ДЗ-08 **РЕШЕНИЕ**

Problem 1

Consider the fixed effect model

$$y_{it} = \alpha_i + u_{it}$$

The disturbances are supposed to be independent and heteroscedastic: $V(u_{it}) = \sigma_i^2$. Data are unbalanced, with different number of observations for each industry.

(a) Show that OLS and GLS estimates of α_i are identical.

(b) Let $\sigma^2 = \sum_{i=1}^{N} T_i \frac{\sigma_i^2}{n}$, $n = \sum_{i=1}^{N} T_i$ be the average disturbance variance. Show that the OLS estimator of σ^2 is biased. Also show that that bias disappears if the data are balanced or the variances are homoscedastic.

Solution

(a) OLS: $\sum_{i=1}^{N}\sum_{t=1}^{T_i}(y_{it}-\alpha_i)^2 \xrightarrow[\alpha_i]{} \min$ hence, $\hat{\alpha}_{i,OLS} = \bar{y}_i$.

GLS: $\sum_{i=1}^{N}\sum_{t=1}^{T_i}\frac{1}{\sigma_i^2}(y_{it}-\alpha_i)^2 = \sum_{i=1}^{N}\frac{1}{\sigma_i^2}\sum_{t=1}^{T_i}(y_{it}-\alpha_i)^2 \xrightarrow[\alpha_i]{} \min$, hence $\hat{\alpha}_{i,GLS} = \bar{y}_i$.

(b) OLS: $\hat{\sigma}^2_{OLS} = \frac{1}{n-N}\sum_{i=1}^{N}\sum_{t=1}^{T_i}(y_{it}-\bar{y}_i)^2$; $E(\hat{\sigma}^2_{OLS}) = \frac{1}{n-N}\sum_{i=1}^{N}\sum_{t=1}^{T_i}E(y_{it}-\bar{y}_i)^2 = \frac{1}{n-N}\sum_{i=1}^{N}(T_i-1)\sigma_i^2 =$

$$= \frac{n}{n-N}\sum_{i=1}^{N}\frac{(T_i-1)}{T}T_i\frac{\sigma_i^2}{n} \neq \sum_{i=1}^{N}T_i\frac{\sigma_i^2}{n}.$$

If $T_i \equiv T$ then $\sigma^2 = \sum_{i=1}^{N} T\frac{\sigma_i^2}{n} = \frac{T}{n}\sum_{i=1}^{N}\sigma_i^2 = \frac{1}{N}\sum_{i=1}^{N}\sigma_i^2$. And

$$E(\hat{\sigma}^2_{OLS}) = \frac{n}{n-N}\sum_{i=1}^{N}(T-1)\frac{\sigma_i^2}{n} = \frac{NT}{NT-N}\sum_{i=1}^{N}(T-1)\frac{\sigma_i^2}{NT} = \frac{NT}{NT-N}\frac{T-1}{NT}\sum_{i=1}^{N}\sigma_i^2 = \frac{1}{N}\sum_{i=1}^{N}\sigma_i^2 = \sigma^2.$$

Problem 2

Estimating the Economic Model of Crime with Panel Data

Becker (1968) introduced an economic model explaining the number of crimes. The main implication of this model is that the number of crimes depends negatively on the probability to be arrested, the probability to be convicted conditional on being arrested, the probability to be imprisoned conditional on being convicted, and the average length of the imprisonment sentence. Since 1968, many empirical studies have tested the empirical implications of Becker's model, usually with cross-section data. Cornwell and Trumbull (1994) use panel data and their results suggest that the cross-section based estimates can be misleading. In this set of exercises, we will use some standard panel data models for an analysis similar to that of Cornwell and Trumbull. The Cornwell and Trumbull study is also briefly described as an example in Wooldridge's textbook (Wooldridge, 2000, p. 432-433), and the data set is taken from the web site of this textbook.

