```
      name:  <unnamed>
       log:  /Users/samueleborsini/Library/Mobile Documents/com~apple~CloudDo
> cs/Universita`/Economics and econometrics/II anno/Advanced Microeconometric
> s/Project/Data analysis/heterogeneous effects.smcl
  log type:  smcl
 opened on:  28 Nov 2023, 00:01:57

 1 .
 2 . //starting the timer
 3 . scalar t1 = c(current_time)

 4 .
 5 . //#HETEROGENOUS EFFECTS
 6 .
 7 . global firsteq "hs_satisfied public_school hs_professionali hs_tecnici fath
  > er* mother* female italian"

 8 . global secondeq "hs_satisfied public_school hs_professionali hs_tecnici fat
  > her* mother* female italian"

 9 . global thirdeq "ever_failed changed_hs public_school grade hs_professionali
  >  hs_tecnici father* mother* female italian"

10 .
11 . //SEX OF THE STUDENT
12 .
13 . //Women
14 . use "final_data.dta", clear

15 .
16 . keep if female == 1
  (9,495 observations deleted)
```

```
17 .
18 . mvprobit (uni_ins = $firsteq ) (work2012=$secondeq ) (hs_satisfied=$thirdeq
   >  ), robust draws(1000) seed(683)
   note: female omitted because of collinearity.
   note: female omitted because of collinearity.
   note: female omitted because of collinearity.

   Iteration 0:  Log pseudolikelihood = -21678.643  (not concave)
   Iteration 1:  Log pseudolikelihood = -21426.674  (not concave)
   Iteration 2:  Log pseudolikelihood = -21402.456  (not concave)
   Iteration 3:  Log pseudolikelihood = -21381.704  (not concave)
   Iteration 4:  Log pseudolikelihood = -21365.661  (not concave)
   Iteration 5:  Log pseudolikelihood = -21351.206  (not concave)
   Iteration 6:  Log pseudolikelihood = -21330.972  (not concave)
   Iteration 7:  Log pseudolikelihood = -21309.511  (not concave)
   Iteration 8:  Log pseudolikelihood = -21293.632  (not concave)
   Iteration 9:  Log pseudolikelihood = -21277.869  (not concave)
   Iteration 10: Log pseudolikelihood = -21229.957
   Iteration 11: Log pseudolikelihood = -21191.748
   Iteration 12: Log pseudolikelihood = -21122.429
   Iteration 13: Log pseudolikelihood = -21111.464
   Iteration 14: Log pseudolikelihood = -21111.217
   Iteration 15: Log pseudolikelihood = -21111.216

   Multivariate probit (SML, # draws = 1000)         Number of obs   =      1230
   > 0
                                                     Wald chi2(41)   =    9279.6
   > 2
   Log pseudolikelihood = -21111.216                 Prob > chi2     =     0.000
   > 0

   ------------------------------------------------------------------------------
   > ------
                        |               Robust
                        | Coefficient  std. err.      z    P>|z|     [95% conf. int
   > erval]
   ------------------------------------------------------------------------------
   > ------
   uni_ins              |
        hs_satisfied    |   1.444003   .0190058    75.98   0.000     1.406752    1.
   > 481254
       public_school    |   .1793444   .0577339     3.11   0.002      .066188    .2
   > 925007
    hs_professionali    |  -.7935078   .0281135   -28.23   0.000    -.8486093   -.7
   > 384063
          hs_tecnici    |  -.4264066   .0329788   -12.93   0.000    -.4910438   -.3
```

```
> 617693
father_elementary │  -.2059371   .0433703    -4.75   0.000    -.2909413    -.
> 120933
    father_middle │  -.1145504    .025179    -4.55   0.000    -.1639003   -.0
> 652004
       father_uni │   .0400277   .0910592     0.44   0.660     -.138445    .2
> 185004
  father_postgrad │   .2251075   .0477957     4.71   0.000     .1314296    .3
> 187854
mother_elementary │    -.45597   .0462663    -9.86   0.000    -.5466504   -.3
> 652897
    mother_middle │  -.2548588   .0252477   -10.09   0.000    -.3043434   -.2
> 053743
       mother_uni │   .0692974     .07269     0.95   0.340    -.0731724    .2
> 117671
  mother_postgrad │   .1520981   .0487771     3.12   0.002     .0564967    .2
> 476996
         italian │   .0229898   .0787277     0.29   0.770    -.1313136    .1
> 772933
           _cons │  -.1938643   .0978666    -1.98   0.048    -.3856794   -.0
> 020492
──────────────────┼──────────────────────────────────────────────────────────
> ──────
work2012          │
     hs_satisfied │  -.7164764   .0679389   -10.55   0.000    -.8496341   -.5
> 833187
    public_school │  -.0308543    .069613    -0.44   0.658    -.1672933    .1
> 055847
 hs_professionali │   .4530869   .0301145    15.05   0.000     .3940635    .5
> 121103
       hs_tecnici │   .3561995   .0364758     9.77   0.000     .2847083    .4
> 276907
father_elementary │   .1420424   .0468247     3.03   0.002     .0502676    .2
> 338172
    father_middle │   .0880746   .0284715     3.09   0.002     .0322716    .1
> 438776
       father_uni │  -.0486474    .109113    -0.45   0.656     -.262505    .1
> 652102
  father_postgrad │  -.3119247   .0562448    -5.55   0.000    -.4221625   -.2
> 016869
mother_elementary │   .0808429   .0507273     1.59   0.111    -.0185808    .1
> 802666
    mother_middle │   .1349951   .0285118     4.73   0.000     .0791131    .1
> 908771
       mother_uni │   .0292416   .0862268     0.34   0.735    -.1397598    .1
> 982429
```

```
  mother_postgrad │  -.0281599   .0557246    -0.51   0.613    -.1373781    .0
> 810584
         italian │  -.0444495   .0834248    -0.53   0.594     -.207959
> .11906
           _cons │  -.4605753   .1229593    -3.75   0.000    -.7015712   -.2
> 195795
─────────────────┼──────────────────────────────────────────────────────────────
> ──────
hs_satisfied     │
      ever_failed │  -.1680602    .026436    -6.36   0.000    -.2198738   -.1
> 162466
       changed_hs │  -.0545033   .0299153    -1.82   0.068    -.1131362    .0
> 041296
    public_school │  -.3640548   .0596343    -6.10   0.000    -.4809359   -.2
> 471738
            grade │     .02231   .0008233    27.10   0.000     .0206964    .0
> 239236
 hs_professionali │   .0171237   .0281792     0.61   0.543    -.0381065    .0
> 723539
       hs_tecnici │   .0042814   .0349479     0.12   0.902    -.0642151     .
