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Summer Session 1
Econ 113
7/22/2019

Homework 5

1a. **sum id**

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
          id |        660    11729.01    1071.583      10002      13921
```

There are 660 households in survey.

egen numstate = group(state)
sum numstate

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
    numstate |        660    24.57879    14.36511          1         49
```

There are 49 states in the survey.

tabulate state

```
 home state |      Freq.     Percent        Cum.
------------+-----------------------------------
         AL |         10        1.52        1.52
         AR |          6        0.91        2.42
         AZ |          7        1.06        3.48
         CA |         66       10.00       13.48
         CO |          7        1.06       14.55
         CT |          8        1.21       15.76
         DC |          3        0.45       16.21
         DE |          1        0.15       16.36
         FL |         33        5.00       21.36
         GA |         14        2.12       23.48
         IA |          9        1.36       24.85
         ID |          3        0.45       25.30
         IL |         30        4.55       29.85
         IN |         12        1.82       31.67
         KS |          5        0.76       32.42
         KY |         10        1.52       33.94
         LA |          9        1.36       35.30
         MA |         14        2.12       37.42
```

```
         MD |         20        3.03       40.45
         ME |          5        0.76       41.21
         MI |         25        3.79       45.00
         MN |         24        3.64       48.64
         MO |         15        2.27       50.91
         MS |          4        0.61       51.52
         MT |          2        0.30       51.82
         NC |         15        2.27       54.09
         ND |          3        0.45       54.55
         NE |          3        0.45       55.00
         NH |          4        0.61       55.61
         NJ |         20        3.03       58.64
         NM |          4        0.61       59.24
         NV |          4        0.61       59.85
         NY |         47        7.12       66.97
         OH |         32        4.85       71.82
         OK |          7        1.06       72.88
         OR |          5        0.76       73.64
         PA |         22        3.33       76.97
         RI |          3        0.45       77.42
         SC |         10        1.52       78.94
         SD |          3        0.45       79.39
         TN |         15        2.27       81.67
         TX |         41        6.21       87.88
         UT |          7        1.06       88.94
         VA |         24        3.64       92.58
         VT |          7        1.06       93.64
         WA |         10        1.52       95.15
         WI |         23        3.48       98.64
         WV |          7        1.06       99.70
         WY |          2        0.30      100.00
------------+-----------------------------------
      Total |        660      100.00
```

California has the highest frequency with 66 households.

1b. **sum apples_lbs regprc educ hhsize faminc**

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
  apples_lbs |        660    1.497778    2.920994          0   42.39999
      regprc |        660    .8827273    .2444687        .59       1.19
        educ |        660    14.38182    2.274014          8         20
      hhsize |        660    2.940909    1.526049          1          9
      faminc |        660    53.40909    35.74122          5        250
```

The summary tells us that the average values of Number of pounds of apples purchased (1.498), Price of Apples (0.883), Education Level (14.382), Household size (1.526), Family income (35.741)

1c. **reg apples_lbs regprc male educ hhsize faminc age**

```
      Source |       SS           df       MS      Number of obs   =       660
```

```
-------------+----------------------------------   F(6, 653)       =      1.71
       Model |   86.963784         6   14.493964   Prob > F        =    0.1161
    Residual |  5535.76104       653  8.47742884   R-squared       =    0.0155
-------------+----------------------------------   Adj R-squared   =    0.0064
       Total |  5622.72482       659  8.53220762   Root MSE        =    2.9116

------------------------------------------------------------------------------
  apples_lbs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      regprc |  -1.027972   .4664261    -2.20   0.028    -1.943848   -.1120959
        male |   .3211917   .2647422     1.21   0.225     -.198657    .8410403
        educ |  -.0396405   .0528399    -0.75   0.453    -.1433972    .0641162
      hhsize |   .1418416   .0810334     1.75   0.081    -.0172758    .3009591
      faminc |   .0024789   .0033627     0.74   0.461    -.0041241     .009082
         age |   .0094249   .0080286     1.17   0.241    -.0063401      .02519
       _cons |   1.921942   1.041491     1.85   0.065    -.1231333    3.967017
------------------------------------------------------------------------------
```

A dollar increase in price of regular apple, we would expect the number of pounds of apples purchased to go down by 1.028. Since the p-value is less than 0.05, t-statistics is greater than 1.96 and 95% confidence interval does not include zero, coefficient estimate is statistically significant at the 95% level.

1d. **sum apples_lbs if state == "FL"**

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
  apples_lbs |         33    1.180808    1.632101          0        6.1
```

sum apples_lbs if state == "PA"

