as.factor(STATENAME)Wisconsin      -5.31018    0.47494 -11.181  < 2e-16 ***
## as.factor(STATENAME)Wyoming        -3.65537    0.46074  -7.934 5.30e-15 ***
## as.factor(YEAR)1989                -0.46478    0.30663  -1.516 0.129867
## as.factor(YEAR)1990                -0.70194    0.30701  -2.286 0.022425 *
## as.factor(YEAR)1991                -0.40637    0.30789  -1.320 0.187166
## as.factor(YEAR)1992                 0.06283    0.30886   0.203 0.838839
## as.factor(YEAR)1993                 0.34825    0.31018   1.123 0.261813
## as.factor(YEAR)1994                 0.98632    0.31140   3.167 0.001582 **
## as.factor(YEAR)1995                 0.06966    0.31368   0.222 0.824297
## as.factor(YEAR)1996                -0.07252    0.31638  -0.229 0.818753
## as.factor(YEAR)1997                -0.15833    0.31957  -0.495 0.620372
## as.factor(YEAR)1998                -0.41886    0.32316  -1.296 0.195197
## as.factor(YEAR)1999                -0.67351    0.32749  -2.057 0.039968 *
## as.factor(YEAR)2000                -1.47407    0.33361  -4.419 1.09e-05 ***
## as.factor(YEAR)2001                -1.78915    0.33638  -5.319 1.27e-07 ***
## as.factor(YEAR)2002                -1.15605    0.34202  -3.380 0.000751 ***
## as.factor(YEAR)2003                -0.69644    0.34869  -1.997 0.046046 *
## as.factor(YEAR)2004                -0.49569    0.35731  -1.387 0.165635
## as.factor(YEAR)2005                -0.10019    0.37148  -0.270 0.787448
## as.factor(YEAR)2006                 0.06367    0.37238   0.171 0.864270
## as.factor(YEAR)2007                -0.35543    0.37748  -0.942 0.346614
## as.factor(YEAR)2008                -0.44068    0.38483  -1.145 0.252405
## as.factor(YEAR)2009                 0.29034    0.39511   0.735 0.462611
```

```
## as.factor(YEAR)2010                 1.90121    0.39806   4.776 2.03e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.532 on 1077 degrees of freedom
## Multiple R-squared:  0.7827, Adjusted R-squared:  0.7682
## F-statistic: 53.87 on 72 and 1077 DF,  p-value: < 2.2e-16
```

```
mod.pov.t1 <- lm(p6.poverty.rate~pctexfel_t1+
              as.factor(STATENAME)+as.factor(YEAR),
                  data = fe.ov[fe.ov$YEAR >= 1988,])
summary(mod.pov.t1) #positive coefficient
```

```
##
## Call:
## lm(formula = p6.poverty.rate ~ pctexfel_t1 + as.factor(STATENAME) +
##     as.factor(YEAR), data = fe.ov[fe.ov$YEAR >= 1988, ])
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.3435 -0.9610 -0.0605  0.9210  5.7427
##
## Coefficients:
##                                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      13.4925022  0.4571144  29.517  < 2e-16 ***
## pctexfel_t1                       0.1454939  0.0817720   1.779 0.075479 .
## as.factor(STATENAME)Alaska       -5.0463221  0.4517676 -11.170  < 2e-16 ***
## as.factor(STATENAME)Arizona      -0.5315285  0.4516988  -1.177 0.239562
## as.factor(STATENAME)Arkansas      1.0435435  0.4695084   2.223 0.026448 *
## as.factor(STATENAME)California   -1.2329909  0.4606187  -2.677 0.007545 **
## as.factor(STATENAME)Colorado     -4.5239507  0.4517070 -10.015  < 2e-16 ***
## as.factor(STATENAME)Connecticut  -7.1626929  0.4639173 -15.440  < 2e-16 ***
## as.factor(STATENAME)Delaware     -6.1033995  0.4566209 -13.366  < 2e-16 ***
## as.factor(STATENAME)Florida      -2.7592203  0.5694395  -4.846 1.45e-06 ***
## as.factor(STATENAME)Georgia      -3.0497439  0.5056312  -6.032 2.23e-09 ***
## as.factor(STATENAME)Hawaii       -4.6408040  0.4550452 -10.199  < 2e-16 ***
## as.factor(STATENAME)Idaho        -2.5288428  0.4523468  -5.590 2.87e-08 ***
## as.factor(STATENAME)Illinois     -3.5569209  0.4536594  -7.841 1.07e-14 ***
## as.factor(STATENAME)Indiana      -4.3626448  0.4643842  -9.394  < 2e-16 ***
## as.factor(STATENAME)Iowa         -4.4921075  0.4630715  -9.701  < 2e-16 ***
## as.factor(STATENAME)Kansas       -3.4878849  0.4551322  -7.663 4.02e-14 ***
## as.factor(STATENAME)Kentucky      0.5249077  0.4617759   1.137 0.255910
## as.factor(STATENAME)Louisiana     2.5850191  0.4516658   5.723 1.35e-08 ***
## as.factor(STATENAME)Maine        -3.1444012  0.4664324  -6.741 2.55e-11 ***
## as.factor(STATENAME)Maryland     -6.3874492  0.4548575 -14.043  < 2e-16 ***
## as.factor(STATENAME)Massachusetts -5.0817318  0.4520674 -11.241  < 2e-16 ***
## as.factor(STATENAME)Michigan     -3.0834669  0.4558776  -6.764 2.20e-11 ***
## as.factor(STATENAME)Minnesota    -5.6125072  0.4524646 -12.404  < 2e-16 ***
## as.factor(STATENAME)Mississippi   3.4155918  0.4554867   7.499 1.34e-13 ***
## as.factor(STATENAME)Missouri     -3.1007579  0.4525670  -6.851 1.23e-11 ***
## as.factor(STATENAME)Montana       0.3490294  0.4601030   0.759 0.448264
## as.factor(STATENAME)Nebraska     -4.5259113  0.4626287  -9.783  < 2e-16 ***
## as.factor(STATENAME)Nevada       -4.7050366  0.4669424 -10.076  < 2e-16 ***
## as.factor(STATENAME)New Hampshire -7.7526455  0.4772374 -16.245  < 2e-16 ***
## as.factor(STATENAME)New Jersey   -6.7136007  0.4517297 -14.862  < 2e-16 ***
```

