Yixuan Li (NetID: yl648)

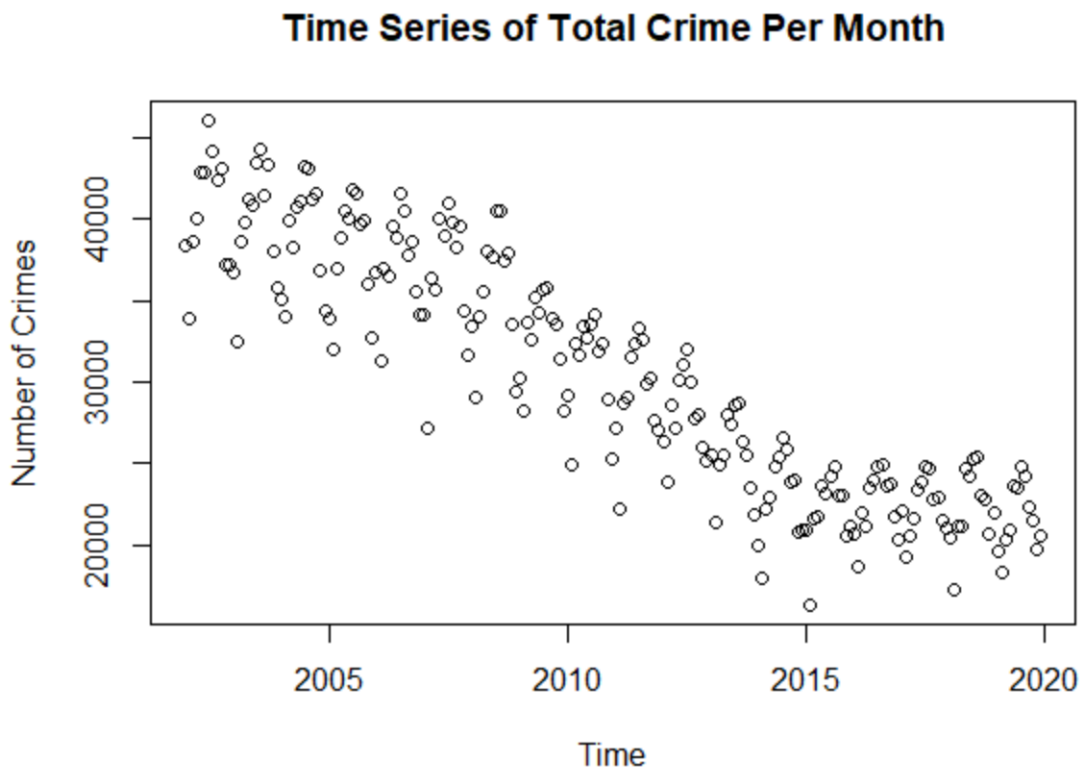
Econ 613 Assignment #3

 # Exercise 1

See R. file.

 # Exercise 2.1

```
> mean (sum_crime_by_month$crimes)
[1] 30379.96
```



 # Exercise 2.2

Merge the two datasets by districts-units and period

	crime_month	district	crime_type	crimes	period	tot_pop	tot_white	tot_black	tot_hisp	p50_inc
1	2005-01-01	1	drug	1	1	38472	22608	4953	2543	91084.91
2	2005-01-01	1	drug	188	1	38472	22608	4953	2543	91084.91
3	2005-01-01	1	other	62	1	38472	22608	4953	2543	91084.91
4	2005-01-01	1	other	302	1	38472	22608	4953	2543	91084.91
5	2005-01-01	1	property	624	1	38472	22608	4953	2543	91084.91
6	2005-01-01	1	property	160	1	38472	22608	4953	2543	91084.91
7	2005-01-01	1	violent	150	1	38472	22608	4953	2543	91084.91
8	2005-01-01	1	violent	62	1	38472	22608	4953	2543	91084.91
9	2005-01-01	2	drug	1	1	37992	630	35966	628	29890.17
10	2005-01-01	2	drug	208	1	37992	630	35966	628	29890.17

 # Exercise 2.3

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See R. file.