> 072778
father_elementary │  -.0478756   .0459599    -1.04   0.298    -.1379554    .0
> 422042
    father_middle │  -.0074751   .0266112    -0.28   0.779     -.059632    .0
> 446819
       father_uni │   .0017349   .0945529     0.02   0.985    -.1835853    .1
> 870552
  father_postgrad │  -.0580152    .045968    -1.26   0.207    -.1481109    .0
> 320804
mother_elementary │   .2103342   .0491406     4.28   0.000     .1140204     .
> 306648
    mother_middle │     .13688   .0267389     5.12   0.000     .0844728    .1
> 892872
       mother_uni │  -.0318281   .0741592    -0.43   0.668    -.1771775    .1
> 135213
  mother_postgrad │  -.0260157   .0471238    -0.55   0.581    -.1183766    .0
> 663453
         italian │  -.2918704   .0812523    -3.59   0.000     -.451122   -.1
> 326188
           _cons │  -1.209176    .118833   -10.18   0.000    -1.442085   -.9
> 762677
─────────────────┼──────────────────────────────────────────────────────────────
> ──────
    /atrho21 │  -.5232841   .0328397   -15.93   0.000    -.5876487   -.458919
> 5
─────────────┼──────────────────────────────────────────────────────────────
```

```
> ─
    /atrho31 │  -1.654466   .0592313   -27.93   0.000    -1.770557   -1.53837
> 5
─────────────┼──────────────────────────────────────────────────────────────────
> ─
    /atrho32 │   .4781524   .0530718     9.01   0.000     .3741335    .582171
> 2
─────────────┼──────────────────────────────────────────────────────────────────
> ─
       rho21 │  -.4802307   .0252661   -19.01   0.000    -.5282024   -.429203
> 2
─────────────┼──────────────────────────────────────────────────────────────────
> ─
       rho31 │  -.9294679   .0080608  -115.31   0.000    -.9436704   -.911846
> 8
─────────────┼──────────────────────────────────────────────────────────────────
> ─
       rho32 │   .4447627   .0425735    10.45   0.000      .357602    .524241
> 7
─────────────┴──────────────────────────────────────────────────────────────────
> ─
Likelihood ratio test of  rho21 = rho31 = rho32 = 0:
             chi2(3) =  1134.85   Prob > chi2 = 0.0000

19 .
20 . //marginal effect of hs_satisfied
21 . replace hs_satisfied=1
   (6,513 real changes made)

22 . mvppred pred_xb, xb
   (xb will be stored in variables pred_xbi, i = 1,...,#eqs)

23 . replace hs_satisfied=0
   (12,300 real changes made)
```

```
24 . mvppred pred_xb_, xb
   (xb will be stored in variables pred_xb_i, i = 1,...,#eqs)

25 .
26 . //probabilities
27 . gen p_uni1 = normal(pred_xb1)

28 . gen p_uni0 = normal(pred_xb_1)

29 . sum p_uni0 p_uni1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
      p_uni0 |     12,300    .3495986    .1577796    .051944   .6501315
      p_uni1 |     12,300    .8187348    .1229517   .4276789    .966351

30 .
31 . gen p_work1 = normal(pred_xb2)

32 . gen p_work0 = normal(pred_xb_2)

33 . sum p_work0 p_work1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
      p_work0 |     12,300    .3920401    .1081284   .1905249   .5943288
      p_work1 |     12,300    .1680291    .0703772   .0556429   .3164028

34 .
35 . //marginal effect of high school satisfaction on prob(uni_ins)
36 . gen APE_hssat_uni=normal(pred_xb1)-normal(pred_xb_1)

37 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_uni
   (running summarize on estimation sample)

   warning: summarize does not set e(sample), so no observations will be
            excluded from the resampling because of missing values or other
            reasons. To exclude observations, press Break, save the data, drop
            any observations that are to be excluded, and rerun bootstrap.
```

```
Bootstrap replications (1,000): .........10.........20.........30.........40.
> .........50.........60.........70.........80.........90.........100.........