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
  apples_lbs |         22    .9242424    1.269095         .1        4.2
```

Average n fumber of pounds of apples purchased by households in Florida and Pennsylvania are 1.180 and 0.924 respectively. It implies that there are characteristic differences across the states regarding demand of apples.

1e. **reg apples_lbs regprc male educ hhsize faminc age i.numstate**

```
      Source |       SS           df       MS      Number of obs   =       660
-------------+----------------------------------   F(54, 605)      =      1.56
       Model |  685.906448        54  12.7019713   Prob > F        =    0.0083
    Residual |  4936.81837       605  8.16003037   R-squared       =    0.1220
-------------+----------------------------------   Adj R-squared   =    0.0436
       Total |  5622.72482       659  8.53220762   Root MSE        =    2.8566

------------------------------------------------------------------------------
  apples_lbs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

regprc	-.8114498	.4781683	-1.70	0.090	-1.750521	.1276215
male	.457658	.2709651	1.69	0.092	-.0744885	.9898044
educ	-.017166	.0535754	-0.32	0.749	-.1223824	.0880504
hhsize	.1446226	.0824746	1.75	0.080	-.0173486	.3065938
faminc	.0040926	.0034233	1.20	0.232	-.0026303	.0108156
age	.0133857	.0081886	1.63	0.103	-.0026957	.0294671
numstate						
2	-.4572004	1.480593	-0.31	0.758	-3.364925	2.450525
3	4.951965	1.410811	3.51	0.000	2.181284	7.722646
4	-.743705	.9758255	-0.76	0.446	-2.660122	1.172712
5	-.6883411	1.417363	-0.49	0.627	-3.471891	2.095208
6	-.1333388	1.362565	-0.10	0.922	-2.809271	2.542594
7	-1.316459	1.893853	-0.70	0.487	-5.035784	2.402865
8	-.6682974	3.013737	-0.22	0.825	-6.586954	5.250359
9	-.8032456	1.037605	-0.77	0.439	-2.84099	1.234499
10	-.4215923	1.191333	-0.35	0.724	-2.761242	1.918057
11	.1661876	1.319684	0.13	0.900	-2.42553	2.757905
12	.2472551	1.89681	0.13	0.896	-3.477877	3.972387
13	-.9623816	1.04885	-0.92	0.359	-3.02221	1.097447
14	-1.005569	1.226727	-0.82	0.413	-3.414728	1.403591
15	-1.586257	1.569629	-1.01	0.313	-4.66884	1.496327
16	.1230167	1.282967	0.10	0.924	-2.396593	2.642626
17	-.8287789	1.318848	-0.63	0.530	-3.418854	1.761297
18	-.6602663	1.192865	-0.55	0.580	-3.002925	1.682392
19	-.7618931	1.109911	-0.69	0.493	-2.94164	1.417854
20	-1.691418	1.573108	-1.08	0.283	-4.780834	1.397998
21	-1.030283	1.072114	-0.96	0.337	-3.1358	1.075235
22	-.4859612	1.080482	-0.45	0.653	-2.607912	1.635989
23	-.8887496	1.170823	-0.76	0.448	-3.188121	1.410622
24	.1516768	1.693161	0.09	0.929	-3.17351	3.476864
25	10.44809	2.219871	4.71	0.000	6.088502	14.80768
26	-.6319742	1.170687	-0.54	0.590	-2.931078	1.66713
27	1.347375	1.884038	0.72	0.475	-2.352674	5.047424
28	-1.198276	1.891852	-0.63	0.527	-4.91367	2.517118
29	-.6103308	1.695744	-0.36	0.719	-3.940591	2.719929
30	.0203974	1.108653	0.02	0.985	-2.156879	2.197674
31	-.4267479	1.698344	-0.25	0.802	-3.762114	2.908618
32	-.9558965	1.697468	-0.56	0.574	-4.289542	2.377749
33	-.7249031	.9996124	-0.73	0.469	-2.688035	1.238228
34	-.780548	1.035977	-0.75	0.451	-2.815096	1.254
35	-.5302519	1.420171	-0.37	0.709	-3.319316	2.258812
36	-.4642612	1.568743	-0.30	0.767	-3.545104	2.616582
37	-1.046057	1.095672	-0.95	0.340	-3.197839	1.105725
38	.6023063	1.88337	0.32	0.749	-3.09643	4.301043
39	-.3778999	1.282072	-0.29	0.768	-2.895751	2.139951
40	-1.352621	1.892034	-0.71	0.475	-5.068373	2.363132
41	-1.041843	1.168103	-0.89	0.373	-3.335871	1.252185
42	-.2459613	1.011002	-0.24	0.808	-2.23146	1.739538
43	-.2642982	1.415027	-0.19	0.852	-3.04326	2.514663
44	.8746097	1.077482	0.81	0.417	-1.241449	2.990668
45	-1.357642	1.417327	-0.96	0.339	-4.14112	1.425837
46	-.9831189	1.289526	-0.76	0.446	-3.515611	1.549373
47	-.9585888	1.08967	-0.88	0.379	-3.098584	1.181407
48	-.7961631	1.41173	-0.56	0.573	-3.568649	1.976323
49	-1.427018	2.216522	-0.64	0.520	-5.780029	2.925993

```
       _cons |   1.619633    1.37227     1.18   0.238    -1.075359    4.314624
------------------------------------------------------------------------------
```