 # Exercise 3

```
Call:
lm(formula = arrest ~ tenure + districtcrimes + p50_inc + b + 
    h + w - 1, data = data5)

Residuals:
    Min      1Q  Median      3Q     Max 
-0.5505 -0.5079 -0.4668  0.4945  5.5395 

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)    
tenure          2.879e-05  8.319e-06   3.461 0.000539 ***
districtcrimes -1.364e-05  1.772e-06  -7.701 1.35e-14 ***
p50_inc         7.210e-07  9.019e-08   7.994 1.30e-15 ***
b               5.028e-01  3.683e-03 136.515  < 2e-16 ***
h               5.173e-01  4.441e-03 116.470  < 2e-16 ***
w               5.152e-01  9.470e-03  54.399  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.7073 on 1077899 degrees of freedom
  (31 observations deleted due to missingness)
Multiple R-squared:  0.3317,    Adjusted R-squared:  0.3317 
F-statistic: 8.917e+04 on 6 and 1077899 DF,  p-value: < 2.2e-16
```

 # Exercise 4

```
Call:
lm(formula = arrest ~ tenure + districtcrimes + p50_inc + b + 
    h + w + factor(unit) + factor(month) - 1, data = data5)

Residuals:
    Min      1Q  Median      3Q     Max 
-0.5282 -0.5003 -0.4920  0.5008  5.5163 

Coefficients:
                         Estimate Std. Error t value Pr(>|t|)
tenure                 -3.810e-06  8.525e-06  -0.447   0.6549
districtcrimes         -6.320e-06  5.305e-06  -1.191   0.2335
p50_inc                -4.910e-07  6.505e-07  -0.755   0.4504
b                      -9.201e-02  1.043e-01  -0.882   0.3775
h                      -1.398e-01  2.028e-01  -0.690   0.4904
w                      -1.013e-01  1.818e-01  -0.557   0.5773
```

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factor(unit)1	6.362e-01	1.061e-01	5.996	2.03e-09	***
factor(unit)2	6.118e-01	9.824e-02	6.227	4.74e-10	***
factor(unit)3	6.162e-01	1.006e-01	6.127	8.94e-10	***
factor(unit)4	6.361e-01	1.251e-01	5.084	3.70e-07	***
factor(unit)5	6.204e-01	1.009e-01	6.147	7.90e-10	***
factor(unit)6	6.223e-01	9.905e-02	6.283	3.32e-10	***
factor(unit)7	6.151e-01	1.010e-01	6.089	1.14e-09	***
factor(unit)8	6.596e-01	1.581e-01	4.171	3.03e-05	***
factor(unit)9	6.393e-01	1.486e-01	4.303	1.68e-05	***
factor(unit)10	6.439e-01	1.576e-01	4.084	4.42e-05	***
factor(unit)11	6.248e-01	1.098e-01	5.688	1.28e-08	***
factor(unit)12	6.366e-01	1.393e-01	4.569	4.90e-06	***
factor(unit)13	6.331e-01	1.395e-01	4.538	5.67e-06	***
factor(unit)14	6.606e-01	1.539e-01	4.292	1.77e-05	***
factor(unit)15	6.159e-01	1.022e-01	6.028	1.66e-09	***
factor(unit)16	6.435e-01	1.478e-01	4.354	1.34e-05	***
factor(unit)17	6.373e-01	1.408e-01	4.527	5.98e-06	***
factor(unit)18	6.402e-01	1.274e-01	5.025	5.02e-07	***
factor(unit)19	6.451e-01	1.365e-01	4.728	2.27e-06	***
factor(unit)20	6.207e-01	1.259e-01	4.931	8.18e-07	***
factor(unit)21	5.995e-01	8.690e-02	6.898	5.26e-12	***
factor(unit)22	6.355e-01	1.137e-01	5.588	2.30e-08	***
factor(unit)23	6.252e-01	1.341e-01	4.663	3.12e-06	***
factor(unit)24	6.208e-01	1.216e-01	5.105	3.31e-07	***
factor(unit)25	6.582e-01	1.650e-01	3.990	6.61e-05	***