> 110.........120.........130.........140.........150.........160.........170
> .........180.........190.........200.........210.........220.........230...
> ......240.........250.........260.........270.........280.........290......
> ...300.........310.........320.........330.........340.........350.........
> 360.........370.........380.........390.........400.........410.........420
> .........430.........440.........450.........460.........470.........480...
> ......490.........500.........510.........520.........530.........540......
> ...550.........560.........570.........580.........590.........600.........
> 610.........620.........630.........640.........650.........660.........670
> .........680.........690.........700.........710.........720.........730...
> ......740.........750.........760.........770.........780.........790......
> ...800.........810.........820.........830.........840.........850.........
> 860.........870.........880.........890.........900.........910.........920
> .........930.........940.........950.........960.........970.........980...
> ......990.........1,000 done

Bootstrap results                                     Number of obs = 12,30
> 0
                                                      Replications  =  1,00
> 0

      Command: summarize APE_hssat_uni
        _bs_1: r(mean)

─────────────┬──────────────────────────────────────────────────────────────
> ─
             │   Observed   Bootstrap                         Normal-based
             │ coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
─────────────┼──────────────────────────────────────────────────────────────
> ─
       _bs_1 │   .4691362    .000494   949.72   0.000      .468168    .470104
> 4
─────────────┴──────────────────────────────────────────────────────────────
> ─
```

```
38 .
39 . //marginal effect of high school satisfaction on prob(work2012)
40 . gen APE_hssat_work=normal(pred_xb2)-normal(pred_xb_2)

41 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_work
   (running summarize on estimation sample)

   warning: summarize does not set e(sample), so no observations will be
            excluded from the resampling because of missing values or other
            reasons. To exclude observations, press Break, save the data, drop
            any observations that are to be excluded, and rerun bootstrap.

   Bootstrap replications (1,000): .........10.........20.........30.........40.
   > .........50.........60.........70.........80.........90.........100.........
   > 110.........120.........130.........140.........150.........160.........170
   > .........180.........190.........200.........210.........220.........230...
   > ......240.........250.........260.........270.........280.........290......
   > ...300.........310.........320.........330.........340.........350.........
   > 360.........370.........380.........390.........400.........410.........420
   > .........430.........440.........450.........460.........470.........480...
   > ......490.........500.........510.........520.........530.........540......
   > ...550.........560.........570.........580.........590.........600.........
   > 610.........620.........630.........640.........650.........660.........670
   > .........680.........690.........700.........710.........720.........730...
   > ......740.........750.........760.........770.........780.........790......
   > ...800.........810.........820.........830.........840.........850.........
   > 860.........870.........880.........890.........900.........910.........920
   > .........930.........940.........950.........960.........970.........980...
   > ......990.........1,000 done

   Bootstrap results                                       Number of obs = 12,30
   > 0
                                                           Replications  =  1,00
   > 0

         Command: summarize APE_hssat_work
           _bs_1: r(mean)
```

```
-------------+----------------------------------------------------------------
> -
             |   Observed   Bootstrap                         Normal-based
             |  coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
-------------+----------------------------------------------------------------
> -
       _bs_1 |   -.224011   .0003542  -632.48   0.000    -.2247052   -.223316
> 8
-------------+----------------------------------------------------------------
> -

. .
. .
. //Men
. use "final_data.dta", clear

. .
. keep if female == 0
(12,300 observations deleted)

. .
. mvprobit (uni_ins = $firsteq ) (work2012=$secondeq ) (hs_satisfied=$thirdeq
>  ), robust draws(1000) seed(683)
note: female omitted because of collinearity.
note: female omitted because of collinearity.
note: female omitted because of collinearity.

Iteration 0:  Log pseudolikelihood = -16732.973  (not concave)
Iteration 1:  Log pseudolikelihood = -16429.489  (not concave)
Iteration 2:  Log pseudolikelihood = -16417.455  (not concave)
Iteration 3:  Log pseudolikelihood = -16398.219  (not concave)
Iteration 4:  Log pseudolikelihood =  -16388.31  (not concave)
Iteration 5:  Log pseudolikelihood = -16378.263  (not concave)
Iteration 6:  Log pseudolikelihood = -16368.621  (not concave)
Iteration 7:  Log pseudolikelihood = -16359.158  (not concave)
Iteration 8:  Log pseudolikelihood = -16349.684  (not concave)
Iteration 9:  Log pseudolikelihood = -16340.373  (not concave)
Iteration 10: Log pseudolikelihood = -16331.278  (not concave)
Iteration 11: Log pseudolikelihood = -16322.389  (not concave)
Iteration 12: Log pseudolikelihood = -16313.722  (not concave)
Iteration 13: Log pseudolikelihood = -16305.363  (not concave)
Iteration 14: Log pseudolikelihood = -16297.328
Warning: cannot do Cholesky factorization of rho matrix
Warning: cannot do Cholesky factorization of rho matrix
Warning: cannot do Cholesky factorization of rho matrix
```

```
Iteration 15: Log pseudolikelihood = -16228.961
Iteration 16: Log pseudolikelihood = -16196.138
Iteration 17: Log pseudolikelihood =  -16193.14
Iteration 18: Log pseudolikelihood = -16193.092
Iteration 19: Log pseudolikelihood = -16193.092

Multivariate probit (SML, # draws = 1000)         Number of obs   =       949
> 5
                                                  Wald chi2(41)   =    7674.4
> 6
Log pseudolikelihood = -16193.092                 Prob > chi2     =     0.000
> 0

------------------------------------------------------------------------------
> ------
                    |               Robust
                    | Coefficient  std. err.      z    P>|z|     [95% conf. int
> erval]
--------------------+---------------------------------------------------------
> ------
uni_ins             |
     hs_satisfied   |   1.491241   .0232461    64.15   0.000     1.445679    1.