```
## as.factor(STATENAME)New Mexico      3.7384392  0.4518729   8.273 3.82e-16 ***
## as.factor(STATENAME)New York       -0.9029899  0.4795571  -1.883 0.059974 .
## as.factor(STATENAME)North Carolina -2.4227052  0.4572285  -5.299 1.41e-07 ***
## as.factor(STATENAME)North Dakota   -2.5648050  0.4712656  -5.442 6.51e-08 ***
## as.factor(STATENAME)Ohio           -3.6060903  0.4516676  -7.984 3.61e-15 ***
## as.factor(STATENAME)Oklahoma       -0.4539735  0.4635387  -0.979 0.327620
## as.factor(STATENAME)Oregon         -2.4592855  0.4568054  -5.384 8.96e-08 ***
## as.factor(STATENAME)Pennsylvania   -4.0353869  0.4847148  -8.325 2.53e-16 ***
## as.factor(STATENAME)Rhode Island   -4.9500069  0.4519812 -10.952  < 2e-16 ***
## as.factor(STATENAME)South Carolina -1.6448062  0.4562167  -3.605 0.000326 ***
## as.factor(STATENAME)South Dakota   -1.9053204  0.4519171  -4.216 2.69e-05 ***
## as.factor(STATENAME)Tennessee      -0.6017093  0.4586453  -1.312 0.189824
## as.factor(STATENAME)Texas          -0.3277428  0.4530075  -0.723 0.469541
## as.factor(STATENAME)Utah           -5.5056221  0.4858983 -11.331  < 2e-16 ***
## as.factor(STATENAME)Vermont        -5.2053046  0.4553546 -11.431  < 2e-16 ***
## as.factor(STATENAME)Virginia       -5.4378453  0.4544705 -11.965  < 2e-16 ***
## as.factor(STATENAME)Washington     -4.1002647  0.4517800  -9.076  < 2e-16 ***
## as.factor(STATENAME)West Virginia   2.5258756  0.5101340   4.951 8.55e-07 ***
## as.factor(STATENAME)Wisconsin      -5.2726324  0.4761461 -11.074  < 2e-16 ***
## as.factor(STATENAME)Wyoming        -3.6253770  0.4619170  -7.849 1.01e-14 ***
## as.factor(YEAR)1989                -0.4681682  0.3065526  -1.527 0.127004
## as.factor(YEAR)1990                -0.7124322  0.3071624  -2.319 0.020560 *
## as.factor(YEAR)1991                -0.4134560  0.3078460  -1.343 0.179535
## as.factor(YEAR)1992                 0.0495910  0.3091536   0.160 0.872589
## as.factor(YEAR)1993                 0.3342593  0.3104589   1.077 0.281872
## as.factor(YEAR)1994                 0.9669471  0.3121434   3.098 0.002000 **
## as.factor(YEAR)1995                 0.0555097  0.3136398   0.177 0.859553
## as.factor(YEAR)1996                -0.0890855  0.3163551  -0.282 0.778305
## as.factor(YEAR)1997                -0.1769729  0.3194895  -0.554 0.579746
## as.factor(YEAR)1998                -0.4400920  0.3231089  -1.362 0.173465
## as.factor(YEAR)1999                -0.6957354  0.3271245  -2.127 0.033662 *
## as.factor(YEAR)2000                -1.4936717  0.3319090  -4.500 7.53e-06 ***
## as.factor(YEAR)2001                -1.8272348  0.3385827  -5.397 8.34e-08 ***
## as.factor(YEAR)2002                -1.1856473  0.3415722  -3.471 0.000539 ***
## as.factor(YEAR)2003                -0.7268117  0.3476352  -2.091 0.036786 *
## as.factor(YEAR)2004                -0.5246129  0.3547483  -1.479 0.139478
## as.factor(YEAR)2005                -0.1188727  0.3638694  -0.327 0.743965
## as.factor(YEAR)2006                 0.0005568  0.3787573   0.001 0.998827
## as.factor(YEAR)2007                -0.4074636  0.3797020  -1.073 0.283460
## as.factor(YEAR)2008                -0.4890810  0.3850257  -1.270 0.204268
## as.factor(YEAR)2009                 0.2460198  0.3926799   0.627 0.531110
## as.factor(YEAR)2010                 1.8344493  0.4033584   4.548 6.03e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.532 on 1077 degrees of freedom
## Multiple R-squared:  0.7828, Adjusted R-squared:  0.7683
## F-statistic: 53.92 on 72 and 1077 DF,  p-value: < 2.2e-16
```