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Econ 613 Assignment #3

```
factor(month)2007-02-01  2.747e-03  1.112e-02   0.247   0.8049
factor(month)2007-03-01  5.425e-03  1.098e-02   0.494   0.6213
factor(month)2007-04-01 -4.433e-03  1.100e-02  -0.403   0.6868
factor(month)2007-05-01  9.642e-03  1.105e-02   0.872   0.3830
factor(month)2007-06-01 -1.518e-02  1.100e-02  -1.380   0.1675
factor(month)2007-07-01 -2.476e-03  1.107e-02  -0.224   0.8230
factor(month)2007-08-01 -9.283e-03  1.101e-02  -0.843   0.3992
factor(month)2007-09-01  2.832e-03  1.096e-02   0.258   0.7962
factor(month)2007-10-01  5.532e-03  1.098e-02   0.504   0.6145
factor(month)2007-11-01  3.270e-03  1.088e-02   0.300   0.7638
factor(month)2007-12-01 -8.522e-03  1.089e-02  -0.783   0.4339
factor(month)2008-01-01 -1.580e-02  1.090e-02  -1.450   0.1470
factor(month)2008-02-01 -7.936e-03  1.096e-02  -0.724   0.4691
factor(month)2008-03-01 -7.042e-03  1.090e-02  -0.646   0.5182
factor(month)2008-04-01  7.880e-03  1.089e-02   0.723   0.4695
factor(month)2008-05-01  1.890e-02  1.091e-02   1.732   0.0833 .
factor(month)2008-06-01  1.043e-03  1.088e-02   0.096   0.9237
factor(month)2008-07-01 -1.992e-05  1.092e-02  -0.002   0.9985
factor(month)2008-08-01  1.040e-03  1.093e-02   0.095   0.9242
factor(month)2008-09-01  9.368e-03  1.086e-02   0.863   0.3882
factor(month)2008-10-01 -3.356e-03  1.085e-02  -0.309   0.7571
factor(month)2008-11-01 -1.542e-03  1.083e-02  -0.142   0.8868
factor(month)2008-12-01  1.093e-02  1.088e-02   1.005   0.3149
factor(month)2009-01-01 -6.007e-03  1.086e-02  -0.553   0.5801
factor(month)2009-02-01 -5.783e-03  1.092e-02  -0.530   0.5964
factor(month)2009-03-01 -8.894e-03  1.085e-02  -0.820   0.4124
factor(month)2009-04-01 -4.911e-03  1.087e-02  -0.452   0.6515
factor(month)2009-05-01 -1.545e-03  1.086e-02  -0.142   0.8869
factor(month)2009-06-01  4.206e-03  1.086e-02   0.387   0.6986
factor(month)2009-07-01  5.471e-03  1.087e-02   0.503   0.6147
factor(month)2009-08-01 -4.667e-03  1.087e-02  -0.429   0.6678
factor(month)2009-09-01 -4.795e-03  1.087e-02  -0.441   0.6592
factor(month)2009-10-01 -1.586e-03  1.087e-02  -0.146   0.8840
factor(month)2009-11-01 -5.210e-03  1.088e-02  -0.479   0.6322
factor(month)2009-12-01 -9.886e-03  1.095e-02  -0.902   0.3668
```