Data

The data set CRIME4.DTA contains data on 90 counties in North Carolina covering the years 1981 till 1987. The data are stored in ASCII format. The variables are as follows, stored in the order given below:

```
 1. county        county identifier
 2. year          81 to 87
 3. crmrte        crimes committed per person
 4. prbarr        'probability' of arrest
 5. prbconv       'probability' of conviction
 6. prbpris       'probability' of prison sentenc
 7. avgsen        avg. sentence, days
 8. polpc         police per capita
 9. density       people per sq. mile
10. taxpc         tax revenue per capita
11. west          =1 if in western N.C.
12. central       =1 if in central N.C.
```

```
13. urban          =1 if in SMSA
14. pctmin80       perc. minority, 1980
15. wcon           weekly wage, construction
16. wtuc           wkly wge, trns, util, commun
17. wtrd           wkly wge, whlesle, retail trade
18. wfir           wkly wge, fin, ins, real est
19. wser                   wkly wge, service industry
20. wmfg                   wkly wge, manufacturing
21. wfed                   wkly wge, fed employees
22. wsta                   wkly wge, state employees
23. wloc                   wkly wge, local gov emps
24. mix                    offense mix: face-to-face/other
25. pctymle                percent young male
26. d82                    =1 if year == 82
27. d83                    =1 if year == 83
28. d84                    =1 if year == 84
29. d85                    =1 if year == 85
30. d86                    =1 if year == 86
31. d87                    =1 if year == 87
32. lcrmrte                log(crmrte)
33. lprbarr                log(prbarr)
34. lprbconv               log(prbconv)
35. lprbpris               log(prbpris)
36. lavgsen                log(avgsen)
37. lpolpc                 log(polpc)
38. ldensity               log(density)
39. ltaxpc                 log(taxpc)
40. lwcon                  log(wcon)
41. lwtuc                  log(wtuc)
42. lwtrd                  log(wtrd)
43. lwfir                  log(wfir)
44. lwser                  log(wser)
45. lwmfg                  log(wmfg)
46. lwfed                  log(wfed)
47. lwsta                  log(wsta)
48. lwloc                  log(wloc)
49. lmix                   log(mix)
50. lpctymle               log(pctymle)
51. lpctmin                log(pctmin)
52. clcrmrte               lcrmrte - lcrmrte[t-1]
53. clprbarr               lprbarr - lprbarr[t-1]
54. clprbcon               lprbconv - lprbconv[t-1]
55. clprbpri               lprbpri - lprbpri[t-1]
56. clavgsen               lavgsen - lavgsen[t-1]
57. clpolpc                lpolpc - lpolpc[t-1]
58. cltaxpc                ltaxpc - ltaxpc[t-1]
59. clmix                  lmix - lmix[t-1]
```

The probability of arrest is an estimated probability, obtained as the ratio of the number of arrests and the reported number of crimes. Similarly, the probabilities of conviction is estimated by the ratio of the number of convictions and the number of arrests, and the probability of prison sentence is estimated as the ratio of the number of people sent to prison and the number of convictions.

Exercises

1. Read the data and present some descriptive statistics on the variables of main interest. Discuss some findings that you think are interesting.

2. Estimate a pooled regression model explaining lcrmrte from an intercept and the variables lprbarr, lprbconv, lprbpris, lavgsen and lpolpc. Briefly discuss the results. Which assumptions have you made? Do you think these assumptions are realistic?

3. Estimate the same model for each separate cross-section. Compare the results with those of the previous exercise.

4. Construct the means over time for each county of the dependent and independent variables in the regression in the previous exercise. Carry out the "between groups" regression on these individual means. Discuss the results and compare them with those of the previous exercises.

5. Estimate a fixed effects model with the same dependent and independent variables as in the previous model. Discuss the results and compare them to those of the previous exercises. Explain why Cornwell and Trumbull concluded that cross-section estimates are misleading.

6. Test the fixed effects model against the pooled regression model.

7. Regress the estimated county specific effects on the means of the regressors included in the previous exercises and on the (time invariant) variables WEST, CENTRAL, URBAN, and PCTMIN80. Discuss the results.

8. Test whether it is useful to add time dummies to the fixed effects model.

9. Go through the other (time varying) variables available in the data set and select some that in your opinion could help to explain the number of crimes. Include them in the fixed effects model and test whether they are significant. In this way, select your favorite model and discuss the policy implications of the results.