```
mod.pov.t2 <- lm(p6.poverty.rate~pctexfel_t2+
              as.factor(STATENAME)+as.factor(YEAR),
                  data = fe.ov[fe.ov$YEAR >= 1988,])
summary(mod.pov.t2)
```

```
##
```

```
## Call:
## lm(formula = p6.poverty.rate ~ pctexfel_t2 + as.factor(STATENAME) +
##     as.factor(YEAR), data = fe.ov[fe.ov$YEAR >= 1988, ])
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.3817 -0.9641 -0.0618  0.9470  5.7521
##
## Coefficients:
##                                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      13.4570961  0.4587204  29.336  < 2e-16 ***
## pctexfel_t2                       0.1573235  0.0828838   1.898 0.057947 .
## as.factor(STATENAME)Alaska       -5.0167520  0.4522425 -11.093  < 2e-16 ***
## as.factor(STATENAME)Arizona      -0.5166457  0.4517605  -1.144 0.253032
## as.factor(STATENAME)Arkansas      1.0828158  0.4730356   2.289 0.022268 *
## as.factor(STATENAME)California   -1.2217142  0.4583938  -2.665 0.007809 **
## as.factor(STATENAME)Colorado     -4.5172520  0.4516692 -10.001  < 2e-16 ***
## as.factor(STATENAME)Connecticut  -7.1486021  0.4608221 -15.513  < 2e-16 ***
## as.factor(STATENAME)Delaware     -6.0606562  0.4595797 -13.187  < 2e-16 ***
## as.factor(STATENAME)Florida      -2.7573342  0.5558277  -4.961 8.15e-07 ***
## as.factor(STATENAME)Georgia      -3.0399423  0.4971311  -6.115 1.35e-09 ***
## as.factor(STATENAME)Hawaii       -4.6185684  0.4560316 -10.128  < 2e-16 ***
## as.factor(STATENAME)Idaho        -2.4955665  0.4534130  -5.504 4.64e-08 ***
## as.factor(STATENAME)Illinois     -3.5296386  0.4548151  -7.761 1.96e-14 ***
## as.factor(STATENAME)Indiana      -4.3411862  0.4604311  -9.429  < 2e-16 ***
## as.factor(STATENAME)Iowa         -4.4650870  0.4647748  -9.607  < 2e-16 ***
## as.factor(STATENAME)Kansas       -3.4646572  0.4561990  -7.595 6.68e-14 ***
## as.factor(STATENAME)Kentucky      0.5535162  0.4636558   1.194 0.232816
## as.factor(STATENAME)Louisiana     2.6113552  0.4517742   5.780 9.76e-09 ***
## as.factor(STATENAME)Maine        -3.1227689  0.4673860  -6.681 3.79e-11 ***
## as.factor(STATENAME)Maryland     -6.3853812  0.4542611 -14.057  < 2e-16 ***
## as.factor(STATENAME)Massachusetts -5.0519978  0.4515796 -11.187  < 2e-16 ***
## as.factor(STATENAME)Michigan     -3.0737019  0.4559615  -6.741 2.56e-11 ***
## as.factor(STATENAME)Minnesota    -5.5932074  0.4518242 -12.379  < 2e-16 ***
## as.factor(STATENAME)Mississippi   3.4387470  0.4565747   7.532 1.06e-13 ***
## as.factor(STATENAME)Missouri     -3.0745341  0.4533936  -6.781 1.96e-11 ***
## as.factor(STATENAME)Montana       0.3733461  0.4614647   0.809 0.418667
## as.factor(STATENAME)Nebraska     -4.5030828  0.4638198  -9.709  < 2e-16 ***
## as.factor(STATENAME)Nevada       -4.6811959  0.4681853  -9.999  < 2e-16 ***
## as.factor(STATENAME)New Hampshire -7.7291866  0.4780326 -16.169  < 2e-16 ***
## as.factor(STATENAME)New Jersey   -6.6961645  0.4515789 -14.828  < 2e-16 ***
## as.factor(STATENAME)New Mexico    3.7634707  0.4523232   8.320 2.63e-16 ***
## as.factor(STATENAME)New York     -0.8772129  0.4806549  -1.825 0.068272 .
## as.factor(STATENAME)North Carolina -2.4016796  0.4582154  -5.241 1.92e-07 ***
## as.factor(STATENAME)North Dakota -2.5328306  0.4736513  -5.347 1.09e-07 ***
## as.factor(STATENAME)Ohio         -3.5844852  0.4517513  -7.935 5.27e-15 ***
## as.factor(STATENAME)Oklahoma     -0.4436766  0.4609085  -0.963 0.335958
## as.factor(STATENAME)Oregon       -2.4438596  0.4573067  -5.344 1.11e-07 ***
## as.factor(STATENAME)Pennsylvania -4.0102116  0.4854501  -8.261 4.21e-16 ***
## as.factor(STATENAME)Rhode Island -4.9315875  0.4516158 -10.920  < 2e-16 ***
## as.factor(STATENAME)South Carolina -1.6250417  0.4570702  -3.555 0.000394 ***
## as.factor(STATENAME)South Dakota -1.8811666  0.4515764  -4.166 3.35e-05 ***
## as.factor(STATENAME)Tennessee    -0.5699313  0.4607432  -1.237 0.216363
## as.factor(STATENAME)Texas        -0.3038493  0.4520201  -0.672 0.501599
```