The magnitude of coefficient estimate goes down to -0.8114, and it is not statistically significant any more. This includes tate fixed effects provides estimate taking the state characteristics into account by controlling for fixed characteristics across states by comparing apple consumptions only across people within each state.

2a. **tab year**

```
    1980 to |
       1987 |      Freq.     Percent        Cum.
------------+-----------------------------------
       1980 |        105       12.50       12.50
       1981 |        105       12.50       25.00
       1982 |        105       12.50       37.50
       1983 |        105       12.50       50.00
       1984 |        105       12.50       62.50
       1985 |        105       12.50       75.00
       1986 |        105       12.50       87.50
       1987 |        105       12.50      100.00
------------+-----------------------------------
      Total |        840      100.00
```

It is panel data, where data is about multiple individuals over time. We observe 8 years of data for each individual, because there is data for each individual over time, we can find number of individuals by dividing the total number of observations by 8. Total number of observations can be found.

sum nr

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
          nr |        840    5263.124    3359.317         17      12548
```

There are 105 individuals included in the data.

2b. **reg lwage union**

```
      Source |       SS           df       MS      Number of obs   =       840
-------------+----------------------------------   F(1, 838)       =     10.54
       Model |  2.73936706         1  2.73936706   Prob > F        =    0.0012
    Residual |  217.815704       838  .259923275   R-squared       =    0.0124
-------------+----------------------------------   Adj R-squared   =    0.0112
       Total |  220.555071       839  .262878512   Root MSE        =    .50983

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       union |   .1400301   .0431339     3.25   0.001     .0553669    .2246933
       _cons |   1.597672      .0198    80.69   0.000     1.558808    1.636535
------------------------------------------------------------------------------
```

If the person is a member of the union, the wage is expected to be 14% higher than the people who are not members of the union.

2c. **reg lwage union i.nr**

```
      Source |       SS           df       MS      Number of obs   =       840
-------------+----------------------------------   F(105, 734)     =      5.32
       Model |  95.3035021       105  .907652401   Prob > F        =    0.0000
    Residual |  125.251569       734  .170642465   R-squared       =    0.4321
-------------+----------------------------------   Adj R-squared   =    0.3509
       Total |  220.555071       839  .262878512   Root MSE        =    .41309

