Caleb White

ECON423

Fixed and Random Effects

1. With panel data such as this we should prefer a fixed effects model over a pooled OLS model. We can improve the internal validity of our estimates with a fixed effects model by controlling for variation of usually unobserved, time invariant characteristics across countries. By divesting the error term of unobserved heterogeneity our model gives us better information.

2. The FE model seems to predict approximately 6% higher GDP per capita each year, whereas the RE model seems to predict a slowdown of that growth in the 4$^{th}$ year to just about 1%. The coefficient of the natural logarithm of initial GDP per capita, *lnini*, for the FE model is -7.01 and 0.46 for the RE model. Taken together with the constants of 43.29 for the FE model and -12.65 for the RE model, we can see that overall the FE model seems to predict higher growth in countries with lower initial GDP per capita and lower growth in countries with higher initial GDP per capita. On the other hand, the RE model predicts a straightforward positive effect of initial GDP per capita on growth, and with what seems to be a smaller marginal effect than in the FE model.

3. With $\gamma \neq 0$ in our CRE model it would seem to say that RE is a bad model in this case and that FE may be preferable.

```
1    capture log close
2
3    cd G:/
4
5    log using 423ex4log.log, text replace
6
7    import excel "G:\EMFT_Data.xlsx", sheet("datastatafeb19") firstrow
8
9    gen lnini = ln(initial)
10
11   *1
12
13   xtset ID year
14   xtreg growth i.year lnini, fe
15
16   *2
17
18   xtset ID year
19   xtreg growth i.year lnini, re
20   summarize lnini
21
22   *3
23
24   egen meanlnini=mean(lnini), by(ID)
25   xtset ID year
26   xtreg growth i.year lnini meanlnini, re
27
28
```

```
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
--------
      name:  <unnamed>
       log:  G:\423ex4log.log
  log type:  text
 opened on:  19 Apr 2022, 11:59:00

.
. import excel "G:\EMFT_Data.xlsx", sheet("datastatafeb19") firstrow
(23 vars, 104 obs)


.
. gen lnini = ln(initial)
(7 missing values generated)


.
. *1
.
. xtset ID year
       panel variable:  ID (strongly balanced)
        time variable:  year, 1 to 4
                delta:  1 unit

. xtreg growth i.year lnini, fe

Fixed-effects (within) regression              Number of obs      =         96
Group variable: ID                             Number of groups   =         26

R-sq:                                          Obs per group:
    within  = 0.7725                                         min =          1
    between = 0.0676                                         avg =        3.7
    overall = 0.2723                                         max =          4

                                               F(4,66)            =      56.03
corr(u_i, Xb)  = -0.6878                        Prob > F           =     0.0000


--------------------------------------------------------------------------------
      growth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+------------------------------------------------------------------
        year |
          2  |   7.227742   1.355021     5.33   0.000     4.522356    9.933128
          3  |   13.37554   1.288662    10.38   0.000     10.80265    15.94844
          4  |   19.40736   1.456175    13.33   0.000     16.50001    22.31471
             |
       lnini |  -7.014666   1.711729    -4.10   0.000    -10.43224   -3.597089
       _cons |   43.29377   12.86876     3.36   0.001     17.60047    68.98707
-------------+------------------------------------------------------------------
     sigma_u |  7.3421277
     sigma_e |  4.1758635
```

```
          rho |    .75558322    (fraction of variance due to u_i)
-------------------------------------------------------------------------
F test that all u_i=0: F(25, 66) = 1.22                    Prob > F = 0.2602


.
. *2
.
. xtset ID year
       panel variable:  ID (strongly balanced)
        time variable:  year, 1 to 4
                delta:  1 unit

. xtreg growth i.year lnini, re

Random-effects GLS regression            Number of obs      =        96
Group variable: ID                       Number of groups   =        26

R-sq:                                    Obs per group:
     within  = 0.7068                                   min =         1
     between = 0.5964                                   avg =       3.7
     overall = 0.6899                                   max =         4

                                         Wald chi2(4)       =    202.42
corr(u_i, X)   = 0 (assumed)             Prob > chi2        =    0.0000

-------------------------------------------------------------------------
      growth |    Coef.   Std. Err.      z    P>|z|    [95% Conf. Interval]
-------------+-----------------------------------------------------------
        year |
          2  |   9.504826   1.287212    7.38   0.000    6.981937   12.02771
          3  |    14.7689    1.25861   11.73   0.000    12.30207   17.23573
          4  |   15.91202   1.266631   12.56   0.000    13.42947   18.39457
             |
       lnini |   .4569526   .4650111    0.98   0.326   -.4544523   1.368358
       _cons |  -12.65386   3.588402   -3.53   0.000     -19.687  -5.620726
-------------+-----------------------------------------------------------
     sigma_u |          0
     sigma_e |  4.1758635
         rho |          0    (fraction of variance due to u_i)
-------------------------------------------------------------------------

. summarize lnini

    Variable |      Obs       Mean    Std. Dev.      Min        Max
-------------+------------------------------------------------------
       lnini |       97   7.476652   1.002892   5.182626    9.73432


.
. *3
.
```

```
. egen meanlnini=mean(lnini), by(ID)

. xtset ID year
       panel variable:  ID (strongly balanced)
        time variable:  year, 1 to 4
                delta:  1 unit

. xtreg growth i.year lnini meanlnini, re

Random-effects GLS regression              Number of obs     =         96
Group variable: ID                         Number of groups  =         26

R-sq:                                      Obs per group:
     within  = 0.7721                                    min =          1
     between = 0.6070                                    avg =        3.7
     overall = 0.7505                                    max =          4

                                           Wald chi2(5)      =     270.67
corr(u_i, X)    = 0 (assumed)              Prob > chi2       =     0.0000

------------------------------------------------------------------------------
      growth |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        year |
          2  |   7.398212    1.24539     5.94   0.000     4.957292    9.839132
          3  |    13.3977   1.172494    11.43   0.000     11.09966    15.69575
          4  |   18.88823   1.307845    14.44   0.000      16.3249    21.45156
             |
       lnini |  -6.360357   1.517314    -4.19   0.000    -9.334238   -3.386477
   meanlnini |   7.314273   1.564491     4.68   0.000     4.247927    10.38062
       _cons |  -16.23899   3.326208    -4.88   0.000    -22.75824   -9.719745
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  4.1758635
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

.
end of do-file
```