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factor(month)2010-01-01	1.815e-03	1.094e-02	0.166	0.8682
factor(month)2010-02-01	3.620e-03	1.116e-02	0.324	0.7457
factor(month)2010-03-01	-8.878e-03	1.099e-02	-0.808	0.4192
factor(month)2010-04-01	7.082e-03	1.100e-02	0.644	0.5198
factor(month)2010-05-01	-3.414e-03	1.101e-02	-0.310	0.7565
factor(month)2010-06-01	-5.868e-03	1.102e-02	-0.532	0.5944
factor(month)2010-07-01	-1.353e-02	1.102e-02	-1.228	0.2196
factor(month)2010-08-01	9.875e-03	1.103e-02	0.895	0.3708
factor(month)2010-09-01	2.215e-03	1.103e-02	0.201	0.8408
factor(month)2010-10-01	-2.548e-03	1.103e-02	-0.231	0.8172
factor(month)2010-11-01	-9.175e-03	1.110e-02	-0.827	0.4084
factor(month)2010-12-01	-4.759e-03	1.122e-02	-0.424	0.6715
factor(month)2011-01-01	-8.207e-03	1.119e-02	-0.733	0.4633
factor(month)2011-02-01	-5.389e-03	1.145e-02	-0.471	0.6378
factor(month)2011-03-01	-4.549e-03	1.121e-02	-0.406	0.6849
factor(month)2011-04-01	-1.189e-03	1.120e-02	-0.106	0.9154
factor(month)2011-05-01	-5.307e-04	1.117e-02	-0.048	0.9621
factor(month)2011-06-01	1.207e-04	1.115e-02	0.011	0.9914
factor(month)2011-07-01	4.004e-03	1.113e-02	0.360	0.7191
factor(month)2011-08-01	-1.043e-04	1.114e-02	-0.009	0.9925
factor(month)2011-09-01	-1.135e-02	1.101e-02	-1.031	0.3027
factor(month)2011-10-01	1.049e-02	1.100e-02	0.954	0.3399
factor(month)2011-11-01	-6.974e-03	1.106e-02	-0.631	0.5283
factor(month)2011-12-01	2.879e-04	1.109e-02	0.026	0.9793
factor(month)2012-01-01	-1.045e-02	1.113e-02	-0.939	0.3477
factor(month)2012-02-01	2.973e-03	1.121e-02	0.265	0.7909
factor(month)2012-03-01	1.820e-03	1.105e-02	0.165	0.8692
factor(month)2012-04-01	4.576e-03	1.114e-02	0.411	0.6812
factor(month)2012-05-01	4.361e-03	1.107e-02	0.394	0.6936
factor(month)2012-06-01	-2.065e-03	1.107e-02	-0.187	0.8520
factor(month)2012-07-01	6.781e-04	1.107e-02	0.061	0.9512
factor(month)2012-08-01	-5.126e-03	1.111e-02	-0.461	0.6445
factor(month)2012-09-01	2.322e-03	1.117e-02	0.208	0.8353
factor(month)2012-10-01	-1.458e-02	1.117e-02	-1.305	0.1919
factor(month)2012-11-01	3.463e-03	1.125e-02	0.308	0.7582
factor(month)2012-12-01	-1.687e-02	1.130e-02	-1.494	0.1352