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       union |   .1594263   .0478191     3.33   0.001     .0655478    .2533048
             |
          nr |
          45 |   .0960207   .2068901     0.46   0.643    -.3101463    .5021877
         259 |  -.0215594   .2079237    -0.10   0.917    -.4297555    .3866367
         353 |   .0673359   .2066309     0.33   0.745    -.3383223     .472994
         729 |   .4242153   .2068901     2.05   0.041     .0180483    .8303822
         847 |   .0633899   .2079237     0.30   0.761    -.3448062     .471586
         863 |   .1237309   .2065445     0.60   0.549    -.2817574    .5292193
         910 |   .2350906   .2065445     1.14   0.255    -.1703977     .640579
        1081 |  -.2648868   .2065445    -1.28   0.200    -.6703751    .1406016
        1094 |   .1402554   .2065445     0.68   0.497     -.265233    .5457437
        1098 |   .4505421   .2065445     2.18   0.029     .0450538    .8560305
        1107 |   .1408674   .2065445     0.68   0.495    -.2646209    .5463558
        1180 |   .1952872   .2068901     0.94   0.346    -.2108798    .6014542
        1316 |   .3770614   .2065445     1.83   0.068     -.028427    .7825497
        1318 |    -.34804   .2065445    -1.69   0.092    -.7535284    .0574483
        1434 |  -.4848421   .2068901    -2.34   0.019    -.8910091   -.0786751
        1576 |    .089009   .2065445     0.43   0.667    -.3164794    .4944973
        1654 |   .1017975   .2065445     0.49   0.622    -.3036909    .5072858
        1744 |   .1137849   .2079237     0.55   0.584    -.2944113     .521981
        1988 |  -.5160423   .2066309    -2.50   0.013    -.9217004   -.1103841
        2108 |   .3373393     .21074     1.60   0.110    -.0763857    .7510644
        2157 |  -.5762316   .2066309    -2.79   0.005    -.9818897   -.1705734
        2216 |   .1668225   .2066309     0.81   0.420    -.2388356    .5724806
        2227 |  -.2304973   .2068901    -1.11   0.266    -.6366643    .1756696
        2306 |  -.5274109   .2066309    -2.55   0.011    -.9330691   -.1217528
        2312 |   .3956799   .2065445     1.92   0.056    -.0098084    .8011683
        2351 |  -.3981536   .2065445    -1.93   0.054    -.8036419    .0073348
        2401 |   .0178165   .2073214     0.09   0.932    -.3891972    .4248302
        2445 |  -.0846957   .2066309    -0.41   0.682    -.4903538    .3209624
        2721 |  -.5711787   .2068901    -2.76   0.006    -.9773457   -.1650117
        2774 |   .4434422   .2065445     2.15   0.032     .0379539    .8489306
        2842 |   .3632436   .2065445     1.76   0.079    -.0422448    .7687319
        3059 |  -.0240733   .2120077    -0.11   0.910    -.4402872    .3921405
        3138 |      .0368   .2086956     0.18   0.860    -.3729114    .4465114
        3200 |  -.1320197   .2086956    -0.63   0.527    -.5417311    .2776917
        3271 |  -.0189044   .2068901    -0.09   0.927    -.4250714    .3872626
```

3282	.1341108	.2068901	0.65	0.517	-.2720562	.5402778
3414	.3261157	.2065445	1.58	0.115	-.0793727	.731604
3526	.0163638	.2079237	0.08	0.937	-.3918324	.4245599
3706	.0774979	.2065445	0.38	0.708	-.3279904	.4829863
3847	.6535028	.2073214	3.15	0.002	.2464891	1.060516
3882	-.3552479	.2066309	-1.72	0.086	-.760906	.0504102
4000	.003609	.2065445	0.02	0.986	-.4018794	.4090973
4025	-.3071502	.2066309	-1.49	0.138	-.7128083	.0985079
4046	-.1446274	.2065445	-0.70	0.484	-.5501158	.2608609
4128	-.3509784	.21074	-1.67	0.096	-.7647034	.0627466
4261	.2519924	.2066309	1.22	0.223	-.1536657	.6576505
4278	.1341302	.2065445	0.65	0.516	-.2713582	.5396185
4365	-.4477431	.2065445	-2.17	0.030	-.8532314	-.0422547
4380	.2811218	.2086956	1.35	0.178	-.1285897	.6908332
4559	-.2464531	.2065445	-1.19	0.233	-.6519415	.1590352
4563	-.3555635	.2066309	-1.72	0.086	-.7612216	.0500946
4607	-.2763503	.2066309	-1.34	0.182	-.6820084	.1293078
4633	.0063617	.2066309	0.03	0.975	-.3992964	.4120199
4716	-.347167	.2079237	-1.67	0.095	-.7553631	.0610292
4759	-.0114174	.21074	-0.05	0.957	-.4251424	.4023076
4884	-.0517639	.2073214	-0.25	0.803	-.4587776	.3552498
4901	-.3989057	.2120077	-1.88	0.060	-.8151195	.0173082
5017	.7130193	.2065445	3.45	0.001	.307531	1.118508
5033	.6401384	.2065445	3.10	0.002	.2346501	1.045627
5141	.3141813	.2065445	1.52	0.129	-.091307	.7196696
5579	-.1918611	.2065445	-0.93	0.353	-.5973495	.2136272
5698	.0882877	.2096351	0.42	0.674	-.3232681	.4998435
5772	-.4059995	.2065445	-1.97	0.050	-.8114878	-.0005112
5816	-.2660695	.2065445	-1.29	0.198	-.6715578	.1394189
5851	-.331496	.2065445	-1.60	0.109	-.7369844	.0739923
6020	-.8610274	.2065445	-4.17	0.000	-1.266516	-.4555391
6463	-.47733	.2065445	-2.31	0.021	-.8828183	-.0718416
6559	.177383	.2065445	0.86	0.391	-.2281053	.5828714
7060	.0159366	.2073214	0.08	0.939	-.3910771	.4229503
7087	-.6804779	.2073214	-3.28	0.001	-1.087492	-.2734642
7342	-.2302803	.2065445	-1.11	0.265	-.6357686	.1752081
7411	-.51977	.2086956	-2.49	0.013	-.9294814	-.1100586
7454	.286005	.2065445	1.38	0.167	-.1194833	.6914934
7474	-.1869763	.21074	-0.89	0.375	-.6007013	.2267487
7783	-.0571807	.2065445	-0.28	0.782	-.462669	.3483076
8224	.1250242	.2068901	0.60	0.546	-.2811427	.5311912
8364	-.1276324	.2066309	-0.62	0.537	-.5332905	.2780257
8370	.3124729	.2086956	1.50	0.135	-.0972385	.7221843
8415	-.4318591	.2096351	-2.06	0.040	-.843415	-.0203033
8518	.5568141	.2096351	2.66	0.008	.1452582	.9683699
8524	-.5230085	.2096351	-2.49	0.013	-.9345643	-.1114527
8743	.0551623	.2065445	0.27	0.789	-.3503261	.4606506
8749	-.1102718	.2065445	-0.53	0.594	-.5157602	.2952165
8758	.0754359	.2065445	0.37	0.715	-.3300524	.4809243
8842	-.2698157	.2065445	-1.31	0.192	-.675304	.1356727
9082	-.2814707	.2065445	-1.36	0.173	-.686959	.1240177
9131	-.2988473	.2065445	-1.45	0.148	-.7043356	.1066411
9132	-.1133751	.2066309	-0.55	0.583	-.5190332	.292283
9390	.1360907	.2073214	0.66	0.512	-.270923	.5431044
9391	-.1362316	.2065445	-0.66	0.510	-.5417199	.2692568
9683	-.5182686	.2068901	-2.51	0.012	-.9244356	-.1121016
9791	-.0354533	.2065445	-0.17	0.864	-.4409416	.3700351