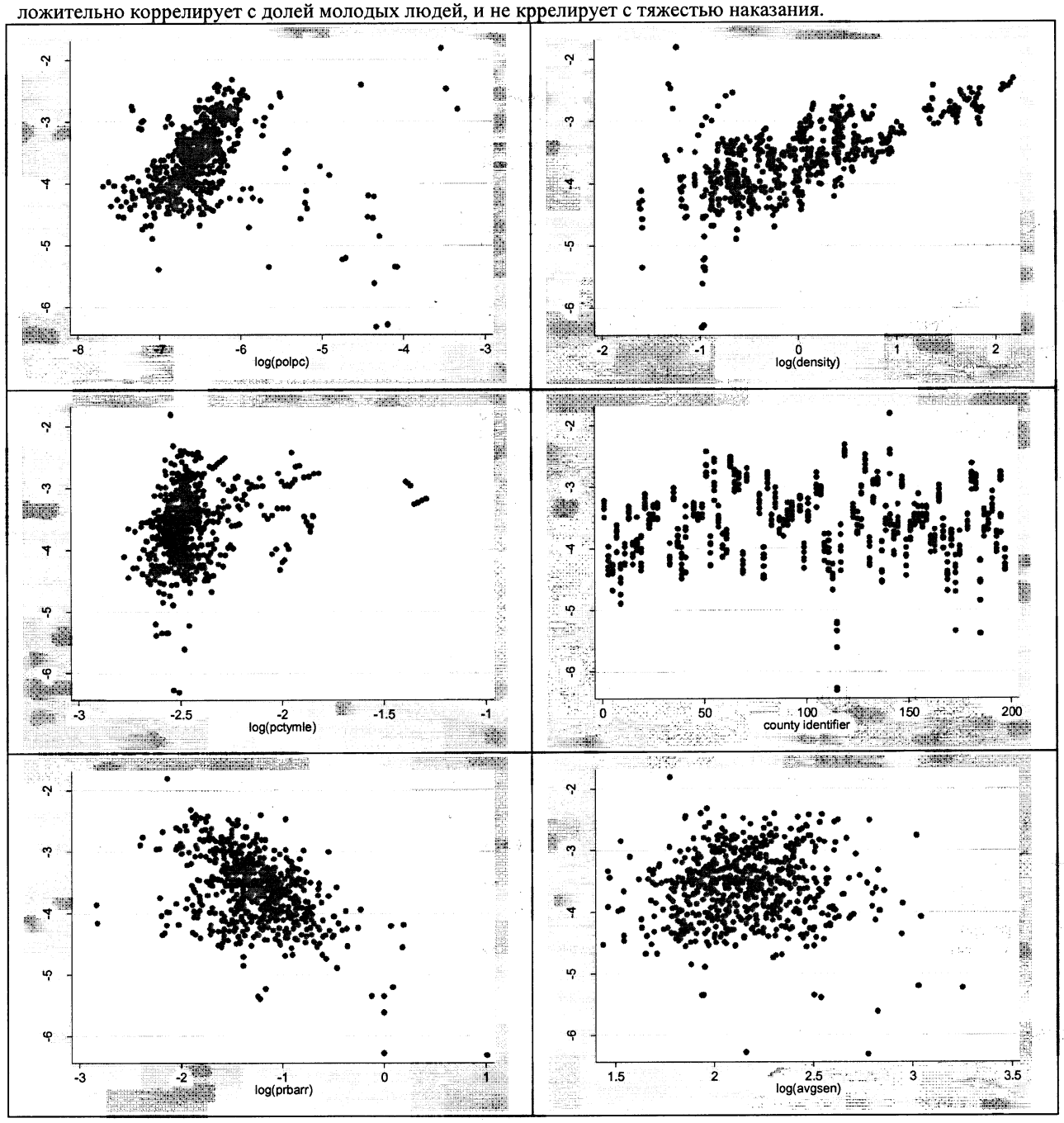
10. Estimate a random effects model assuming that the random effects are independent of the regressors. Discuss the results.

