5/NOV/17

Assignment-9
ECON-online
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P.156

a) i) Sex worker characteristics can be treated as time invarient for the period of data set as the period is very short. They are very less likely to change. They can be a part of individual effects.

ii) All variables are significant at 5%.

iii) Risk premium for no condom is approx 17%.
$100 \times \exp(0.01702) - 1) = 18.55\%$
for Regular price is approx 3.7% higher
for Rich price is approx 8.2% higher
for alchole — " — 5.6% lower
for bar — " — 29% higher
for street " — 45% higher

b) Sign of alchol changed (not significant)
estimates of all variables changed.
bar went to 46% from 29%, street came down to 10% from 45%

price is higher for attractive and educated sex workers, and lower for older.

premium for unprotected sex with attractive educated worker is approx = 0.138 + 0.276 + 0.216 = 63%

$100 \times \exp(0.63) - 1) = 87.76\%$

c) Hausman test is significant therefor we conclude that at least one variable is correlated with individual random effects.
∴ We should use fixed effects

d) Sometimes it could be possible that a certain sex worker could be the way that she won't prefer condoms or it could be that she wants more money which it could be her nature & she would have all clients with no condoms. this way it could be a characteristic of sex worker rather than a client. The alchol is variable is negative again. All the variables are significant now.

coefficients of all the variables changed.

, 0.17 + 0.33 + 0.29 = 0.79

the premium for unprotected sex with attractive educated worker is approx 79%.

100 × (exp 0.79 − 1) = 81%.

the premium reduced drastically.

Q. 15.10 i) deterrence increase crime rate drop

a) ii) wages in private sec ↑ crime rate drop

iii) pop density ↑ crime rate increase

iv) % young male increase crime rate increase as expected

lprbarr → −0.65 → significant negative as expected

b) i) lprbconv → −0.44 → significant → −ve as expected

lprbpris → 0.20 → significant → not as expected should have been −ve

lavgsen → −0.05 → not significant → −ve as expected

lwmfg → 0.29 → significant → +ve not as expected

ii) 1% increase in prob arrest decreases the crime rate by 65% keeping all things constant

c) i) lprbarr → -0.23 → significant → -ve as expected
lprbconv → -0.13 → significant → -ve as expected
pprbpris → -0.14 → significant → — " —
lavgsen → 0.018 → not significat → not as expected
lwmtg → -0.16 → significant → as expected

ii) 1% increase in prob arrest will reduce crime rate by 23%. this is significantly different from OLS prediction. This suggest there could be hetrogenity.

iii) 1% increase in prison sentence cause 0.018% increase in crime rate. However this is not statistically significant so we can say that this is not different from zero. We can say that longer prison sentences have no effect on crime rate.

d) $H_0: \beta_1 - \beta_{g0} = 0$
H_1: at lest one of $\beta_1 - \beta_{g0} \neq 0$

$$\frac{106.814 - 16.149/89}{16.149/630-95} = 33.74$$

Fcrit = 1.287

We reject the null hypo. And conclude that there is individual specific county effects

e) i) Estimates changes significantly when time dummies are added. Also the signs of all time dummies are negative for OLS & +ve for fixed effects. Signs of lwmfg & lPRBPRs are different.

ii) In previous question we have concluded that there is fixed effect. so comparing the significance with fixed effect model.

$$\frac{(16.149 - 14.383)/6-1}{14.383/630-90-6-7} = \frac{0.3532}{0.0272}$$

$$= 12.9$$

Fcrit = 2.23

$H_0 : \rightarrow D_{82} - D_{87} = 0$

H_1 : At least one of $D_{82} - D_{87} \neq 0$

we reject the null hypothesis. We conclude that year effects are important.

There appears a trend effect looking at fixed effect model, we can say that 83-85 are not significant. Also their values are pretty small coefficients of 86 & 87 are quite large and also significant.

iii) OLS

1% increase in manufacturing wages results in 0.0159% increase in crime which does not make any sense. Also this result is not significant.
OLS says lwmfg does not affect crime rate significantly.