> 536802
    public_school   |   .2319344   .0617204     3.76   0.000     .1109646    .3
> 529041
 hs_professionali   |  -1.080156   .0361337   -29.89   0.000    -1.150977   -1.
> 009336
       hs_tecnici   |  -.5115118   .0328954   -15.55   0.000    -.5759856   -.4
> 470379
father_elementary   |  -.1503712   .0537463    -2.80   0.005     -.255712   -.0
> 450304
    father_middle   |  -.1659284   .0294567    -5.63   0.000    -.2236625   -.1
> 081942
       father_uni   |   .1766836   .1050645     1.68   0.093    -.0292389    .3
> 826062
  father_postgrad   |   .3180789   .0524432     6.07   0.000     .2152921    .4
> 208657
mother_elementary   |   -.342746   .0569425    -6.02   0.000    -.4543512   -.2
> 311408
    mother_middle   |  -.2504937   .0294244    -8.51   0.000    -.3081644   -.1
> 928229
       mother_uni   |   .2438688   .0953096     2.56   0.011     .0570653    .4
> 306722
  mother_postgrad   |   .1285863   .0549151     2.34   0.019     .0209548    .2
> 362179
          italian   |   .0924139   .1031338     0.90   0.370    -.1097247    .2
```

```
> 945525
            _cons │  -.2156717   .1216407    -1.77   0.076    -.4540831    .0
> 227398
──────────────────┼──────────────────────────────────────────────────────────────
> ──────
work2012          │
     hs_satisfied │  -.7246771   .0769025    -9.42   0.000    -.8754031    -.
> 573951
    public_school │  -.0920207   .0665804    -1.38   0.167    -.2225158    .0
> 384745
 hs_professionali │   .7159247   .0384624    18.61   0.000     .6405396    .7
> 913097
       hs_tecnici │   .5335769   .0375861    14.20   0.000     .4599095    .6
> 072443
father_elementary │   .0914345   .0562665     1.63   0.104    -.0188459    .2
> 017149
    father_middle │   .1315374   .0312161     4.21   0.000     .0703549    .1
> 927198
       father_uni │  -.1698728   .1150533    -1.48   0.140    -.3953732    .0
> 556276
  father_postgrad │  -.1806013   .0569668    -3.17   0.002    -.2922542   -.0
> 689483
mother_elementary │   .1088295   .0585997     1.86   0.063    -.0060238    .2
> 236829
    mother_middle │   .0946859     .03114     3.04   0.002     .0336526    .1
> 557192
       mother_uni │  -.2059706   .0997752    -2.06   0.039    -.4015264   -.0
> 104148
  mother_postgrad │  -.1851782   .0597089    -3.10   0.002    -.3022054   -.0
> 681509
          italian │   -.112358    .102415    -1.10   0.273    -.3130877    .0
> 883716
            _cons │  -.3902682   .1329057    -2.94   0.003    -.6507586   -.1
> 297779
──────────────────┼──────────────────────────────────────────────────────────────
> ──────
hs_satisfied      │
      ever_failed │  -.2268468   .0272708    -8.32   0.000    -.2802965    -.
> 173397
       changed_hs │  -.0564095   .0341633    -1.65   0.099    -.1233684    .0
> 105494
    public_school │  -.2373851   .0656664    -3.62   0.000     -.366089   -.1
> 086813
            grade │   .0214862   .0009735    22.07   0.000     .0195782    .0
> 233941
 hs_professionali │   .0253802   .0347694     0.73   0.465    -.0427666    .0
```

```
> 935271
       hs_tecnici │  -.0370708   .0344331    -1.08   0.282    -.1045584    .0
> 304168
father_elementary │  -.0433864   .0549924    -0.79   0.430    -.1511696    .0
> 643968
    father_middle │   .0595975   .0309322     1.93   0.054    -.0010284    .1
> 202234
       father_uni │  -.0570274   .1070601    -0.53   0.594    -.2668613    .1
> 528065
  father_postgrad │  -.0664966   .0516787    -1.29   0.198    -.1677849    .0
> 347917
mother_elementary │   .1460489    .058528     2.50   0.013     .0313361    .2
> 607617
    mother_middle │   .0554948    .030873     1.80   0.072    -.0050151    .1
> 160048
       mother_uni │  -.1991604   .0956494    -2.08   0.037    -.3866298   -.0
> 116911
  mother_postgrad │  -.0116331   .0547416    -0.21   0.832    -.1189245    .0
> 956584
          italian │  -.1469361   .1041068    -1.41   0.158    -.3509816    .0
> 571095
            _cons │  -1.520714   .1423189   -10.69   0.000    -1.799654   -1.