```
       9846  |   .3553605   .2066309     1.72   0.086    -.0502976    .7610186
       9936  |    .368808   .2086956     1.77   0.078    -.0409034    .7785194
      10043  |  -.7313702   .2066309    -3.54   0.000    -1.137028   -.3257121
      10067  |   .1008419   .2065445     0.49   0.626    -.3046465    .5063302
      10091  |   .0715577   .2066309     0.35   0.729    -.3341004    .4772158
      10209  |  -.3829557   .2065445    -1.85   0.064     -.788444    .0225327
      10265  |   .5794677   .2066309     2.80   0.005     .1738096    .9851258
      12012  |  -.1328268   .2065445    -0.64   0.520    -.5383151    .2726616
      12122  |  -.4650195   .2065445    -2.25   0.025    -.8705078   -.0595312
      12385  |   .1633052   .2065445     0.79   0.429    -.2421831    .5687936
      12534  |   .5333491   .2065445     2.58   0.010     .1278607    .9388374
      12548  |  -.3153899   .2073214    -1.52   0.129    -.7224036    .0916238
             |
       _cons |   1.637786    .146049    11.21   0.000     1.351063     1.92451
------------------------------------------------------------------------------
```

Adding individual fixed effects raises the coefficient estimate to 0.159. The estimate with individual fixed effects provides the relationship between wage and the membership by controlling for individual characteristics, such as work ethics. However omitting such individuals created downward bias and implies workers may not have better work ethics. Therefore concern not valid.

2d. **reg lwage union year**