11. Test the random effects model in the previous exercise against the fixed effects model and against the pooled regression model.

Solution

1. gen lpolpc1=lpolpc- clpolpc

Из графиков можно заключить, что количество преступлений положительно коррелирует с плотностью населения, количеством полиции (?), отрицательно с вероятность ареста, сильно варьирует в зависимости от района, слабо положительно коррелирует с долей молодых людей, и не коррелирует с тяжестью наказания.



Матрица корреляций:

corr lcrmrte lprbarr lprbconv lprbpris lavgsen lpolpc

```
             |  lcrmrte  lprbarr lprbconv lprbpris  lavgsen   lpolpc
-------------+------------------------------------------------------
     lcrmrte |   1.0000
     lprbarr |  -0.4498   1.0000
    lprbconv |  -0.4569  -0.0973   1.0000
```

```
    lprbpris |   0.1805  -0.0212  -0.1581   1.0000
     lavgsen |   0.0214  -0.0483  -0.0269   0.0029   1.0000
      lpolpc |   0.1395   0.0531   0.2730  -0.0560   0.0336   1.0000
```

2.

Неотвратимость наказания (`lprbarr, lprbconv`) снижает преступность, тяжесть наказания (`lavgsen`) не значима, другой показатель неотвратимости наказания (`lprbpris`) положительно коррелирует с преступностью, полиция повышает (?) преступность (тут видимо есть эндогенность – при более высокой преступности возрастают расходы местного бюджета на полицию). Предполагается отсутствие индивидуального эффекта, что видимо, не вполне корректно из-за неоднородности районов.

```
reg    lcrmrte      lprbarr lprbconv lprbpris lavgsen lpolpc
Prob > F      =  0.0000
R-squared     =  0.5658
Adj R-squared=  0.5624

lcrmrte       Coef.         Std. Err.       t    P>t
lprbarr      -.7215113     .0367089   -19.65   0.000
lprbconv     -.5492767     .0262701   -20.91   0.000
lprbpris      .2379716     .0664302     3.58   0.000
lavgsen      -.0652007     .0553516    -1.18   0.239
lpolpc        .3625234     .0299608    12.10   0.000
_cons        -2.206729     .2386927    -9.25   0.000
```

3.

Есть некоторые вариации коэффициентов по годам по годам, но не существенные

`Lavgsen` и часто `lprbpris` — незначимы

1981

```
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------
     lprbarr |  -.6389785   .0991133    -6.45   0.000
    lprbconv |  -.5742229   .0678576    -8.46   0.000
    lprbpris |   .0908728   .1889373     0.48   0.632
     lavgsen |  -.0389218   .1312269    -0.30   0.768
      lpolpc |   .2980306   .0885235     3.37   0.001
       _cons |  -2.688402   .6721831    -4.00   0.000
```

1982

```
------------------------------------------------------
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------
     lprbarr |  -.6833121   .0994148    -6.87   0.000
    lprbconv |  -.5972914   .0801288    -7.45   0.000
    lprbpris |   .2425427   .1640054     1.48   0.143
     lavgsen |  -.0879718   .1524012    -0.58   0.565
      lpolpc |   .3039994   .0848964     3.58   0.001
       _cons |  -2.479068   .6633709    -3.74   0.000
------------------------------------------------------
```

1983

```
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------
     lprbarr |  -.7654428   .0835683    -9.16   0.000
    lprbconv |  -.4664764   .0688177    -6.78   0.000
    lprbpris |   .4981606   .1396416     3.57   0.001
     lavgsen |  -.1795763   .1517595    -1.18   0.240
      lpolpc |   .4176287   .0760655     5.49   0.000
       _cons |  -1.370831   .6181525    -2.22   0.029
```

1984

```
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------
     lprbarr |  -.6800545   .1099577    -6.18   0.000
    lprbconv |  -.5770381   .0842731    -6.85   0.000
    lprbpris |   .1064558    .243549     0.44   0.663
     lavgsen |  -.0254459   .1926989    -0.13   0.895
      lpolpc |   .3632997   .0753655     4.82   0.000
       _cons |  -2.426434   .6166852    -3.93   0.000
```