> 241774
──────────────────┼──────────────────────────────────────────────────────────
> ──────
    /atrho21 │  -.5855317   .0366659   -15.97   0.000    -.6573956   -.513667
> 8
─────────────┼──────────────────────────────────────────────────────────
> ─
    /atrho31 │  -1.614644   .0617414   -26.15   0.000    -1.735655   -1.49363
> 3
─────────────┼──────────────────────────────────────────────────────────
> ─
    /atrho32 │   .4697701   .0598197     7.85   0.000     .3525256    .587014
> 6
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho21 │  -.5266744   .0264953   -19.88   0.000    -.5766276    -.47279
> 8
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho31 │  -.9238434   .0090459  -102.13   0.000    -.9397207   -.903991
> 1
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho32 │   .4380136    .048343     9.06   0.000     .3386135    .527745
```

```
   > 1
   -------------+------------------------------------------------------------------

   > -
   Likelihood ratio test of  rho21 = rho31 = rho32 = 0:
               chi2(3) =  1079.76   Prob > chi2 = 0.0000

50 .
51 . //marginal effect of hs_satisfied
52 . replace hs_satisfied=1
   (5,946 real changes made)

53 . mvppred pred_xb, xb
   (xb will be stored in variables pred_xbi, i = 1,...,#eqs)

54 . replace hs_satisfied=0
   (9,495 real changes made)

55 . mvppred pred_xb_, xb
   (xb will be stored in variables pred_xb_i, i = 1,...,#eqs)

56 .
57 . //probabilities
58 . gen p_uni1 = normal(pred_xb1)

59 . gen p_uni0 = normal(pred_xb_1)

60 . sum p_uni0 p_uni1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
      p_uni0 |      9,495    .3048374    .1919872   .0434402   .7487701
      p_uni1 |      9,495    .7764531     .152456   .4126055   .9846857

61 .
```

```
62 . gen p_work1 = normal(pred_xb2)

63 . gen p_work0 = normal(pred_xb_2)

64 . sum p_work0 p_work1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
     p_work0 |      9,495    .4638517    .1485796   .1632424    .682251
     p_work1 |      9,495    .2217021    .1016554   .0440137   .4010329

65 .
66 . //marginal effect of high school satisfaction on prob(uni_ins)
67 . gen APE_hssat_uni=normal(pred_xb1)-normal(pred_xb_1)

68 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_uni
   (running summarize on estimation sample)

   warning: summarize does not set e(sample), so no observations will be
            excluded from the resampling because of missing values or other
            reasons. To exclude observations, press Break, save the data, drop
            any observations that are to be excluded, and rerun bootstrap.

   Bootstrap replications (1,000): .........10.........20.........30.........40.
   > .........50.........60.........70.........80.........90.........100.........
   > 110.........120.........130.........140.........150.........160.........170
   > .........180.........190.........200.........210.........220.........230...
   > ......240.........250.........260.........270.........280.........290......
   > ...300.........310.........320.........330.........340.........350.........
   > 360.........370.........380.........390.........400.........410.........420
   > .........430.........440.........450.........460.........470.........480...
   > ......490.........500.........510.........520.........530.........540......
   > ...550.........560.........570.........580.........590.........600.........
   > 610.........620.........630.........640.........650.........660.........670
   > .........680.........690.........700.........710.........720.........730...
   > ......740.........750.........760.........770.........780.........790......
   > ...800.........810.........820.........830.........840.........850.........
   > 860.........870.........880.........890.........900.........910.........920
   > .........930.........940.........950.........960.........970.........980...
   > ......990.........1,000 done

   Bootstrap results                                       Number of obs = 9,49
   > 5
                                                           Replications  = 1,00
   > 0
```

```
      Command: summarize APE_hssat_uni
        _bs_1: r(mean)

-------------+------------------------------------------------------------------
> -
             |   Observed   Bootstrap                         Normal-based
             |  coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
-------------+------------------------------------------------------------------
> -
       _bs_1 |   .4716157   .0007342   642.37   0.000     .4701767    .473054
> 6
-------------+------------------------------------------------------------------
> -

69 .
70 . //marginal effect of high school satisfaction on prob(work2012)
71 . gen APE_hssat_work=normal(pred_xb2)-normal(pred_xb_2)

72 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_work
   (running summarize on estimation sample)

   warning: summarize does not set e(sample), so no observations will be
            excluded from the resampling because of missing values or other
            reasons. To exclude observations, press Break, save the data, drop
            any observations that are to be excluded, and rerun bootstrap.

   Bootstrap replications (1,000): .........10.........20.........30.........40.
   > .........50.........60.........70.........80.........90.........100.........
   > 110.........120.........130.........140.........150.........160.........170
   > .........180.........190.........200.........210.........220.........230...
   > ......240.........250.........260.........270.........280.........290......
   > ...300.........310.........320.........330.........340.........350.........
   > 360.........370.........380.........390.........400.........410.........420
   > .........430.........440.........450.........460.........470.........480...
   > ......490.........500.........510.........520.........530.........540......
   > ...550.........560.........570.........580.........590.........600.........
   > 610.........620.........630.........640.........650.........660.........670
   > .........680.........690.........700.........710.........720.........730...
   > ......740.........750.........760.........770.........780.........790......
   > ...800.........810.........820.........830.........840.........850.........
   > 860.........870.........880.........890.........900.........910.........920
   > .........930.........940.........950.........960.........970.........980...