```
## as.factor(STATENAME)Utah           -5.4734806  0.4879499 -11.217  < 2e-16 ***
## as.factor(STATENAME)Vermont        -5.1804518  0.4565641 -11.347  < 2e-16 ***
## as.factor(STATENAME)Virginia       -5.4130413  0.4555858 -11.881  < 2e-16 ***
## as.factor(STATENAME)Washington     -4.0663037  0.4516516  -9.003  < 2e-16 ***
## as.factor(STATENAME)West Virginia   2.5597024  0.5114416   5.005 6.53e-07 ***
## as.factor(STATENAME)Wisconsin      -5.2437847  0.4779145 -10.972  < 2e-16 ***
## as.factor(STATENAME)Wyoming        -3.5957814  0.4639187  -7.751 2.10e-14 ***
## as.factor(YEAR)1989                -0.4658448  0.3064234  -1.520 0.128738
## as.factor(YEAR)1990                -0.7128291  0.3070147  -2.322 0.020429 *
## as.factor(YEAR)1991                -0.4208528  0.3079876  -1.366 0.172080
## as.factor(YEAR)1992                 0.0468373  0.3089383   0.152 0.879525
## as.factor(YEAR)1993                 0.3256099  0.3106281   1.048 0.294768
## as.factor(YEAR)1994                 0.9583075  0.3122369   3.069 0.002200 **
## as.factor(YEAR)1995                 0.0416836  0.3142524   0.133 0.894500
## as.factor(YEAR)1996                -0.0962651  0.3160064  -0.305 0.760707
## as.factor(YEAR)1997                -0.1857568  0.3191323  -0.582 0.560642
## as.factor(YEAR)1998                -0.4500799  0.3226792  -1.395 0.163357
## as.factor(YEAR)1999                -0.7074914  0.3267195  -2.165 0.030573 *
## as.factor(YEAR)2000                -1.5053893  0.3311528  -4.546 6.09e-06 ***
## as.factor(YEAR)2001                -1.8346934  0.3363853  -5.454 6.10e-08 ***
## as.factor(YEAR)2002                -1.2125088  0.3436174  -3.529 0.000435 ***
## as.factor(YEAR)2003                -0.7433498  0.3468372  -2.143 0.032319 *
## as.factor(YEAR)2004                -0.5407394  0.3533375  -1.530 0.126217
## as.factor(YEAR)2005                -0.1319254  0.3609210  -0.366 0.714792
## as.factor(YEAR)2006                 0.0008362  0.3705920   0.002 0.998200
## as.factor(YEAR)2007                -0.4550851  0.3862789  -1.178 0.239007
## as.factor(YEAR)2008                -0.5239562  0.3872710  -1.353 0.176357
## as.factor(YEAR)2009                 0.2161428  0.3928547   0.550 0.582306
## as.factor(YEAR)2010                 1.8104272  0.4008650   4.516 6.99e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.531 on 1077 degrees of freedom
## Multiple R-squared:  0.7829, Adjusted R-squared:  0.7684
## F-statistic: 53.94 on 72 and 1077 DF,  p-value: < 2.2e-16
```

```
mod.pov.t3 <- lm(p6.poverty.rate~pctexfel_t3+
             as.factor(STATENAME)+as.factor(YEAR),
                 data = fe.ov[fe.ov$YEAR >= 1988,])
summary(mod.pov.t3)
```

```
##
## Call:
## lm(formula = p6.poverty.rate ~ pctexfel_t3 + as.factor(STATENAME) +
##     as.factor(YEAR), data = fe.ov[fe.ov$YEAR >= 1988, ])
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.4040 -0.9486 -0.0548  0.9311  5.7619
##
## Coefficients:
##                                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)                     13.45250    0.46032  29.224  < 2e-16 ***
## pctexfel_t3                      0.15827    0.08354   1.895 0.058411 .
## as.factor(STATENAME)Alaska      -4.98846    0.45331 -11.005  < 2e-16 ***
```