1985

```
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------
```

```
     lprbarr |   -.842586   .1130809    -7.45   0.000
    lprbconv |  -.5112046   .0660793    -7.74   0.000
    lprbpris |   .1702136   .2158408     0.79   0.433
     lavgsen |  -.0375874   .1749804    -0.21   0.830
      lpolpc |   .3760042   .0810506     4.64   0.000
       _cons |  -2.399902   .6398518    -3.75   0.000
```

1986

```
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------
     lprbarr |  -.6944479   .0985755    -7.04   0.000
    lprbconv |   -.647814   .0675528    -9.59   0.000
    lprbpris |   .2807411   .1641958     1.71   0.091
     lavgsen |  -.1259598   .1490572    -0.85   0.400
      lpolpc |   .4759127   .0724661     6.57   0.000
       _cons |   -1.33185   .6372348    -2.09   0.040
```

1987

```
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------
     lprbarr |  -.7339084   .1093422    -6.71   0.000
    lprbconv |  -.4340935   .0796492    -5.45   0.000
    lprbpris |   .1307631   .1958738     0.67   0.506
     lavgsen |  -.1456424   .1692714    -0.86   0.392
      lpolpc |   .4141207   .1271017     3.26   0.002
       _cons |  -1.708116   1.052529    -1.62   0.108
```

Однако в 1984 уровень преступности был несколько ниже чем в 1981 (на 10%-ном уровне), остальные года эквивалентны 1981-му.

```
------------------------------------------------------------
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------------
     lprbarr |  -.7195033   .0367657   -19.57   0.000
    lprbconv |  -.5456588   .0263683   -20.69   0.000
    lprbpris |   .2475521   .0672268     3.68   0.000
     lavgsen |  -.0867575   .0579205    -1.50   0.135
      lpolpc |   .3659887   .0300252    12.19   0.000
         d82 |   .0051371    .057931     0.09   0.929
         d83 |   -.043503   .0576243    -0.75   0.451
         d84 |  -.1087542    .057923    -1.88   0.061
         d85 |  -.0780453   .0583244    -1.34   0.181
         d86 |  -.0420791   .0578218    -0.73   0.467
         d87 |  -.0270426    .056899    -0.48   0.635
       _cons |  -2.082293   .2516253    -8.28   0.000
------------------------------------------------------------
```

4.

```
xtreg  lcrmrte  lprbarr lprbconv lprbpris lavgsen  lpolpc, be
------------------------------------------------------------
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------------
     lprbarr |  -.8128525   .0925787    -8.78   0.000
    lprbconv |  -.5920724    .070137    -8.44   0.000
    lprbpris |    1.16067    .237592     4.89   0.000
     lavgsen |  -.1312699   .2085175    -0.63   0.531
      lpolpc |   .3446985   .0716332     4.81   0.000
       _cons |  -1.515489   .7063476    -2.15   0.035
------------------------------------------------------------
```

`Lprbpris` — значима, положительный коэффициент, больше, чем в других регрессиях

5.

```
xtreg  lcrmrte  lprbarr lprbconv lprbpris lavgsen  lpolpc, fe
------------------------------------------------------------
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------------
     lprbarr |  -.3835369   .0334672   -11.46   0.000
    lprbconv |  -.3059757   .0218578   -14.00   0.000
    lprbpris |  -.1954515   .0333637    -5.86   0.000
     lavgsen |   .0356643   .0261247     1.37   0.173
      lpolpc |   .4137712   .0274687    15.06   0.000
       _cons |  -1.872858   .1729314   -10.83   0.000
-------------+----------------------------------------------
```

```
     sigma_u |  .42736725
     sigma_e |  .14681793
         rho |  .89443836   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(89, 535) =     40.69                 Prob > F = 0.0000
```

6.

F-тест показывает наличие индивидуального эффекта. При его учете коэффициент при `lprbpris` становится отрицательным, как и при других показателях неотвратимости наказания.