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```
factor(month)2013-01-01  3.795e-03  1.131e-02   0.335   0.7373
factor(month)2013-02-01 -8.078e-03  1.156e-02  -0.699   0.4847
factor(month)2013-03-01 -1.585e-02  1.137e-02  -1.395   0.1631
factor(month)2013-04-01  3.512e-03  1.133e-02   0.310   0.7565
factor(month)2013-05-01  1.411e-02  1.123e-02   1.257   0.2088
factor(month)2013-06-01  7.059e-03  1.125e-02   0.628   0.5303
factor(month)2013-07-01  1.753e-02  1.122e-02   1.563   0.1180
factor(month)2013-08-01 -2.732e-03  1.122e-02  -0.244   0.8076
factor(month)2013-09-01  3.037e-03  1.130e-02   0.269   0.7882
factor(month)2013-10-01 -8.699e-03  1.134e-02  -0.767   0.4430
factor(month)2013-11-01 -5.810e-03  1.144e-02  -0.508   0.6117
factor(month)2013-12-01  3.319e-03  1.155e-02   0.287   0.7738
factor(month)2014-01-01 -1.496e-02  1.171e-02  -1.278   0.2011
factor(month)2014-02-01  2.499e-03  1.186e-02   0.211   0.8331
factor(month)2014-03-01 -4.441e-03  1.155e-02  -0.385   0.7005
factor(month)2014-04-01 -1.862e-02  1.148e-02  -1.622   0.1049
factor(month)2014-05-01 -5.901e-03  1.137e-02  -0.519   0.6038
factor(month)2014-06-01 -1.761e-03  1.130e-02  -0.156   0.8762
factor(month)2014-07-01  5.575e-03  1.126e-02   0.495   0.6206
factor(month)2014-08-01 -1.113e-03  1.130e-02  -0.098   0.9215
factor(month)2014-09-01  1.055e-03  1.134e-02   0.093   0.9259
factor(month)2014-10-01 -1.730e-03  1.133e-02  -0.153   0.8787
factor(month)2014-11-01 -8.539e-03  1.154e-02  -0.740   0.4591
factor(month)2014-12-01 -7.021e-03  1.153e-02  -0.609   0.5427
factor(month)2015-01-01 -4.922e-03  1.157e-02  -0.425   0.6705
factor(month)2015-02-01 -9.308e-03  1.196e-02  -0.778   0.4363
factor(month)2015-03-01  4.154e-03  1.153e-02   0.360   0.7187
factor(month)2015-04-01 -3.524e-03  1.156e-02  -0.305   0.7604
factor(month)2015-05-01 -6.722e-03  1.142e-02  -0.589   0.5561
factor(month)2015-06-01 -7.111e-03  1.143e-02  -0.622   0.5340
factor(month)2015-07-01 -8.631e-03  1.138e-02  -0.758   0.4483
factor(month)2015-08-01 -5.341e-03  1.136e-02  -0.470   0.6383
factor(month)2015-09-01 -1.012e-03  1.147e-02  -0.088   0.9297
factor(month)2015-10-01 -8.335e-03  1.147e-02  -0.727   0.4673
factor(month)2015-11-01  2.320e-03  1.162e-02   0.200   0.8418
factor(month)2015-12-01 -7.373e-03  1.161e-02  -0.635   0.5253
```

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```
factor(month)2016-01-01 -5.344e-03  1.166e-02  -0.458   0.6467
factor(month)2016-02-01 -7.099e-03  1.180e-02  -0.601   0.5476
factor(month)2016-03-01 -1.453e-02  1.155e-02  -1.258   0.2084
factor(month)2016-04-01  9.818e-03  1.160e-02   0.846   0.3973
factor(month)2016-05-01  9.858e-03  1.145e-02   0.861   0.3891
factor(month)2016-06-01 -5.147e-03  1.141e-02  -0.451   0.6520
factor(month)2016-07-01 -1.082e-02  1.138e-02  -0.951   0.3417
factor(month)2016-08-01 -1.921e-02  1.134e-02  -1.694   0.0903 .
factor(month)2016-09-01 -1.542e-03  1.141e-02  -0.135   0.8925
factor(month)2016-10-01  3.118e-03  1.141e-02   0.273   0.7847
factor(month)2016-11-01 -1.398e-02  1.155e-02  -1.210   0.2261
factor(month)2016-12-01 -1.290e-02  1.163e-02  -1.109   0.2673
factor(month)2017-01-01  8.784e-05  1.159e-02   0.008   0.9940
factor(month)2017-02-01 -5.838e-03  1.179e-02  -0.495   0.6205
factor(month)2017-03-01  6.054e-03  1.171e-02   0.517   0.6050
factor(month)2017-04-01 -5.738e-03  1.164e-02  -0.493   0.6222
factor(month)2017-05-01  8.410e-03  1.154e-02   0.729   0.4660
factor(month)2017-06-01 -1.219e-02  1.151e-02  -1.059   0.2894
factor(month)2017-07-01 -6.123e-03  1.146e-02  -0.534   0.5930
factor(month)2017-08-01 -2.664e-03  1.148e-02  -0.232   0.8165
factor(month)2017-09-01 -8.493e-03  1.157e-02  -0.734   0.4628
factor(month)2017-10-01 -9.683e-03  1.155e-02  -0.839   0.4017
factor(month)2017-11-01 -1.685e-02  1.166e-02  -1.444   0.1486
factor(month)2017-12-01 -8.924e-03  1.166e-02  -0.765   0.4442
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.7068 on 1077743 degrees of freedom
  (31 observations deleted due to missingness)
Multiple R-squared:  0.3328,    Adjusted R-squared:  0.3327
F-statistic:  3318 on 162 and 1077743 DF,  p-value: < 2.2e-16
```