```
## as.factor(STATENAME)Arizona        -0.50033    0.45209  -1.107 0.268676
## as.factor(STATENAME)Arkansas        1.10479    0.47670   2.318 0.020660 *
## as.factor(STATENAME)California     -1.20066    0.45664  -2.629 0.008677 **
## as.factor(STATENAME)Colorado       -4.51033    0.45176  -9.984  < 2e-16 ***
## as.factor(STATENAME)Connecticut    -7.11965    0.45805 -15.543  < 2e-16 ***
## as.factor(STATENAME)Delaware       -6.02631    0.46333 -13.007  < 2e-16 ***
## as.factor(STATENAME)Florida        -2.70715    0.54115  -5.003 6.60e-07 ***
## as.factor(STATENAME)Georgia        -3.00027    0.48889  -6.137 1.18e-09 ***
## as.factor(STATENAME)Hawaii         -4.60188    0.45736 -10.062  < 2e-16 ***
## as.factor(STATENAME)Idaho          -2.46744    0.45500  -5.423 7.24e-08 ***
## as.factor(STATENAME)Illinois       -3.50789    0.45634  -7.687 3.38e-14 ***
## as.factor(STATENAME)Indiana        -4.30664    0.45725  -9.419  < 2e-16 ***
## as.factor(STATENAME)Iowa           -4.45131    0.46660  -9.540  < 2e-16 ***
## as.factor(STATENAME)Kansas         -3.44782    0.45757  -7.535 1.03e-13 ***
## as.factor(STATENAME)Kentucky        0.57041    0.46581   1.225 0.221013
## as.factor(STATENAME)Louisiana       2.63724    0.45239   5.830 7.34e-09 ***
## as.factor(STATENAME)Maine          -3.11548    0.46846  -6.651 4.64e-11 ***
## as.factor(STATENAME)Maryland       -6.37383    0.45365 -14.050  < 2e-16 ***
## as.factor(STATENAME)Massachusetts  -5.03626    0.45162 -11.152  < 2e-16 ***
## as.factor(STATENAME)Michigan       -3.07484    0.45590  -6.745 2.50e-11 ***
## as.factor(STATENAME)Minnesota      -5.56902    0.45158 -12.332  < 2e-16 ***
## as.factor(STATENAME)Mississippi     3.45417    0.45787   7.544 9.67e-14 ***
## as.factor(STATENAME)Missouri       -3.05171    0.45464  -6.712 3.09e-11 ***
## as.factor(STATENAME)Montana         0.38640    0.46297   0.835 0.404122
## as.factor(STATENAME)Nebraska       -4.49286    0.46513  -9.659  < 2e-16 ***
## as.factor(STATENAME)Nevada         -4.67332    0.46937  -9.957  < 2e-16 ***
## as.factor(STATENAME)New Hampshire  -7.72602    0.47868 -16.140  < 2e-16 ***
## as.factor(STATENAME)New Jersey     -6.67763    0.45173 -14.782  < 2e-16 ***
## as.factor(STATENAME)New Mexico      3.78613    0.45318   8.355  < 2e-16 ***
## as.factor(STATENAME)New York       -0.87272    0.48158  -1.812 0.070234 .
## as.factor(STATENAME)North Carolina -2.38965    0.45936  -5.202 2.36e-07 ***
## as.factor(STATENAME)North Dakota   -2.51902    0.47599  -5.292 1.46e-07 ***
## as.factor(STATENAME)Ohio           -3.56459    0.45217  -7.883 7.78e-15 ***
## as.factor(STATENAME)Oklahoma       -0.42278    0.45886  -0.921 0.357065
## as.factor(STATENAME)Oregon         -2.43671    0.45794  -5.321 1.26e-07 ***
## as.factor(STATENAME)Pennsylvania   -4.00969    0.48567  -8.256 4.37e-16 ***
## as.factor(STATENAME)Rhode Island   -4.90964    0.45161 -10.871  < 2e-16 ***
## as.factor(STATENAME)South Carolina -1.61384    0.45805  -3.523 0.000444 ***
## as.factor(STATENAME)South Dakota   -1.85393    0.45176  -4.104 4.37e-05 ***
## as.factor(STATENAME)Tennessee      -0.54804    0.46322  -1.183 0.237025
## as.factor(STATENAME)Texas          -0.27593    0.45161  -0.611 0.541327
## as.factor(STATENAME)Utah           -5.46511    0.48978 -11.158  < 2e-16 ***
## as.factor(STATENAME)Vermont        -5.16227    0.45810 -11.269  < 2e-16 ***
## as.factor(STATENAME)Virginia       -5.39460    0.45700 -11.804  < 2e-16 ***
## as.factor(STATENAME)Washington     -4.03497    0.45226  -8.922  < 2e-16 ***
## as.factor(STATENAME)West Virginia   2.56341    0.51257   5.001 6.65e-07 ***
## as.factor(STATENAME)Wisconsin      -5.23491    0.47957 -10.916  < 2e-16 ***
## as.factor(STATENAME)Wyoming        -3.57929    0.46604  -7.680 3.56e-14 ***
## as.factor(YEAR)1989                -0.46314    0.30638  -1.512 0.130923
## as.factor(YEAR)1990                -0.70624    0.30680  -2.302 0.021527 *
## as.factor(YEAR)1991                -0.41553    0.30771  -1.350 0.177180
## as.factor(YEAR)1992                 0.04619    0.30900   0.149 0.881211
## as.factor(YEAR)1993                 0.33113    0.31017   1.068 0.285958
## as.factor(YEAR)1994                 0.95907    0.31218   3.072 0.002179 **
```