FE

1% increase in manufacturing wages decreases crime rate by 0.57%. this is what we expect and result is significant at 0.1% also.

f) wages should be increased. Factors affecting crime as prob of conviction, prob arrest, should be increased. ~~It~~ It appears that prison term does not affect crime rate.

```
> library(plm)
> library(haven)
> library(lme4)
> mexican <- read_dta("D:/Class Notes/Fall 17 Classes/ECON/Data_sets/mexican.dta")
> View(mexican)
>
>
> # ------ Fixed effect with client char and othe char ----------
>
> modelfe <- plm (lnprice ~ regular + rich + alcohol + nocondom + bar + street,
+                 data = mexican, index = c("id", "trans"), model = "within")
> summary(modelfe)
Oneway (individual) effect Within Model

Call:
plm(formula = lnprice ~ regular + rich + alcohol + nocondom +
    bar + street, data = mexican, model = "within", index = c("id",
    "trans"))

Balanced Panel: n=754, T=4, N=3016

Residuals :
   Min. 1st Qu.  Median 3rd Qu.    Max.
-2.8400 -0.0385  0.0000  0.0200  1.6600

Coefficients :
          Estimate Std. Error t-value  Pr(>|t|)
regular   0.037219   0.016849  2.2090 0.0272770 *
rich      0.082636   0.020528  4.0254 5.875e-05 ***
alcohol  -0.056856   0.026139 -2.1751 0.0297261 *
nocondom  0.170282   0.025817  6.5957 5.256e-11 ***
bar       0.298455   0.134450  2.2198 0.0265299 *
street    0.455159   0.130465  3.4887 0.0004946 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    111.72
Residual Sum of Squares: 107.6
R-Squared:      0.03688
Adj. R-Squared: -0.28715
F-statistic: 14.3978 on 6 and 2256 DF, p-value: 3.5477e-16
> 100*(exp(.1702)-1)
[1] 18.55419
>
> # ------ Random Effects with all char ----------
>
> modelre <- plm (lnprice ~ regular + rich + alcohol + nocondom +
+                   bar + street +
+                   age + attractive + school,
+                 data = mexican, index = c("id", "trans"), model = "random" )
> summary(modelre)
Oneway (individual) effect Random Effect Model
   (Swamy-Arora's transformation)

Call:
plm(formula = lnprice ~ regular + rich + alcohol + nocondom +
    bar + street + age + attractive + school, data = mexican,
    model = "random", index = c("id", "trans"))

Balanced Panel: n=754, T=4, N=3016

Effects:
                  var std.dev share
idiosyncratic 0.04776 0.21854  0.14
```

```
individual    0.29335 0.54162  0.86
theta:  0.8022

Residuals :
   Min. 1st Qu.  Median 3rd Qu.    Max.
-3.0400 -0.1030 -0.0104  0.0949  1.7800

Coefficients :
             Estimate Std. Error t-value  Pr(>|t|)
(Intercept)  5.9102833  0.1302847 45.3644 < 2.2e-16 ***
regular      0.0236131  0.0161865  1.4588    0.1447
rich         0.1160405  0.0200370  5.7913 7.706e-09 ***
alcohol      0.0149458  0.0249582  0.5988    0.5493
nocondom     0.1389512  0.0250293  5.5515 3.078e-08 ***
bar          0.4642233  0.0998789  4.6479 3.498e-06 ***
street       0.1030499  0.1010661  1.0196    0.3080
age         -0.0257618  0.0027521 -9.3607 < 2.2e-16 ***
attractive   0.2768010  0.0602084  4.5974 4.455e-06 ***
school       0.2161133  0.0453175  4.7689 1.941e-06 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    167.72
Residual Sum of Squares: 149.08
R-Squared:      0.11113
Adj. R-Squared: 0.10847
F-statistic: 41.7573 on 9 and 3006 DF, p-value: < 2.22e-16
> 0.138+0.276+.216
[1] 0.63
> 100*(exp(0.63)-1)
[1] 87.76106
>
> # H Test
>
> phtest(modelfe, modelre)

        Hausman Test

data:  lnprice ~ regular + rich + alcohol + nocondom + bar + street
chisq = 155.95, df = 6, p-value < 2.2e-16
alternative hypothesis: one model is inconsistent

>
> # ------ No condom Endogenous -----
>
> modelrenc <- pht(lnprice ~  regular + rich + alcohol + nocondom +
+                    + bar + street +
+                    age + attractive + school | age + attractive + school  ,
+                  data = mexican, model = "ht")
>
> summary(modelrenc)
Oneway (individual) effect Hausman-Taylor Model
Call:
pht(formula = lnprice ~ regular + rich + alcohol + nocondom +