7.

```
xtreg  lcrmrte  lprbarr lprbconv lprbpris lavgsen  lpolpc, fe
predict uu, u
local list "lcrmrte  lprbarr lprbconv lprbpris lavgsen  lpolpc"
        foreach xx of local list {
        display "`xx'"
        xtreg `xx', fe
        predict mm, xb
        predict u1, u
        gen tm_`xx' = u1+mm
        drop u1 mm
        }
reg uu west central urban pctmin80 tm_lprbarr tm_lprbconv tm_lprbpris tm_lavgsen  tm_lpolpc
```

```
------------------------------------------------------------
          uu |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------------
        west |  -.3159483   .0341209    -9.26   0.000
     central |  -.0567069   .0227318    -2.49   0.013
       urban |   .1332446   .0369903     3.60   0.000
    pctmin80 |   .0062172   .0008046     7.73   0.000
  tm_lprbarr |  -.4301418   .0269604   -15.95   0.000
 tm_lprbconv |  -.3082678   .0206731   -14.91   0.000
 tm_lprbpris |   .8765429   .0677316    12.94   0.000
  tm_lavgsen |  -.2785488   .0576916    -4.83   0.000
   tm_lpolpc |  -.0551223   .0199678    -2.76   0.006
       _cons |    .173909   .1985676     0.88   0.381
------------------------------------------------------------
```

На Западе и в Центре преступность ниже, в городах и районах с высокой долей меньшинств – выше.

8.

```
xtreg  lcrmrte  lprbarr lprbconv lprbpris lavgsen  lpolpc d8*, fe
```

```
------------------------------------------------------------
     lcrmrte |      Coef.   Std. Err.      t    P>|t|
-------------+----------------------------------------------
     lprbarr |  -.3597945   .0324192   -11.10   0.000
    lprbconv |  -.2858734   .0212173   -13.47   0.000
    lprbpris |  -.1827813   .0324611    -5.63   0.000
     lavgsen |  -.0044879   .0264471    -0.17   0.865
      lpolpc |   .4241144   .0263661    16.09   0.000
          d82 |   .0125802   .0215416     0.58   0.559
          d83 |  -.0792812   .0213399    -3.72   0.000
          d84 |  -.1177281   .0216145    -5.45   0.000
          d85 |  -.1119561   .0218459    -5.12   0.000
          d86 |  -.0818268   .0214266    -3.82   0.000
          d87 |  -.0404705   .0210392    -1.92   0.055
        _cons |  -1.604135   .1685739    -9.52   0.000
-------------+----------------------------------------------
     sigma_u |  .43487414
     sigma_e |  .13871214
         rho |  .90765322   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(89, 529) =     45.87                 Prob > F = 0.0000
```

```
test d82 d83 d84 d85 d86 d87

 ( 1)  d82 = 0
 ( 2)  d83 = 0
 ( 3)  d84 = 0
 ( 4)  d85 = 0
 ( 5)  d86 = 0
 ( 6)  d87 = 0

       F(  6,   529) =   11.73
            Prob > F =    0.0000
```

Фиктивные переменные по времени значимы.