```
## as.factor(YEAR)1995                0.04373    0.31404   0.139 0.889281
## as.factor(YEAR)1996               -0.09845    0.31633  -0.311 0.755687
## as.factor(YEAR)1997               -0.17969    0.31829  -0.565 0.572505
## as.factor(YEAR)1998               -0.44405    0.32175  -1.380 0.167838
## as.factor(YEAR)1999               -0.70107    0.32563  -2.153 0.031543 *
## as.factor(YEAR)2000               -1.49913    0.33000  -4.543 6.18e-06 ***
## as.factor(YEAR)2001               -1.82666    0.33476  -5.457 6.02e-08 ***
## as.factor(YEAR)2002               -1.19798    0.34034  -3.520 0.000450 ***
## as.factor(YEAR)2003               -0.74742    0.34800  -2.148 0.031953 *
## as.factor(YEAR)2004               -0.53265    0.35139  -1.516 0.129852
## as.factor(YEAR)2005               -0.12147    0.35822  -0.339 0.734595
## as.factor(YEAR)2006                0.01672    0.36615   0.046 0.963587
## as.factor(YEAR)2007               -0.42226    0.37623  -1.122 0.261965
## as.factor(YEAR)2008               -0.53910    0.39249  -1.374 0.169870
## as.factor(YEAR)2009                0.21501    0.39352   0.546 0.584911
## as.factor(YEAR)2010                1.81599    0.39929   4.548 6.03e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.531 on 1077 degrees of freedom
## Multiple R-squared:  0.7829, Adjusted R-squared:  0.7684
## F-statistic: 53.94 on 72 and 1077 DF,  p-value: < 2.2e-16
```

```
#fe poverty
pov.exfel <- plm(p6.poverty.rate~pctexfel_t2+
                   popshare.26.35+popshare.36.45+popshare.46.55+popshare.56.65+popshare.66.plus+
                 p6.degree.rate+p6.marriage.rate+t.unemp.rate+t_1.unemp.rate+t_2.unemp.rate+
                   t_3.unemp.rate+
                 p6.disab.rate+effective.wage+TANF.mu+z_labor_unemployment_compensatio,
                  data = fe.ov[fe.ov$YEAR >= 1988,], index = c("STATENAME","YEAR"), model="within",effe
pov.exfel.robust <- coeftest(pov.exfel, vcov=vcovDC(pov.exfel))

pov.exfel.robust #no effect
```

```
##
## t test of coefficients:
##
##                                   Estimate  Std. Error t value  Pr(>|t|)
## pctexfel_t2                     1.4129e-01  9.6216e-02  1.4684  0.142287
## popshare.26.35                 -1.6796e-01  7.5799e-02 -2.2158  0.026914 *
## popshare.36.45                 -1.4328e-01  8.5255e-02 -1.6806  0.093127 .
## popshare.46.55                 -2.8681e-01  9.4743e-02 -3.0272  0.002528 **
## popshare.56.65                 -8.2322e-02  8.2538e-02 -0.9974  0.318803
## popshare.66.plus               -1.0392e-01  9.7495e-02 -1.0659  0.286716
## p6.degree.rate                 -4.6791e-02  3.4328e-02 -1.3631  0.173156
## p6.marriage.rate                3.2857e-03  4.4657e-02  0.0736  0.941362
## t.unemp.rate                    2.6676e-01  8.3560e-02  3.1924  0.001452 **
## t_1.unemp.rate                  2.4862e-01  1.2445e-01  1.9978  0.045993 *
## t_2.unemp.rate                  1.0809e-01  1.1105e-01  0.9733  0.330635
## t_3.unemp.rate                  3.2834e-01  7.3880e-02  4.4443 9.743e-06 ***
## p6.disab.rate                   2.9983e-01  5.1720e-02  5.7972 8.886e-09 ***
## effective.wage                  3.2023e-01  1.7396e-01  1.8408  0.065928 .
## TANF.mu                         2.5082e-05  1.9187e-03  0.0131  0.989572
## z_labor_unemployment_compensatio  4.4936e-04  1.7942e-03  0.2505  0.802284
## ---
```

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