    +bar + street + age + attractive + school | age + attractive +
    school, data = mexican, model = "ht")

T.V. exo  :
T.V. endo : regular, rich, alcohol, nocondom, bar, street
T.I. exo  : age, attractive, school
T.I. endo :

Balanced Panel: n=754, T=4, N=3016
```

```
Effects:
                 var std.dev share
idiosyncratic 0.04757 0.21810 0.106
individual    0.40161 0.63373 0.894
theta:  0.8304

Residuals :
    Min.  1st Qu.   Median  3rd Qu.     Max.
-3.02000 -0.10200 -0.00211  0.09280  1.69000

Coefficients :
             Estimate Std. Error  t-value  Pr(>|t|)
(Intercept)  6.2216480  0.1679867  37.0366 < 2.2e-16 ***
regular      0.0372192  0.0168547   2.2082 0.0272280 *
rich         0.0826358  0.0205352   4.0241 5.719e-05 ***
alcohol     -0.0568559  0.0261481  -2.1744 0.0296768 *
nocondom     0.1702820  0.0258257   6.5935 4.296e-11 ***
bar          0.2984554  0.1344948   2.2191 0.0264810 *
street       0.4551593  0.1305083   3.4876 0.0004874 ***
age         -0.0328104  0.0032309 -10.1552 < 2.2e-16 ***
attractive   0.3309315  0.0690810   4.7905 1.664e-06 ***
school       0.2943199  0.0525102   5.6050 2.083e-08 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    1543.7
Residual Sum of Squares: 143.46
F-statistic: 3259.82 on 9 and 3006 DF, p-value: < 2.22e-16
> .17+.33+.29
[1] 0.79
> 100*(exp(0.79-1))
[1] 81.05842
> # --------------Problem 15.10 Crime Rate ----------------
>
> library(haven)
> crime <- read_dta("D:/Class Notes/Fall 17 Classes/ECON/Data_sets/crime.dta")
> View(crime)
>
> # -----OLS -------
>
> crimereg <- lm (lcrmrte ~ lprbarr + lprbconv + lprbpris + lavgsen + lwmfg, data = crime
)
> summary(crimereg)

Call:
lm(formula = lcrmrte ~ lprbarr + lprbconv + lprbpris + lavgsen +
    lwmfg, data = crime)

Residuals:
     Min       1Q   Median       3Q      Max
-1.54913 -0.24408  0.02184  0.26066  2.22985

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -6.08610    0.36536 -16.658  < 2e-16 ***
lprbarr     -0.65658    0.04035 -16.274  < 2e-16 ***
lprbconv    -0.44658    0.02774 -16.098  < 2e-16 ***
lprbpris     0.20823    0.07267   2.865   0.0043 **
lavgsen     -0.05863    0.06060  -0.967   0.3337
lwmfg        0.29206    0.06190   4.718 2.94e-06 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.4137 on 624 degrees of freedom
```

```
Multiple R-squared:  0.4824,   Adjusted R-squared:  0.4783
F-statistic: 116.3 on 5 and 624 DF,  p-value: < 2.2e-16

> anova(crimereg)
Analysis of Variance Table

Response: lcrmrte
           Df  Sum Sq Mean Sq  F value    Pr(>F)
lprbarr     1  41.760  41.760 243.9602 < 2.2e-16 ***
lprbconv    1  52.223  52.223 305.0826 < 2.2e-16 ***
lprbpris    1   1.718   1.718  10.0391  0.001607 **
lavgsen     1   0.053   0.053   0.3113  0.577096
lwmfg       1   3.811   3.811  22.2624 2.937e-06 ***
Residuals 624 106.814   0.171
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
>
> # -----Fixed Effects ---------
>
> crimefe <- plm(lcrmrte ~ lprbarr + lprbconv + lprbpris + lavgsen + lwmfg, data = crime,
+                index = c("county"), model = "within")
>
> summary(crimefe)
Oneway (individual) effect Within Model

Call:
plm(formula = lcrmrte ~ lprbarr + lprbconv + lprbpris + lavgsen +
    lwmfg, data = crime, model = "within", index = c("county"))

Balanced Panel: n=90, T=7, N=630

Residuals :
    Min.  1st Qu.   Median  3rd Qu.     Max.
-0.99500 -0.07760 -0.00202  0.07890  1.08000

Coefficients :
          Estimate Std. Error t-value  Pr(>|t|)
lprbarr  -0.231271   0.037648 -6.1429 1.582e-09 ***
lprbconv -0.137803   0.022187 -6.2110 1.058e-09 ***
lprbpris -0.143137   0.039303 -3.6418  0.000297 ***
lavgsen   0.018281   0.030950  0.5907  0.554994
lwmfg    -0.166641   0.055267 -3.0152  0.002690 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    17.991
Residual Sum of Squares: 16.149
R-Squared:      0.10238
Adj. R-Squared: -0.05533
F-statistic: 12.2044 on 5 and 535 DF, p-value: 3.2267e-11
>
> qf(0.95,89,535)
[1] 1.287491
>
> # -----OLS with Pop density, %young male and time dummies ----