   > ......990.........1,000 done
```

```
Bootstrap results                                       Number of obs = 9,49
> 5
                                                        Replications  = 1,00
> 0

      Command: summarize APE_hssat_work
        _bs_1: r(mean)

-------------+------------------------------------------------------------------
> -
             |   Observed   Bootstrap                         Normal-based
             |  coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
-------------+------------------------------------------------------------------
> -
       _bs_1 |  -.2421496   .0005063  -478.26   0.000     -.243142   -.241157
> 3
-------------+------------------------------------------------------------------
> -

73 .
74 .
75 .
76 . //PARENTS EDUCATION
77 . use "final_data.dta", clear

78 .
79 . keep if father_uni == 1 | father_postgrad == 1
(19,444 observations deleted)

80 . keep if mother_uni == 1 | mother_postgrad == 1
(1,201 observations deleted)

81 .
```

```
82 . mvprobit (uni_ins = $firsteq ) (work2012=$secondeq ) (hs_satisfied=$thirdeq
   >  ), robust draws(1000) seed(683)
   note: father_elementary omitted because of collinearity.
   note: father_middle omitted because of collinearity.
   note: father_postgrad omitted because of collinearity.
   note: mother_elementary omitted because of collinearity.
   note: mother_middle omitted because of collinearity.
   note: mother_postgrad omitted because of collinearity.
   note: father_elementary omitted because of collinearity.
   note: father_middle omitted because of collinearity.
   note: father_postgrad omitted because of collinearity.
   note: mother_elementary omitted because of collinearity.
   note: mother_middle omitted because of collinearity.
   note: mother_postgrad omitted because of collinearity.
   note: father_elementary omitted because of collinearity.
   note: father_middle omitted because of collinearity.
   note: father_uni omitted because of collinearity.
   note: mother_elementary omitted because of collinearity.
   note: mother_middle omitted because of collinearity.
   note: mother_postgrad omitted because of collinearity.

   Iteration 0:  Log pseudolikelihood = -1530.5664  (not concave)
   Iteration 1:  Log pseudolikelihood = -1510.3497  (not concave)
   Iteration 2:  Log pseudolikelihood = -1504.7501  (not concave)
   Iteration 3:  Log pseudolikelihood = -1501.5367
   Warning: cannot do Cholesky factorization of rho matrix
   Iteration 4:  Log pseudolikelihood = -1491.6369
   Iteration 5:  Log pseudolikelihood = -1484.7353
   Iteration 6:  Log pseudolikelihood = -1484.5325
   Iteration 7:  Log pseudolikelihood = -1484.5316
   Iteration 8:  Log pseudolikelihood = -1484.5316

   Multivariate probit (SML, # draws = 1000)        Number of obs   =       115
   > 0
                                                    Wald chi2(26)   =     590.0
   > 6
   Log pseudolikelihood = -1484.5316                Prob > chi2     =     0.000
   > 0
```

	Coefficient	Robust std. err.	z	P>|z|	[95% conf.	interval]
uni_ins						
hs_satisfied	**1.471896**	**.0959669**	**15.34**	**0.000**	**1.283804**	**1.659987**
public_school	**.0296738**	**.184798**	**0.16**	**0.872**	**-.3325235**	**.3718711**
hs_professionali	**-1.162814**	**.1709848**	**-6.80**	**0.000**	**-1.497938**	**-.8276897**
hs_tecnici	**-.551081**	**.142887**	**-3.86**	**0.000**	**-.8311344**	**-.2710276**
father_uni	**-.1573041**	**.1532307**	**-1.03**	**0.305**	**-.4576308**	**.1430226**
mother_uni	**.0515783**	**.1268804**	**0.41**	**0.684**	**-.1971028**	**.3002594**
female	**-.2339989**	**.0848476**	**-2.76**	**0.006**	**-.400297**	**-.0677007**
italian	**-.1064038**	**.2878398**	**-0.37**	**0.712**	**-.6705595**	**.4577519**
_cons	**.6701942**	**.3507096**	**1.91**	**0.056**	**-.017184**	**1.357572**
work2012						
hs_satisfied	**-.4028662**	**.2590812**	**-1.55**	**0.120**	**-.910656**	**.1049236**
public_school	**.0100352**	**.1963106**	**0.05**	**0.959**	**-.3747266**	**.3947969**
hs_professionali	**.8136179**	**.1637665**	**4.97**	**0.000**	**.4926414**	**1.134594**
hs_tecnici	**.5402317**	**.1529997**	**3.53**	**0.000**	**.2403578**	**.8401057**
father_uni	**.1883836**	**.1684898**	**1.12**	**0.264**	**-.1418505**	**.5186176**
mother_uni	**-.0310518**	**.1468255**	**-0.21**	**0.833**	**-.3188245**	**.2567208**
female	**-.009436**	**.0985782**	**-0.10**	**0.924**	**-.2026457**	**.1837737**
italian	**-.0178328**	**.2723589**	**-0.07**	**0.948**	**-.5516465**	**.5159809**
_cons	**-1.078418**	**.3617002**	**-2.98**	**0.003**	**-1.787338**	**-.3694978**

```
> 94988
─────────────────┼──────────────────────────────────────────────────────────────
> ──────
hs_satisfied     │
     ever_failed │  -.4388358   .1188665    -3.69   0.000    -.6718098   -.20
> 58617
      changed_hs │  -.1971097   .1208223    -1.63   0.103     -.433917    .03
> 96977
   public_school │  -.2468581   .1575819    -1.57   0.117    -.5557129    .06
> 19968
           grade │   .0247277   .0030947     7.99   0.000     .0186621    .03
> 07932
hs_professionali │   .2854747   .1736657     1.64   0.100    -.0549038    .62
> 58532
      hs_tecnici │   .1371575    .139389     0.98   0.325      -.13604    .41
> 03549