```
pov.employ <- plm(p6.y1.notemployed.rate_t1~pctexfel_t2+
                   popshare.26.35+popshare.36.45+popshare.46.55+popshare.56.65+popshare.66.plus+
                  p6.degree.rate+p6.marriage.rate+t.unemp.rate+t_1.unemp.rate+t_2.unemp.rate+t_3.unemp.ra
                  p6.disab.rate+effective.wage+TANF.mu+z_labor_unemployment_compensatio,
                   data = fe.ov[fe.ov$YEAR >= 1988,], index = c("STATENAME","YEAR"), model="within",effe
pov.employ.robust <- coeftest(pov.employ, vcov=vcovDC(pov.employ))
pov.employ.robust
```

```
##
## t test of coefficients:
##
##                                    Estimate  Std. Error t value  Pr(>|t|)
## pctexfel_t2                       2.0649e-01  8.6605e-02  2.3842 0.0172896 *
## popshare.26.35                    4.8054e-02  6.3076e-02  0.7618 0.4463257
## popshare.36.45                    1.6448e-01  6.8839e-02  2.3893 0.0170521 *
## popshare.46.55                   -1.4786e-01  7.2617e-02 -2.0362 0.0419818 *
## popshare.56.65                    1.8346e-01  7.5931e-02  2.4162 0.0158524 *
## popshare.66.plus                  5.0544e-02  6.5492e-02  0.7717 0.4404355
## p6.degree.rate                   -1.8580e-02  2.9240e-02 -0.6354 0.5252856
## p6.marriage.rate                  1.5185e-02  3.5310e-02  0.4300 0.6672554
## t.unemp.rate                      8.6033e-02  4.9995e-02  1.7208 0.0855738 .
## t_1.unemp.rate                    9.1369e-01  3.3383e-02 27.3702 < 2.2e-16 ***
## t_2.unemp.rate                    2.1144e-02  4.4079e-02  0.4797 0.6315470
## t_3.unemp.rate                    1.7695e-01  4.8902e-02  3.6185 0.0003103 ***
## p6.disab.rate                     3.2158e-02  4.3716e-02  0.7356 0.4621332
## effective.wage                    1.5534e-01  9.8198e-02  1.5819 0.1139757
## TANF.mu                          -7.0701e-04  1.6153e-03 -0.4377 0.6616907
## z_labor_unemployment_compensatio -2.8012e-05  1.1252e-03 -0.0249 0.9801428
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
pov.exfel.robust #effect on employment
```

```
##
## t test of coefficients:
##
##                                    Estimate  Std. Error t value  Pr(>|t|)
## pctexfel_t2                       1.4129e-01  9.6216e-02  1.4684  0.142287
## popshare.26.35                   -1.6796e-01  7.5799e-02 -2.2158  0.026914 *
## popshare.36.45                   -1.4328e-01  8.5255e-02 -1.6806  0.093127 .
## popshare.46.55                   -2.8681e-01  9.4743e-02 -3.0272  0.002528 **
## popshare.56.65                   -8.2322e-02  8.2538e-02 -0.9974  0.318803
## popshare.66.plus                 -1.0392e-01  9.7495e-02 -1.0659  0.286716
## p6.degree.rate                   -4.6791e-02  3.4328e-02 -1.3631  0.173156
## p6.marriage.rate                  3.2857e-03  4.4657e-02  0.0736  0.941362
## t.unemp.rate                      2.6676e-01  8.3560e-02  3.1924  0.001452 **
## t_1.unemp.rate                    2.4862e-01  1.2445e-01  1.9978  0.045993 *
## t_2.unemp.rate                    1.0809e-01  1.1105e-01  0.9733  0.330635
## t_3.unemp.rate                    3.2834e-01  7.3880e-02  4.4443 9.743e-06 ***
## p6.disab.rate                     2.9983e-01  5.1720e-02  5.7972 8.886e-09 ***
## effective.wage                    3.2023e-01  1.7396e-01  1.8408  0.065928 .
## TANF.mu                           2.5082e-05  1.9187e-03  0.0131  0.989572
## z_labor_unemployment_compensatio  4.4936e-04  1.7942e-03  0.2505  0.802284
```

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

```
pov.exfel.employ <- plm(p6.poverty.rate~p6.y1.notemployed.rate_t1+pctexfel_t2+
                  popshare.26.35+popshare.36.45+popshare.46.55+popshare.56.65+popshare.66.plus+
                p6.degree.rate+p6.marriage.rate+t.unemp.rate+t_1.unemp.rate+t_2.unemp.rate+t_3.unemp.ra
                p6.disab.rate+effective.wage+TANF.mu+z_labor_unemployment_compensatio,
                 data = fe.ov[fe.ov$YEAR >= 1988,], index = c("STATENAME","YEAR"), model="within",effe
pov.exfel.employ.robust <- coeftest(pov.exfel.employ, vcov=vcovDC(pov.exfel.employ))
pov.exfel.employ.robust
```