```
      Source |       SS           df       MS      Number of obs   =       840
-------------+----------------------------------   F(2, 837)       =     43.83
       Model |  20.9080259         2   10.454013   Prob > F        =    0.0000
    Residual |  199.647045       837  .238526936   R-squared       =    0.0948
-------------+----------------------------------   Adj R-squared   =    0.0926
       Total |  220.555071       839  .262878512   Root MSE        =    .48839

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       union |   .1140039   .0414279     2.75   0.006     .0326891    .1953187
        year |   .0643532   .0073736     8.73   0.000     .0498804    .0788261
       _cons |  -126.0414   14.62485    -8.62   0.000    -154.7471   -97.33575
------------------------------------------------------------------------------
```

Coefficient estimate decreased by 0.114, implies both union membership and wages increase over time, by controlling time trend, extract the true effect of union membership. The concern was valid.

2e. **reg lwage union i.year**

```
      Source |       SS           df       MS      Number of obs   =       840
-------------+----------------------------------   F(8, 831)       =     11.64
       Model |  22.2201426         8  2.77751783   Prob > F        =    0.0000
    Residual |  198.334929       831  .238670191   R-squared       =    0.1007
-------------+----------------------------------   Adj R-squared   =    0.0921
       Total |  220.555071       839  .262878512   Root MSE        =    .48854

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

```
       union |   .1094027   .0415557     2.63   0.009     .0278363    .1909691
             |
        year |
        1981 |   .1759985   .0674433     2.61   0.009     .0436192    .3083778
        1982 |    .246268   .0674817     3.65   0.000     .1138135    .3787226
        1983 |   .2479505   .0674259     3.68   0.000     .1156053    .3802956
        1984 |   .3804267   .0675652     5.63   0.000     .2478083    .5130451
        1985 |   .3770881   .0674817     5.59   0.000     .2446335    .5095426
        1986 |   .4389489   .0674538     6.51   0.000     .3065491    .5713488
        1987 |   .5101333    .067652     7.54   0.000     .3773443    .6429222
             |
       _cons |   1.307024   .0480952    27.18   0.000     1.212621    1.401426
------------------------------------------------------------------------------
```

Use year fixed effects her due to concern that relation between wage and union membership vary from year to year. Adding year fixed effects lowers estimate results by 0.109, with the 95% confidence, it isn't significant any longer. This implies may not be strong relationship between wage and union membership. Instead, the year fixed differences created bias and looked like there was a relationship. Relation between wage and union is biased if not include year fix effects.

3a. **reg raise missed**

Source	SS	df	MS	Number of obs =	5
Model	19.3359477	1	19.3359477	F(1, 3) =	39.62
Residual	1.46405229	3	.488017429	Prob > F =	0.0081
Total	20.8	4	5.2	R-squared =	0.9296
				Adj R-squared =	0.9062
				Root MSE =	.69858

raise	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
missed	-.5620915	.089298	-6.29	0.008	-.8462777	-.2779053
_cons	5.673203	.5019789	11.30	0.001	4.075682	7.270724

Riase = 5.67- 0.56Missed + u

reg distance missed

Source	SS	df	MS	Number of obs =	5
Model	18.2281046	1	18.2281046	F(1, 3) =	11.96
Residual	4.57189542	3	1.52396514	Prob > F =	0.0407
Total	22.8	4	5.7	R-squared =	0.7995
				Adj R-squared =	0.7326
				Root MSE =	1.2345

distance	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
missed	.5457516	.1578017	3.46	0.041	.043556	1.047947
_cons	2.398693	.8870648	2.70	0.074	-.4243433	5.221729

Distance = 2.40 + 0.55Missed + u

3b. "Lazy" and "raised", it would be negative. With "lazy" and "missed", it would be positive. It would be biased downward because we would expect true coefficient to be higher towards direction of zero.

3c. Two restrictions distance must satisfy in order to be valid instrument are inclusion and exclusion.
Inclusion: Cov (Missed,Distance) $\neq$ 0 [Missed and Distance has to be related]

Exclusion: Cov (Distance,u) = 0, Cov (Distance,Lazy) = 0

3d. **ivregress 2sls raise (missed=distance)**

Instrumental variables (2SLS) regression	Number of obs =	5
	Wald chi2(1) =	36.89
	Prob > chi2 =	0.0000
	R-squared =	0.9193

Root MSE = .57927

raise	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
missed	-.502994	.0828143	-6.07	0.000	-.665307	-.340681
_cons	5.413174	.4470868	12.11	0.000	4.5369	6.289448

Instrumented: missed

Instruments: distance

3e. The coefficient went from -0.56 in part a to -0.50 in part d. The coefficient did increase however, there is a 3/4 of a standard error shift which is significant. What is important is that in part d, we added distance where in part a, it is only the raise and missed variables.