9.

```
xtreg  lcrmrte  lprbarr lprbconv lprbpris lavgsen  lpolpc d8* ldensity lwcon lwtuc  lwtrd lwfir
       lwser l wmfg lwfed lwsta lwloc lpctymle ltaxpc lmix, fe
```

```
------------------------------------------------------------------------------
     lcrmrte |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lprbarr |  -.3553352   .0331411   -10.72   0.000    -.4204433   -.2902272
    lprbconv |    -.28167   .0212032   -13.28   0.000    -.3233252   -.2400149
    lprbpris |  -.1725937   .0324023    -5.33   0.000    -.2362504    -.108937
     lavgsen |  -.0022518   .0261755    -0.09   0.931    -.0536756    .0491719
      lpolpc |   .4125651   .0269519    15.31   0.000     .3596162    .4655139
         d82 |   .0220252   .0261164     0.84   0.399    -.0292824    .0733327
         d83 |   -.041761   .0359918    -1.16   0.246    -.1124694    .0289474
         d84 |  -.0457774   .0471339    -0.97   0.332    -.1383753    .0468205
         d85 |  -.0204236   .0646682    -0.32   0.752    -.1474689    .1066217
         d86 |   .0300543   .0795825     0.38   0.706    -.1262912    .1863999
         d87 |   .0939942   .0948951     0.99   0.322     -.092434    .2804225
    ldensity |   .4039363   .2851002     1.42   0.157    -.1561635    .9640361
       lwcon |  -.0378999   .0391845    -0.97   0.334    -.1148807     .039081
       lwtuc |   .0457869   .0191931     2.39   0.017     .0080806    .0834932
       lwtrd |  -.0206108   .0405906    -0.51   0.612     -.100354    .0591324
       lwfir |  -.0038305   .0283148    -0.14   0.892    -.0594569     .051796
       lwser |   .0086382   .0192507     0.45   0.654    -.0291811    .0464575
       lwmfg |  -.3587417    .112218    -3.20   0.001     -.579202   -.1382814
       lwfed |  -.3082912   .1768173    -1.74   0.082    -.6556614    .0390791
       lwsta |   .0494109   .1144341     0.43   0.666    -.1754031    .2742249
       lwloc |   .1822251   .1180615     1.54   0.123    -.0497152    .4141655
    lpctymle |   .6235668   .3647114     1.71   0.088    -.0929351    1.340069
      ltaxpc |   .0144755   .0448261     0.32   0.747    -.0735885    .1025395
        lmix |   .0005681   .0151308     0.04   0.970    -.0291575    .0302936
       _cons |   2.340509   1.689701     1.39   0.167    -.9790297    5.660047
-------------+----------------------------------------------------------------
     sigma_u |  .37754187
     sigma_e |  .13677145
         rho |  .88398703   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(89, 516) =    32.82                 Prob > F = 0.0000
```

Значимы зарплаты

wtuc (wkly wge, trns, util, commun) – **увеличивает** и wmfg (wkly wge, manufacturing) – **уменьшает** преступность

10. 11

```
xtreg  lcrmrte  lprbarr lprbconv lprbpris lavgsen  lpolpc, re
```

```
     lcrmrte |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lprbarr |  -.4485975   .0326419   -13.74   0.000    -.5125745   -.3846205
    lprbconv |  -.3469171   .0214454   -16.18   0.000    -.3889493   -.3048848
    lprbpris |  -.1876919   .0348083    -5.39   0.000    -.2559148   -.1194689
     lavgsen |   .0276295   .0274935     1.00   0.315    -.0262568    .0815157
      lpolpc |   .4184813   .0269885    15.51   0.000     .3655847    .4713779
       _cons |   -1.92944    .177319   -10.88   0.000    -2.276979   -1.581901
-------------+----------------------------------------------------------------
     sigma_u |   .2997784
     sigma_e |  .14681793
         rho |  .80654279   (fraction of variance due to u_i)
```

```
xttest0
```

```
Breusch and Pagan Lagrangian multiplier test for random effects

        lcrmrte[county,t] = Xb + u[county] + e[county,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                 lcrmrte |   .3281087        .5728077
                       e |   .0215555        .1468179
                       u |   .0898671        .2997784

        Test:   Var(u) = 0
                                chibar2(01) =   933.68
                             Prob > chibar2 =   0.0000
```

Тест Бреуш-Пагана отвергает Pooled в пользу RE

```
xtreg  lcrmrte  lprbarr lprbconv lprbpris lavgsen  lpolpc, re
est store RE
xtreg  lcrmrte  lprbarr lprbconv lprbpris lavgsen  lpolpc, fe
```

```
est store FE
hausman FE RE, sigmamore
```

```
                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       FE           RE         Difference          S.E.
-------------+----------------------------------------------------------------
     lprbarr |   -.3835369    -.4485975        .0650606        .0139921
    lprbconv |   -.3059757    -.3469171        .0409414        .0088373
    lprbpris |   -.1954515    -.1876919       -.0077597         .006471
     lavgsen |    .0356643     .0276295        .0080348         .003558
      lpolpc |    .4137712     .4184813       -.0047101         .011013
------------------------------------------------------------------------------
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       74.31
                Prob>chi2 =      0.0000
```

Тест Бреуш-Пагана отвергает RE в пользу FE