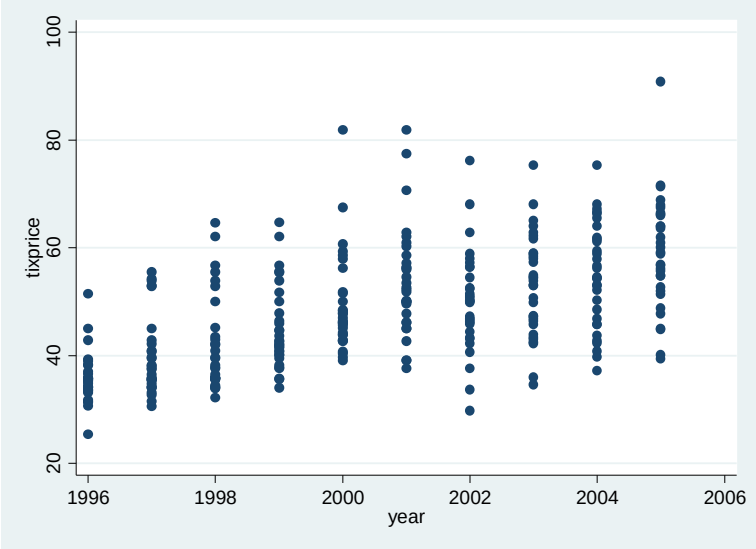
Intercept Dummies and Fixed Effects: Looking at NFL Ticket Price Data

```
. use "nfltix.dta" , clear

.
```

. *Look at trend (year) effects

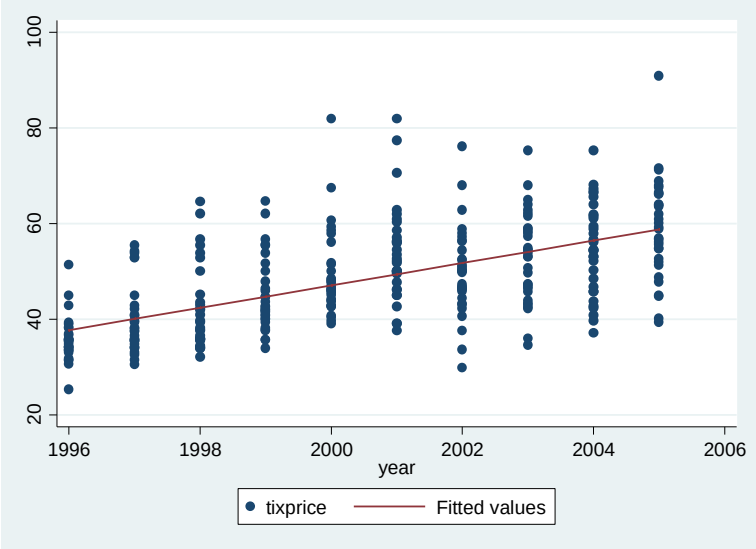
```
. scatter tixprice year
```




```
. corr tixprice year
(obs=311)

             | tixprice     year
-------------+------------------
    tixprice |   1.0000
        year |   0.6019   1.0000


. tabstat tixprice, by(year) stats(n mean sd min max)

Summary for variables: tixprice
     by categories of: year

    year |         N      mean        sd       min       max
---------+--------------------------------------------------
    1996 |        30    35.753  4.694526     25.33     51.41
    1997 |        30  39.68733   7.25928      30.5     55.47
    1998 |        30  42.15267   8.93972     32.15     64.58
    1999 |        31  45.02742   7.77455     33.99     64.65
    2000 |        31  49.35161  9.109982     39.05     81.89
    2001 |        31  53.64355  10.22033      37.6     81.89
    2002 |        32  50.02281  9.268484     29.78     76.19
    2003 |        32  52.94937  9.401004     34.63     75.33
    2004 |        32  54.75188  9.637482     37.13     75.33
    2005 |        32  58.95437  10.47349     39.37     90.89
---------+--------------------------------------------------
   Total |       311  48.39293  11.17113     25.33     90.89
------------------------------------------------------------
.
```

Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

```
. reg tixprice year

      Source |       SS           df       MS      Number of obs   =       311
-------------+----------------------------------   F(1, 309)       =    175.50
       Model |  14013.3998         1  14013.3998   Prob > F        =    0.0000
    Residual |  24672.7915       309  79.8472217   R-squared       =    0.3622
-------------+----------------------------------   Adj R-squared   =    0.3602
       Total |  38686.1913       310  124.794165   Root MSE        =    8.9357

------------------------------------------------------------------------------
    tixprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        year |    2.340513   .1766726    13.25   0.000      1.99288    2.688147
       _cons |   -4633.973   353.4467   -13.11   0.000     -5329.44   -3938.506
------------------------------------------------------------------------------

. predict yhat0
(option xb assumed; fitted values)

. twoway (scatter tixprice year) (line yhat0 year)
```



Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

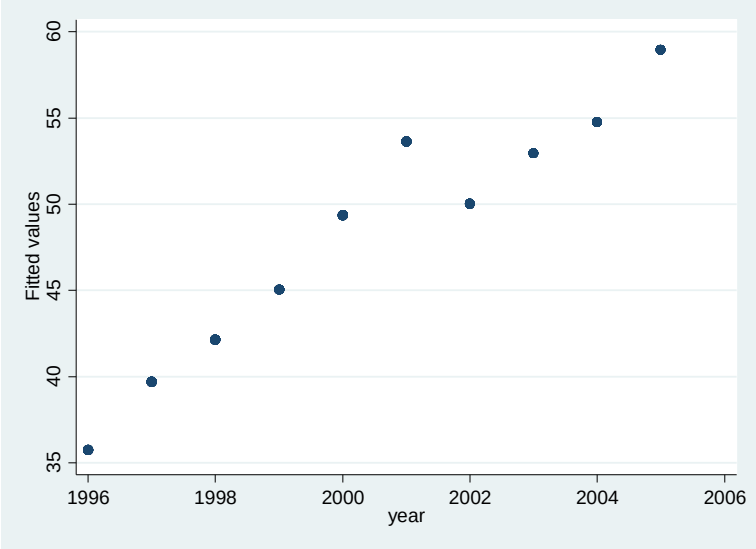
. *Look at year fixed effects (i.year)

```
. reg tixprice i.year
```

Source	SS	df	MS	Number of obs	=	311
Model	15081.876	9	1675.764	F(9, 301)	=	21.37
Residual	23604.3153	301	78.4196521	Prob > F	=	0.0000
Total	38686.1913	310	124.794165	R-squared	=	0.3899
				Adj R-squared	=	0.3716
				Root MSE	=	8.8555

tixprice	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
year						
1997	3.934333	2.286477	1.72	0.086	-.565171	8.433838
1998	6.399667	2.286477	2.80	0.005	1.900163	10.89917
1999	9.274419	2.267963	4.09	0.000	4.811349	13.73749
2000	13.59861	2.267963	6.00	0.000	9.135542	18.06168
2001	17.89055	2.267963	7.89	0.000	13.42748	22.35362
2002	14.26981	2.250467	6.34	0.000	9.841171	18.69845
2003	17.19637	2.250467	7.64	0.000	12.76773	21.62502
2004	18.99887	2.250467	8.44	0.000	14.57023	23.42752
2005	23.20137	2.250467	10.31	0.000	18.77273	27.63002
_cons	35.753	1.616783	22.11	0.000	32.57137	38.93463

```
. predict yhat1
(option xb assumed; fitted values)

. scatter yhat1 year
```



Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

```
. tabstat tixprice yhat1, by(year) stats(mean)

Summary statistics: mean
  by categories of: year

    year |  tixprice     yhat1
---------+--------------------
    1996 |    35.753    35.753
    1997 |  39.68733  39.68733
    1998 |  42.15267  42.15267
    1999 |  45.02742  45.02742
    2000 |  49.35161  49.35161
    2001 |  53.64355  53.64355
    2002 |  50.02281  50.02281
    2003 |  52.94937  52.94938
    2004 |  54.75188  54.75188
    2005 |  58.95437  58.95438
---------+--------------------
   Total |  48.39293  48.39293
------------------------------
```

. *Look at "above average" effects

```
. gen above500=(winprcnt > .500)

. tab winprcnt above500

           |       above500
  winprcnt |         0          1 |     Total
-----------+----------------------+----------
     .0625 |         3          0 |         3
      .125 |         5          0 |         5
     .1875 |        12          0 |        12
       .25 |        23          0 |        23
     .3125 |        25          0 |        25
      .313 |         1          0 |         1
      .375 |        33          0 |        33
     .4375 |        36          0 |        36
        .5 |        38          0 |        38
     .5625 |         0         37 |        37
      .625 |         0         35 |        35
     .6875 |         0         22 |        22
       .75 |         0         19 |        19
     .8125 |         0         14 |        14
      .875 |         0          6 |         6
     .9375 |         0          2 |         2
-----------+----------------------+----------
     Total |       176        135 |       311

. eststo clear
```

Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

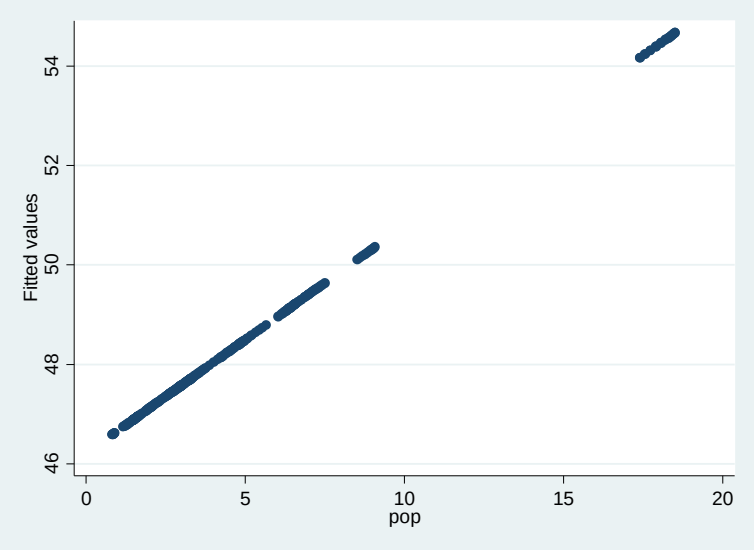
```
. reg tixprice above500

      Source |       SS           df       MS      Number of obs   =       311
-------------+----------------------------------   F(1, 309)       =      2.89
       Model |   358.71207         1   358.71207   Prob > F        =    0.0900
    Residual |  38327.4792       309  124.037149   R-squared       =    0.0093
-------------+----------------------------------   Adj R-squared   =    0.0061
       Total |  38686.1913       310  124.794165   Root MSE        =    11.137

------------------------------------------------------------------------------
    tixprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    above500 |   2.166856   1.274186     1.70   0.090    -.3403233    4.674035
       _cons |   47.45233   .8394978    56.52   0.000     45.80047    49.10418
------------------------------------------------------------------------------

. eststo
(est1 stored)

. predict yhat2
. tabstat yhat2, by(above500) stats(n mean)

Summary for variables: yhat2
     by categories of: above500

above500 |         N      mean
---------+--------------------
       0 |       176  47.45233
       1 |       135  49.61919
---------+--------------------
   Total |       311  48.39293
------------------------------
```