4a. It is the slope of regression of Employed on H for those who are not drafted into the military. By taking the derivative with respect to H, we get $d_{employed}/d_{h(68)} = 0.023-0.013$Military, which implies with one inch taller height, the probability of being employed will be increased by 0.023-0.013Military. Therefore when the person is not drafted into the military, the person with one inch taller height will have 0.023 higher probability to be employed at age 30.

4b. It is the difference between the slopes of regressions for non-military people and/for military people. The difference between partial derivatives of military person and non-military person is $dEmployed_{M=1}/d(h-68) - dEmployed_{M=0} = 0.013$, the effect of being one inch taller decreases by 0.013 if the person was drafted into the military.

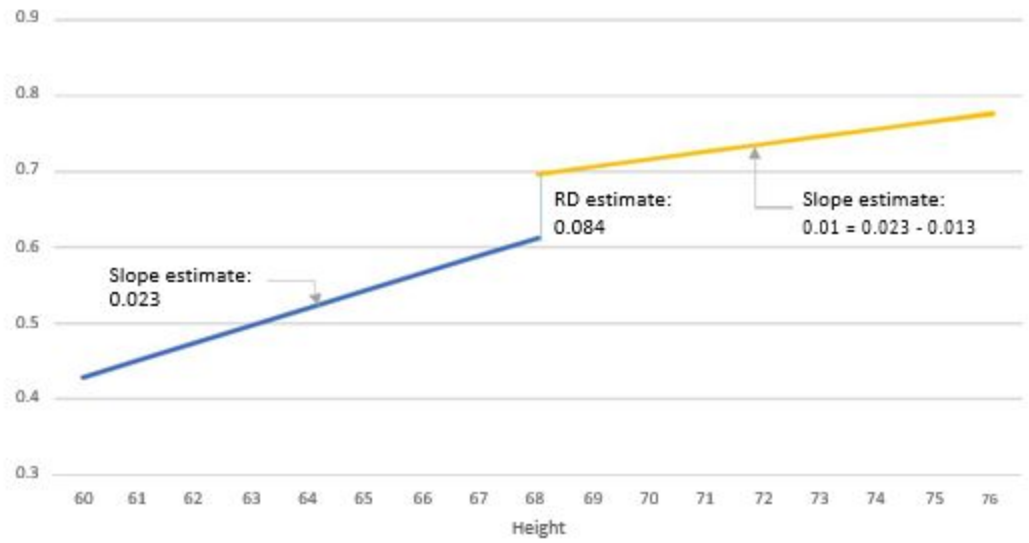
4c. It is the regression discontinuity estimate. It implies the comparisons of the people who are cut off at 68 inch height. The people who are drafted have 0.084 higher probability in getting employed at age 30 than non-drafted.

4d. $H_0 : \beta_3 = 0 : \beta_3 \neq 0$

$T_{95\%} = 1.96$

$t = (0.084-0)/0.033 = 2.55 > 1.96$

Therefore we can reject the null hypothesis that being drafted into military has no effect on being employed at the 95% confidence level



4e.

4f. The person who is 5'7" is not drafted into the military because his/her height is below 68. The predicted employed for this person is then,

$\text{Employed}_{67} = 0.612 + 0.023\ (67 - 68) - 0.013\ (67 - 68)(0) + 0.084(0)$

$= 0.612 + 0.023(67 - 68)$

$= 0.589$

And for the person who is 68" is

$\text{Employed}_{6\,7} = 0.612 + 0.023(68 - 68) - 0.013(68 - 68)(1) + 0.084(1)$

$= 0.612 + 0.084$

$= 0.696$

Total difference in the employment rate is 0.107 (0.696 - 0.589). If the person with 68" was not drafted, expected employment rate should have been 0.612; one inch difference in height increases the rate by 0.023. Because the person drafted, their expected employment rate increases even more, by 0.084; crossing military service height threshold increases rate by 0.084.