> crimereg2 <- lm (lcrmrte ~ lprbarr + lprbconv + lprbpris + lavgsen + lwmfg +
+                              ldensity + lpctymle +
+                              d82 + d83 + d84 + d85 + d86 + d87, data = crime)
> summary(crimereg2)

Call:
lm(formula = lcrmrte ~ lprbarr + lprbconv + lprbpris + lavgsen +
    lwmfg + ldensity + lpctymle + d82 + d83 + d84 + d85 + d86 +
    d87, data = crime)
```

```
Residuals:
     Min       1Q   Median       3Q      Max
-1.28650 -0.21313  0.00437  0.22888  2.34934

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.67693    0.46621  -7.887 1.42e-14 ***
lprbarr     -0.42453    0.04191 -10.129  < 2e-16 ***
lprbconv    -0.28270    0.02879  -9.819  < 2e-16 ***
lprbpris     0.08771    0.06935   1.265   0.2064
lavgsen     -0.10834    0.05774  -1.876   0.0611 .
lwmfg        0.01598    0.07049   0.227   0.8208
ldensity     0.30521    0.02737  11.152  < 2e-16 ***
lpctymle     0.15907    0.08405   1.893   0.0589 .
d82         -0.01757    0.05737  -0.306   0.7595
d83         -0.06686    0.05786  -1.156   0.2483
d84         -0.11935    0.05855  -2.039   0.0419 *
d85         -0.10563    0.05998  -1.761   0.0787 .
d86         -0.06574    0.06117  -1.075   0.2829
d87         -0.01011    0.06166  -0.164   0.8699
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.3743 on 616 degrees of freedom
Multiple R-squared:  0.5818,   Adjusted R-squared:  0.573
F-statistic: 65.92 on 13 and 616 DF,  p-value: < 2.2e-16

> anova(crimereg2)
Analysis of Variance Table

Response: lcrmrte
           Df Sum Sq Mean Sq  F value    Pr(>F)
lprbarr     1 41.760  41.760 298.0358 < 2.2e-16 ***
lprbconv    1 52.223  52.223 372.7064 < 2.2e-16 ***
lprbpris    1  1.718   1.718  12.2644 0.0004951 ***
lavgsen     1  0.053   0.053   0.3803 0.5376831
lwmfg       1  3.811   3.811  27.1970 2.513e-07 ***
ldensity    1 18.906  18.906 134.9301 < 2.2e-16 ***
lpctymle    1  0.482   0.482   3.4419 0.0640403 .
d82         1  0.147   0.147   1.0510 0.3056790
d83         1  0.002   0.002   0.0176 0.8943704
d84         1  0.362   0.362   2.5838 0.1084748
d85         1  0.395   0.395   2.8191 0.0936548 .
d86         1  0.202   0.202   1.4438 0.2299904
d87         1  0.004   0.004   0.0269 0.8698694
Residuals 616 86.313   0.140
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
>
> # ---- Fixed effects with time dummies ----------
>
> crimefe2 <- plm(lcrmrte ~ lprbarr + lprbconv + lprbpris + lavgsen + lwmfg +
+                   ldensity + lpctymle +
+                   d82 + d83 + d84 + d85 + d86 + d87, data = crime,
+                 index = c("county"), model = "within")
>
> summary(crimefe2)
Oneway (individual) effect Within Model

Call:
plm(formula = lcrmrte ~ lprbarr + lprbconv + lprbpris + lavgsen +
    lwmfg + ldensity + lpctymle + d82 + d83 + d84 + d85 + d86 +
    d87, data = crime, model = "within", index = c("county"))
```

```
Balanced Panel: n=90, T=7, N=630

Residuals :
    Min.  1st Qu.   Median  3rd Qu.     Max.
-0.89900 -0.06760  0.00507  0.06630  1.11000

Coefficients :
          Estimate Std. Error t-value  Pr(>|t|)
lprbarr  -0.195152   0.036704 -5.3169 1.562e-07 ***
lprbconv -0.111339   0.021730 -5.1238 4.210e-07 ***
lprbpris -0.097665   0.038424 -2.5418  0.011315 *
lavgsen  -0.023962   0.031460 -0.7617  0.446594
lwmfg    -0.576232   0.132950 -4.3342 1.753e-05 ***
ldensity  0.769416   0.337740  2.2781  0.023118 *
lpctymle  1.246045   0.434638  2.8669  0.004312 **
d82       0.025280   0.027297  0.9261  0.354811
d83       0.021608   0.035170  0.6144  0.539217
d84       0.012070   0.042636  0.2831  0.777209
d85       0.058874   0.052797  1.1151  0.265310
d86       0.158618   0.065225  2.4319  0.015353 *
d87       0.278223   0.077213  3.6033  0.000344 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    17.991
Residual Sum of Squares: 14.383
R-Squared:      0.20051
Adj. R-Squared: 0.045771
F-statistic: 10.167 on 13 and 527 DF, p-value: < 2.22e-16
>
> qf(.95,5,527)
[1] 2.23112
```