. *Introduce pop effects

```
. reg tixprice pop

      Source |       SS           df       MS      Number of obs   =       311
-------------+----------------------------------   F(1, 309)       =      8.65
       Model |  1053.09603         1  1053.09603   Prob > F        =    0.0035
    Residual |  37633.0952       309  121.789952   R-squared       =    0.0272
-------------+----------------------------------   Adj R-squared   =    0.0241
       Total |  38686.1913       310  124.794165   Root MSE        =    11.036

------------------------------------------------------------------------------
    tixprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   .4571545   .1554658     2.94   0.004     .1512491    .7630599
       _cons |   46.20765   .9715369    47.56   0.000     44.29598    48.11931
------------------------------------------------------------------------------
. eststo
. predict yhat3

What was unexplained by the rest of the model?  (The constant term, of course!)

. gen unexp = tixprice-.4571545*pop
. tabstat unexp, stats(n mean)

    variable |         N      mean
-------------+--------------------
       unexp |       311  46.20765
---------------------------------
```

Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

```
. scatter yhat3 pop
```

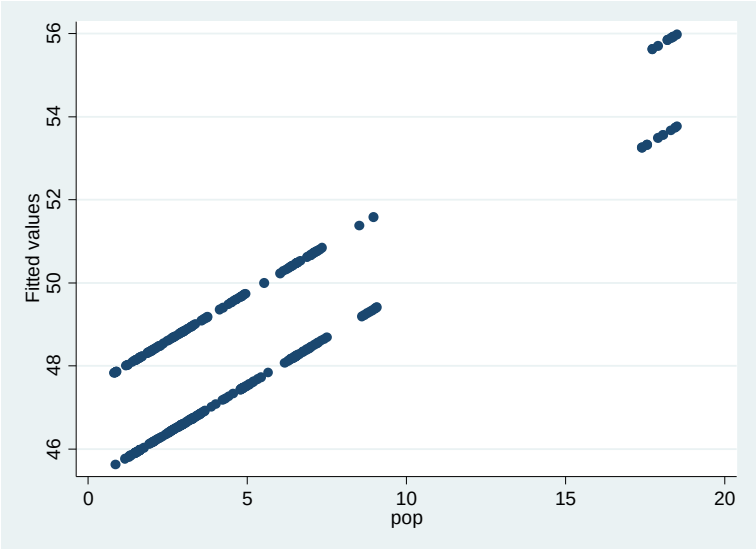


. *Combine pop and above500 fixed effects

```
. reg tixprice above500 pop

      Source |       SS           df       MS      Number of obs   =       311
-------------+----------------------------------   F(2, 308)       =      5.91
       Model |  1430.76291         2  715.381457   Prob > F        =    0.0030
    Residual |  37255.4284       308  120.959183   R-squared       =    0.0370
-------------+----------------------------------   Adj R-squared   =    0.0307
       Total |  38686.1913       310  124.794165   Root MSE        =    10.998

------------------------------------------------------------------------------
    tixprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    above500 |   2.223624   1.258422     1.77   0.078     -.252568    4.699815
         pop |   .4613033   .1549524     2.98   0.003     .1564041    .7662025
       _cons |   45.22258   1.117244    40.48   0.000     43.02418    47.42097
------------------------------------------------------------------------------

. eststo
. predict yhat4

*Dummies capture averages of what was unexplained by the rest of the model

. replace unexp = tixprice-.461303*pop

. tabstat unexp, by(above500) stats(n mean)

Summary for variables: unexp
     by categories of: above500

above500 |         N      mean
---------+--------------------
       0 |       176  45.22258
       1 |       135   47.4462
---------+--------------------
   Total |       311  46.18782
-----------------------------
```