```
##
## t test of coefficients:
##
##                                   Estimate  Std. Error t value  Pr(>|t|)
## p6.y1.notemployed.rate_t1         0.25241206  0.07003776  3.6039  0.000328 ***
## pctexfel_t2                       0.08916552  0.09843111  0.9059  0.365212
## popshare.26.35                   -0.18008721  0.06954998 -2.5893  0.009748 **
## popshare.36.45                   -0.18479997  0.08133540 -2.2721  0.023282 *
## popshare.46.55                   -0.24948540  0.08587236 -2.9053  0.003745 **
## popshare.56.65                   -0.12863010  0.08664964 -1.4845  0.137977
## popshare.66.plus                 -0.11667644  0.09040721 -1.2906  0.197136
## p6.degree.rate                   -0.04210149  0.03409622 -1.2348  0.217184
## p6.marriage.rate                 -0.00054715  0.04434143 -0.0123  0.990157
## t.unemp.rate                      0.24503969  0.08434775  2.9051  0.003747 **
## t_1.unemp.rate                    0.01799253  0.12606086  0.1427  0.886531
## t_2.unemp.rate                    0.10274864  0.10738215  0.9569  0.338861
## t_3.unemp.rate                    0.28367898  0.07286217  3.8934  0.000105 ***
## p6.disab.rate                     0.29171043  0.04916601  5.9332 4.018e-09 ***
## effective.wage                    0.28102007  0.16121042  1.7432  0.081590 .
## TANF.mu                           0.00020354  0.00192535  0.1057  0.915828
## z_labor_unemployment_compensatio  0.00045643  0.00168210  0.2713  0.786180
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#mediation
library(mediation)
```

```
## Warning: package 'mediation' was built under R version 3.6.3
```

```
## Loading required package: MASS
```

```
## Warning: package 'MASS' was built under R version 3.6.3
```

```
##
## Attaching package: 'MASS'
```

```
## The following object is masked from 'package:dplyr':
##
##     select
```

```
## Loading required package: Matrix
```

```
## Loading required package: mvtnorm
```

```
## Warning: package 'mvtnorm' was built under R version 3.6.3
```

```
## Loading required package: sandwich
```

```
## mediation: Causal Mediation Analysis
```

```
## Version: 4.5.0
```

```
mod.m <- lm(p6.y1.notemployed.rate~pctexfel+
              popshare.26.35+popshare.36.45+popshare.46.55+popshare.56.65+popshare.66.plus+
                 p6.degree.rate+p6.marriage.rate+t.unemp.rate+t_1.unemp.rate+t_2.unemp.rate+t_3.unemp.ra
                 p6.disab.rate+effective.wage+TANF.mu+z_labor_unemployment_compensatio+
                 as.factor(STATENAME)+as.factor(YEAR),
                  data = fe.ov[fe.ov$YEAR >= 1988,])

mod.y <- lm(p6.poverty.rate~pctexfel+p6.y1.notemployed.rate+
              popshare.26.35+popshare.36.45+popshare.46.55+popshare.56.65+popshare.66.plus+
                 p6.degree.rate+p6.marriage.rate+t.unemp.rate+t_1.unemp.rate+t_2.unemp.rate+t_3.unemp.ra
                 p6.disab.rate+effective.wage+TANF.mu+z_labor_unemployment_compensatio+
              as.factor(STATENAME)+as.factor(YEAR),
                  data = fe.ov[fe.ov$YEAR >= 1988,])

mediate <- mediate(mod.m, mod.y, treat="pctexfel", mediator="p6.y1.notemployed.rate")
summary(mediate)
```

```
##
## Causal Mediation Analysis
##
## Quasi-Bayesian Confidence Intervals
##
##                Estimate 95% CI Lower 95% CI Upper p-value
## ACME            0.07087      0.03606         0.11  <2e-16 ***
## ADE             0.00806     -0.13993         0.14    0.90
## Total Effect    0.07893     -0.07331         0.22    0.28
## Prop. Mediated  0.67252     -6.18991         8.21    0.28
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 1150
##
##
## Simulations: 1000
```

```
#bivariate ols
mod.m <- lm(p6.y1.notemployed.rate~pctexfel,
                  data = fe.ov[fe.ov$YEAR >= 1988,])

mod.y <- lm(p6.poverty.rate~pctexfel+p6.y1.notemployed.rate,
                  data = fe.ov[fe.ov$YEAR >= 1988,])

mediate <- mediate(mod.m, mod.y, treat="pctexfel", mediator="p6.y1.notemployed.rate")
summary(mediate)
```

```
##
## Causal Mediation Analysis
##
## Quasi-Bayesian Confidence Intervals
##
##                Estimate 95% CI Lower 95% CI Upper p-value
## ACME             0.1656       0.1005         0.24  <2e-16 ***
## ADE             -0.0834      -0.1682         0.00   0.062 .
```

```
## Total Effect     0.0822      -0.0271         0.20   0.136
## Prop. Mediated   1.8592     -11.5889        12.57   0.136
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 1150
##
##
## Simulations: 1000
```