 father_postgrad │  -.0232888    .149878    -0.16   0.877    -.3170444    .27
> 04667
      mother_uni │  -.2588253   .1234402    -2.10   0.036    -.5007637    -.0
> 16887
          female │   .1350516   .0777697     1.74   0.082    -.0173741    .28
> 74774
         italian │  -.2663559   .2882995    -0.92   0.356    -.8314125    .29
> 87007
           _cons │  -1.679109   .4294417    -3.91   0.000      -2.5208   -.83
> 74191
─────────────────┼──────────────────────────────────────────────────────────────
> ──────
    /atrho21 │  -.5074183   .1182516    -4.29   0.000    -.7391873   -.275649
> 4
─────────────┼──────────────────────────────────────────────────────────────
> ─
    /atrho31 │  -1.390264   .1717764    -8.09   0.000     -1.72694   -1.05358
> 9
─────────────┼──────────────────────────────────────────────────────────────
> ─
    /atrho32 │   .3092108    .177003     1.75   0.081    -.0377086    .656130
> 2
─────────────┼──────────────────────────────────────────────────────────────
> ─
       rho21 │  -.4679312   .0923593    -5.07   0.000    -.6286539   -.268873
> 7
─────────────┼──────────────────────────────────────────────────────────────
> ─
       rho31 │   -.883229   .0377748   -23.38   0.000    -.9386933   -.783197
> 7
```

```
-------------+----------------------------------------------------------------
> -
       rho32 |    .299719   .1611025     1.86   0.063    -.0376908    .575782
> 3
-------------+----------------------------------------------------------------
> -
Likelihood ratio test of  rho21 = rho31 = rho32 = 0:
             chi2(3) =  92.0697   Prob > chi2 = 0.0000

83 .
84 . //marginal effect of hs_satisfied
85 . replace hs_satisfied=1
(666 real changes made)

86 . mvppred pred_xb, xb
(xb will be stored in variables pred_xbi, i = 1,...,#eqs)

87 . replace hs_satisfied=0
(1,150 real changes made)

88 . mvppred pred_xb_, xb
(xb will be stored in variables pred_xb_i, i = 1,...,#eqs)

89 .
90 . //probabilities
91 . gen p_uni1 = normal(pred_xb1)

92 . gen p_uni0 = normal(pred_xb_1)

93 . sum p_uni0 p_uni1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
      p_uni0 |      1,150    .6272495    .1240676   .1683635   .7579951
      p_uni1 |      1,150    .9544736    .0509551   .6954095   .9850633
```

```
 94 .
 95 . gen p_work1 = normal(pred_xb2)

 96 . gen p_work0 = normal(pred_xb_2)

 97 . sum p_work0 p_work1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
     p_work0 |      1,150    .1732966    .0788667   .1278238   .4697822
     p_work1 |      1,150    .0923509     .055875   .0618283   .3160819

 98 .
 99 . //marginal effect of high school satisfaction on prob(uni_ins)
100 . gen APE_hssat_uni=normal(pred_xb1)-normal(pred_xb_1)

101 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_uni
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
    > 860.........870.........880.........890.........900.........910.........920
    > .........930.........940.........950.........960.........970.........980...
    > ......990.........1,000 done
```

```
Bootstrap results                                       Number of obs = 1,15
> 0
                                                        Replications  = 1,00
> 0

      Command: summarize APE_hssat_uni
        _bs_1: r(mean)

─────────────┬──────────────────────────────────────────────────────────────
> ─
             │   Observed   Bootstrap                         Normal-based
             │ coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
─────────────┼──────────────────────────────────────────────────────────────
> ─
       _bs_1 │   .3272241   .0021355   153.23   0.000     .3230386    .331409
> 6
─────────────┴──────────────────────────────────────────────────────────────
> ─

102 .
103 . //marginal effect of high school satisfaction on prob(work2012)
104 . gen APE_hssat_work=normal(pred_xb2)-normal(pred_xb_2)

105 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_work
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
```

```
> 860.........870.........880.........890.........900.........910.........920
> .........930.........940.........950.........960.........970.........980...
> ......990.........1,000 done

Bootstrap results                                       Number of obs = 1,15
> 0
                                                        Replications  = 1,00
> 0

      Command: summarize APE_hssat_work
        _bs_1: r(mean)

-------------+------------------------------------------------------------
> -
             |   Observed   Bootstrap                         Normal-based
             |  coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
-------------+------------------------------------------------------------
> -
       _bs_1 |  -.0809457   .0006479  -124.94   0.000    -.0822155   -.079675
> 8
-------------+------------------------------------------------------------
> -

106 .
107 .
108 . // At least one of the parents has lower than university education.
109 . use "final_data.dta", clear

110 . drop if (father_uni == 1 & mother_uni == 1) | (father_uni == 1 & mother_pos
> tgrad == 1) | (father_postgrad == 1 & mother_uni == 1) | (father_postgrad =
> = 1 & mother_postgrad == 1)
(1,150 observations deleted)
```

```
111 .