 # Exercise 5

Panel Data: Individual Fixed Effects

1) Within estimator

Yixuan Li (NetID: yl648)

Econ 613 Assignment #3

```
Call:
plm(formula = arrest ~ tenure + districtcrimes + p50_inc + b +
    h + w, data = data5, effect = "nested", model = "within",
    index = c("NUID", "month", "unit"))

Unbalanced Panel: n = 13028, T = 1-132, N = 1077905

Effects:
                   var    std.dev share
idiosyncratic  4.995e-01  7.068e-01     1
individual     1.033e-04  1.016e-02     0
group         -4.305e-06         NA     0
theta:
               Min.      1st Qu.     Median        Mean     3rd Qu.        Max.
id     0.0001034076  0.009682772  0.0124834  0.01098215  0.01337857  0.01337857
group -0.4560770777 -0.330356945 -0.2991665 -0.28460677 -0.22212276 -0.07917202

Residuals:
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -0.504  -0.499  -0.498   0.000   0.501   5.502

Coefficients:
                  Estimate  Std. Error z-value Pr(>|z|)
(Intercept)     5.0668e-01  1.0712e-02 47.2990   <2e-16 ***
tenure         -4.5654e-06  8.3782e-06 -0.5449   0.5858
districtcrimes  2.9816e-07  1.6145e-06  0.1847   0.8535
p50_inc         2.3826e-08  7.5710e-08  0.3147   0.7530
b              -8.3542e-03  1.1297e-02 -0.7395   0.4596
h              -5.6283e-03  1.1731e-02 -0.4798   0.6314
w              -1.3070e-02  1.3605e-02 -0.9607   0.3367
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    540040
Residual Sum of Squares: 538420
R-Squared:      0.0030035
Adj. R-Squared: 0.002998
Chisq: 3.70287 on 6 DF, p-value: 0.71681
```

```
> coeftest (WI, vcov. = vcovHC, type = "HC1")

t test of coefficients:

                  Estimate  Std. Error t value Pr(>|t|)
(Intercept)     5.0668e-01  1.0651e-02 47.5724   <2e-16 ***
tenure         -4.5654e-06  8.3870e-06 -0.5443   0.5862
districtcrimes  2.9816e-07  1.6109e-06  0.1851   0.8532
p50_inc         2.3826e-08  7.4654e-08  0.3192   0.7496
b              -8.3542e-03  1.1190e-02 -0.7465   0.4553
h              -5.6283e-03  1.1631e-02 -0.4839   0.6285
w              -1.3070e-02  1.3470e-02 -0.9703   0.3319
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

2) Between estimator

Yixuan Li (NetID: yl648)

Econ 613 Assignment #3

```
Call:
plm(formula = arrest ~ tenure + districtcrimes + p50_inc + b +
    h + w, data = data5, effect = "nested", model = "Between",
    index = c("NUID", "month", "unit"))

Unbalanced Panel: n = 13028, T = 1-132, N = 1077905

Effects:
                    var    std.dev share
idiosyncratic  4.995e-01  7.068e-01     1
individual     1.033e-04  1.016e-02     0
group         -4.305e-06         NA     0
theta:
               Min.      1st Qu.     Median        Mean     3rd Qu.        Max.
id     0.0001034076  0.009682772  0.0124834  0.01098215  0.01337857  0.01337857
group -0.4560770777 -0.330356945 -0.2991665 -0.28460677 -0.22212276 -0.07917202

Residuals:
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -0.504  -0.499  -0.498   0.000   0.501   5.502