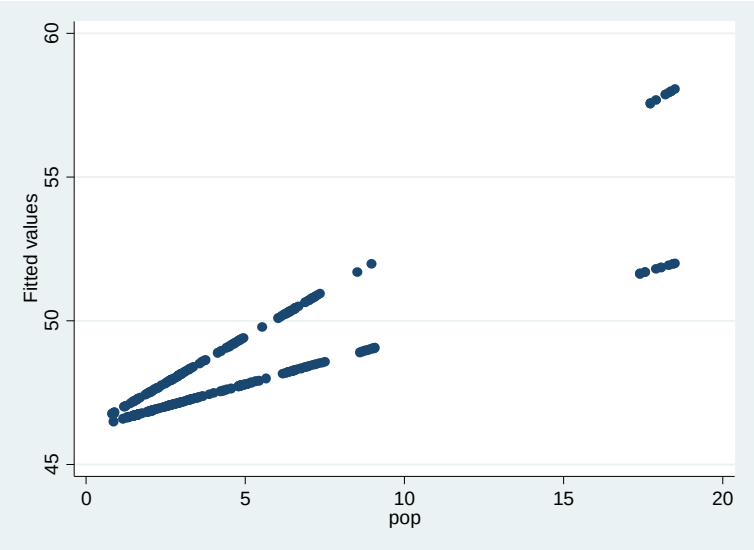
Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

```
. scatter yhat4 pop
```



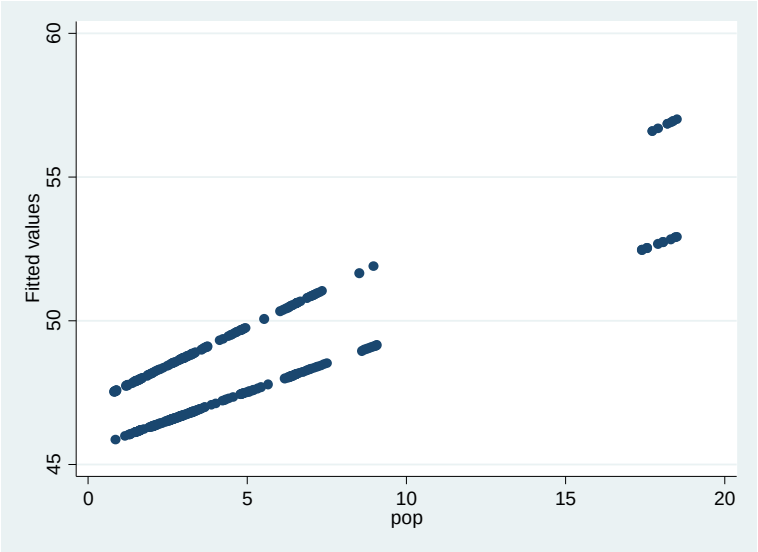

```
. *Now interact pop with above500

. gen above500pop = pop*above500

.
. *same intercept, different slopes
.
. reg tixprice pop above500pop

      Source |       SS           df       MS      Number of obs   =       311
-------------+----------------------------------   F(2, 308)       =      5.67
       Model |  1374.60625         2  687.303127   Prob > F        =    0.0038
    Residual |   37311.585       308   121.14151   R-squared       =    0.0355
-------------+----------------------------------   Adj R-squared   =    0.0293
       Total |  38686.1913       310  124.794165   Root MSE        =    11.006

------------------------------------------------------------------------------
    tixprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   .3109097   .1791633     1.74   0.084    -.0416293    .6634487
 above500pop |   .3282277   .2014765     1.63   0.104    -.0682167    .7246721
       _cons |   46.23558   .9690987    47.71   0.000     44.32868    48.14247
------------------------------------------------------------------------------

. eststo
(est4 stored)

. predict yhat5
(option xb assumed; fitted values)

. scatter yhat5 pop
```

Intercept Dummies and Fixed Effects: *NFL Ticket Prices*




```
. *different intercepts and different slopes
.
. reg tixprice pop above500 above500pop

      Source |       SS           df       MS      Number of obs   =       311
-------------+----------------------------------   F(3, 307)       =      4.00
       Model |  1453.89737         3  484.632458   Prob > F        =    0.0082
    Residual |  37232.2939       307   121.27783   R-squared       =    0.0376
-------------+----------------------------------   Adj R-squared   =    0.0282
       Total |  38686.1913       310  124.794165   Root MSE        =    11.013

------------------------------------------------------------------------------
    tixprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   .3994538   .2100647     1.90   0.058     -.013895    .8128027
    above500 |   1.574924   1.947772     0.81   0.419    -2.257748    5.407597
 above500pop |   .1360968   .3116083     0.44   0.663    -.4770615    .7492552
       _cons |   45.52153   1.311506    34.71   0.000     42.94086    48.10221
------------------------------------------------------------------------------

. eststo
(est5 stored)

. predict yhat6
(option xb assumed; fitted values)

. scatter yhat6 pop
```