Coefficients:
                 Estimate  Std. Error z-value Pr(>|z|)
(Intercept)     5.0668e-01  1.0712e-02 47.2990   <2e-16 ***
tenure         -4.5654e-06  8.3782e-06 -0.5449   0.5858
districtcrimes  2.9816e-07  1.6145e-06  0.1847   0.8535
p50_inc         2.3826e-08  7.5710e-08  0.3147   0.7530
b              -8.3542e-03  1.1297e-02 -0.7395   0.4596
h              -5.6283e-03  1.1731e-02 -0.4798   0.6314
w              -1.3070e-02  1.3605e-02 -0.9607   0.3367
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    540040
Residual Sum of Squares: 538420
R-Squared:      0.0030035
Adj. R-Squared: 0.002998
Chisq: 3.70287 on 6 DF, p-value: 0.71681
```

```
> coeftest (BTW, vcov. = vcovHC, type = "HC1")

t test of coefficients:

                  Estimate  Std. Error t value Pr(>|t|)
(Intercept)     5.0668e-01  1.0651e-02 47.5724   <2e-16 ***
tenure         -4.5654e-06  8.3870e-06 -0.5443   0.5862
districtcrimes  2.9816e-07  1.6109e-06  0.1851   0.8532
p50_inc         2.3826e-08  7.4654e-08  0.3192   0.7496
b              -8.3542e-03  1.1190e-02 -0.7465   0.4553
h              -5.6283e-03  1.1631e-02 -0.4839   0.6285
w              -1.3070e-02  1.3470e-02 -0.9703   0.3319
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

3) First difference estimator

Yixuan Li (NetID: yl648)

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```
Call:
plm(formula = arrest ~ tenure + districtcrimes + p50_inc + b +
    h + w, data = data5, effect = "nested", model = "First Difference",
    index = c("NUID", "month", "unit"))

Unbalanced Panel: n = 13028, T = 1-132, N = 1077905

Effects:
                   var    std.dev share
idiosyncratic  4.995e-01  7.068e-01     1
individual     1.033e-04  1.016e-02     0
group         -4.305e-06         NA     0
theta:
               Min.      1st Qu.      Median        Mean     3rd Qu.        Max.
id     0.0001034076  0.009682772  0.0124834  0.01098215  0.01337857  0.01337857
group -0.4560770777 -0.330356945 -0.2991665 -0.28460677 -0.22212276 -0.07917202

Residuals:
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -0.504  -0.499  -0.498   0.000   0.501   5.502

Coefficients:
                 Estimate  Std. Error z-value Pr(>|z|)
(Intercept)     5.0668e-01  1.0712e-02 47.2990   <2e-16 ***
tenure         -4.5654e-06  8.3782e-06 -0.5449   0.5858
districtcrimes  2.9816e-07  1.6145e-06  0.1847   0.8535
p50_inc         2.3826e-08  7.5710e-08  0.3147   0.7530
b              -8.3542e-03  1.1297e-02 -0.7395   0.4596
h              -5.6283e-03  1.1731e-02 -0.4798   0.6314
w              -1.3070e-02  1.3605e-02 -0.9607   0.3367
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    540040
Residual Sum of Squares: 538420
R-Squared:      0.0030035
Adj. R-Squared: 0.002998
Chisq: 3.70287 on 6 DF, p-value: 0.71681
```

```
> coeftest (FD, vcov. = vcovHC, type = "HC1")

t test of coefficients:

                 Estimate  Std. Error t value Pr(>|t|)
(Intercept)     5.0668e-01  1.0651e-02 47.5724   <2e-16 ***
tenure         -4.5654e-06  8.3870e-06 -0.5443   0.5862
districtcrimes  2.9816e-07  1.6109e-06  0.1851   0.8532
p50_inc         2.3826e-08  7.4654e-08  0.3192   0.7496
b              -8.3542e-03  1.1190e-02 -0.7465   0.4553
h              -5.6283e-03  1.1631e-02 -0.4839   0.6285
w              -1.3070e-02  1.3470e-02 -0.9703   0.3319
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

The estimated parameters by within, between, and first difference model are close without significant differences.

5.2 Use a GMM approach to estimate all parameters in one step.