Intercept Dummies and Fixed Effects: *NFL Ticket Prices*



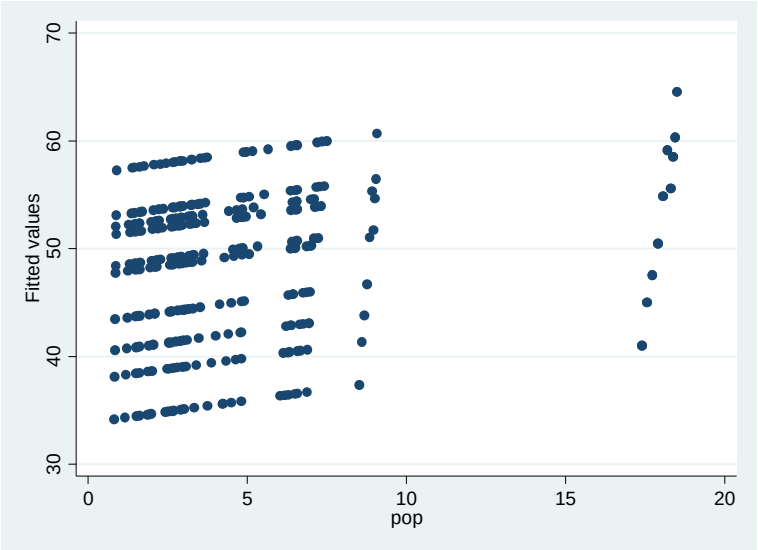
Differences-in-Differences (*Diff-n-Diff*)

```
.
. esttab, r2 ar2 compress

------------------------------------------------------------------------------
                (1)          (2)          (3)          (4)          (5)
            tixprice     tixprice     tixprice     tixprice     tixprice
------------------------------------------------------------------------------
above500       2.167                     2.224                     1.575
              (1.70)                    (1.77)                    (0.81)

pop                         0.457**      0.461**      0.311        0.399
                           (2.94)       (2.98)       (1.74)       (1.90)

above500~p                                           0.328        0.136
                                                     (1.63)       (0.44)

_cons          47.45***     46.21***     45.22***     46.24***     45.52***
              (56.52)      (47.56)      (40.48)      (47.71)      (34.71)
------------------------------------------------------------------------------
N                311          311          311          311          311
R-sq           0.009        0.027        0.037        0.036        0.038
adj. R-sq      0.006        0.024        0.031        0.029        0.028
------------------------------------------------------------------------------
t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001
.
. eststo clear
```

Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

. *Now go back to pop and year effects: Combine pop and year fixed effects

```
. reg tixprice pop i.year

      Source |       SS           df       MS      Number of obs   =       311
-------------+----------------------------------   F(10, 300)      =     21.01
       Model |  15933.1245        10  1593.31245   Prob > F        =    0.0000
    Residual |  22753.0667       300  75.8435558   R-squared       =    0.4119
-------------+----------------------------------   Adj R-squared   =    0.3923
       Total |  38686.1913       310  124.794165   Root MSE        =    8.7088

------------------------------------------------------------------------------
    tixprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   .4111844   .1227348     3.35   0.001     .1696542    .6527145
             |
        year |
       1997  |   3.948284   2.248612     1.76   0.080    -.4767652    8.373334
       1998  |    6.38941    2.24861     2.84   0.005     1.964363    10.81446
       1999  |   9.258814   2.230405     4.15   0.000     4.869593    13.64803
       2000  |    13.5598    2.23043     6.08   0.000     9.170525    17.94907
       2001  |   17.82815   2.230478     7.99   0.000     13.43878    22.21751
       2002  |   14.18987   2.213323     6.41   0.000     9.834268    18.54548
       2003  |   17.10104   2.213377     7.73   0.000     12.74532    21.45675
       2004  |   18.88694   2.213447     8.53   0.000     14.53109    23.24279
       2005  |   23.07208   2.213531    10.42   0.000     18.71606    27.42809
             |
       _cons |   33.84161   1.689268    20.03   0.000      30.5173    37.16593
------------------------------------------------------------------------------

 . eststo
 (est1 stored)

. predict yhat7
(option xb assumed; fitted values)

. scatter yhat7 pop
```



Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

. *Compare coeffs to areg (also fixed effects) results

```
. areg tixprice pop, absorb(year)

Linear regression, absorbing indicators         Number of obs     =        311
                                                F(   1,    300)   =      11.22
                                                Prob > F          =     0.0009
                                                R-squared         =     0.4119
                                                Adj R-squared     =     0.3923
                                                Root MSE          =     8.7088

------------------------------------------------------------------------------
    tixprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   .4111844   .1227348     3.35   0.001     .1696542    .6527145
       _cons |   46.42739   .7668631    60.54   0.000     44.91828    47.93651
-------------+----------------------------------------------------------------
        year |         F(9, 300) =     21.799   0.000          (10 categories)

. eststo
(est2 stored)

. esttab, r2 ar2

--------------------------------------------
                    (1)             (2)
                tixprice        tixprice
--------------------------------------------
pop                0.411***        0.411***
                  (3.35)          (3.35)

1996.year             0
                    (.)

1997.year          3.948
                  (1.76)

1998.year          6.389**
                  (2.84)

Skip a few

2003.year          17.10***
                  (7.73)

2004.year          18.89***
                  (8.53)

2005.year          23.07***
                 (10.42)

_cons              33.84***        46.43***
                 (20.03)         (60.54)
--------------------------------------------
N                    311             311
R-sq                0.412           0.412
adj. R-sq           0.392           0.392
--------------------------------------------
t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001
```

Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

The .do File

```
use "nfltix.dta" , clear

*Look at trend (year) effects
scatter tixprice year
corr tixprice year
tabstat tixprice, by(year) stats(n mean sd min max)

reg tixprice year
predict yhat0
twoway (scatter tixprice year) (line yhat0 year)


*Look at year fixed effects
reg tixprice i.year
predict yhat1
scatter yhat1 year

tabstat tixprice yhat1, by(year) stats(mean)


*Look at "above average" effects
gen above500=(winprcnt > .500)
tab winprcnt above500

eststo clear
reg tixprice above500
eststo
predict yhat2
tabstat yhat2, by(above500) stats(n mean)


*Introduce pop effects
reg tixprice pop
eststo
predict yhat3
scatter yhat3 pop


*Combine pop and above500 fixed effects
reg tixprice above500 pop
eststo
predict yhat4
scatter yhat4 pop

*Dummies capture averages of what was unexplained by the rest of the model

gen unexp = tixprice-.461303*pop
tabstat unexp, by(above500) stats(n mean)


*Now interact pop with above500
gen above500pop = pop*above500


*same intercept, different slopes

reg tixprice pop above500pop
eststo
predict yhat5
scatter yhat5 pop
```

Intercept Dummies and Fixed Effects: *NFL Ticket Prices*

```
*different intercepts and different slopes

reg tixprice pop above500 above500pop
eststo
predict yhat6
scatter yhat6 pop

esttab, r2 ar2 compress


*Now go back to pop and year effects
eststo clear


*Combine pop and year fixed effects
reg tixprice pop i.year
eststo
predict yhat7
scatter yhat7 pop


*Compare coeffs to areg results
areg tixprice pop, absorb(year)
eststo
esttab, r2 ar2
```