112 . mvprobit (uni_ins = $firsteq ) (work2012=$secondeq ) (hs_satisfied=$thirdeq
    >  ), robust draws(1000) seed(683)

    Iteration 0:  Log pseudolikelihood = -36947.608  (not concave)
    Iteration 1:  Log pseudolikelihood = -36458.164  (not concave)
    Iteration 2:  Log pseudolikelihood = -36376.442  (not concave)
    Iteration 3:  Log pseudolikelihood = -36349.649  (not concave)
    Iteration 4:  Log pseudolikelihood =  -36322.31  (not concave)
    Iteration 5:  Log pseudolikelihood =  -36229.03
    Warning: cannot do Cholesky factorization of rho matrix
    Warning: cannot do Cholesky factorization of rho matrix
    Warning: cannot do Cholesky factorization of rho matrix
    Warning: cannot do Cholesky factorization of rho matrix
    Warning: cannot do Cholesky factorization of rho matrix
    Warning: cannot do Cholesky factorization of rho matrix
    Iteration 6:  Log pseudolikelihood = -36175.892  (backed up)
    Iteration 7:  Log pseudolikelihood = -35986.366
    Iteration 8:  Log pseudolikelihood = -35884.874
    Iteration 9:  Log pseudolikelihood = -35878.116
    Iteration 10: Log pseudolikelihood = -35877.878
    Iteration 11: Log pseudolikelihood = -35877.878

    Multivariate probit (SML, # draws = 1000)         Number of obs   =      2064
    > 5
                                                      Wald chi2(44)   =   16398.3
    > 3
    Log pseudolikelihood = -35877.878                 Prob > chi2     =     0.000
    > 0

    ------------------------------------------------------------------------------
    > ------
                        |               Robust
                        | Coefficient  std. err.      z    P>|z|     [95% conf. int
    > erval]
    ------------------------------------------------------------------------------
    > ------
    uni_ins             |
         hs_satisfied |   1.465225    .014882    98.46   0.000     1.436057    1.
    > 494394
        public_school |   .2157918   .0433107     4.98   0.000     .1309044    .3
    > 006793
     hs_professionali |  -.8963582   .0222918   -40.21   0.000    -.9400494    -.
    > 852667
           hs_tecnici |  -.4337028   .0229723   -18.88   0.000    -.4787277   -.3
    > 886779
```

```
father_elementary │  -.1844143   .0337951    -5.46   0.000    -.2506514   -.1
> 181772
    father_middle │  -.1364611   .0190871    -7.15   0.000    -.1738711   -.0
> 990511
       father_uni │    .136424   .0821519     1.66   0.097    -.0245907    .2
> 974388
  father_postgrad │   .3380435   .0447034     7.56   0.000     .2504265    .4
> 256605
mother_elementary │  -.4107381   .0360096   -11.41   0.000    -.4813157   -.3
> 401605
    mother_middle │  -.2496061   .0191406   -13.04   0.000     -.287121   -.2
> 120913
       mother_uni │   .1631374   .0724279     2.25   0.024     .0211814    .3
> 050935
  mother_postgrad │   .2147705   .0458038     4.69   0.000     .1249966    .3
> 045443
           female │   .0072965   .0178047     0.41   0.682       -.0276    .0
> 421931
          italian │   .0457729   .0641274     0.71   0.475    -.0799145    .1
> 714603
            _cons │  -.2406267   .0786785    -3.06   0.002    -.3948337   -.0
> 864196
──────────────────┼──────────────────────────────────────────────────────────
> ──────
work2012          │
     hs_satisfied │  -.7340658   .0510959   -14.37   0.000     -.834212   -.6
> 339197
    public_school │  -.0659751    .049283    -1.34   0.181    -.1625681    .0
> 306178
 hs_professionali │   .5477516   .0236183    23.19   0.000     .5014605    .5
> 940427
       hs_tecnici │   .4128173    .025512    16.18   0.000     .3628148    .4
> 628199
father_elementary │   .1226543   .0359526     3.41   0.001     .0521885
> .19312
    father_middle │    .110301   .0210196     5.25   0.000     .0691033    .1
> 514986
       father_uni │  -.1302736   .0970607    -1.34   0.180     -.320509    .0
> 599618
  father_postgrad │  -.2677376   .0493866    -5.42   0.000    -.3645335   -.1
> 709416
mother_elementary │   .0948327    .038133     2.49   0.013     .0200934     .
> 169572
    mother_middle │   .1186266   .0210451     5.64   0.000     .0773791    .1
> 598742
       mother_uni │  -.0599342   .0799847    -0.75   0.454    -.2167013     .
```

```
> 096833
  mother_postgrad │  −.1279296   .0507812    −2.52   0.012    −.2274589   −.0
> 284003
          female │  −.0783704   .0199616    −3.93   0.000    −.1174945   −.0
> 392463
         italian │  −.0675582   .0661034    −1.02   0.307    −.1971186    .0
> 620022
           _cons │  −.3511533   .0908924    −3.86   0.000    −.5292992   −.1
> 730074
─────────────────┼──────────────────────────────────────────────────────────────
> ──────
hs_satisfied     │
      ever_failed │  −.1872606    .019072    −9.82   0.000    −.2246411   −.1
> 498801
       changed_hs │  −.0467827   .0228273    −2.05   0.040    −.0915233   −.0
> 020421
    public_school │  −.3080042   .0458421    −6.72   0.000    −.3978531   −.2
> 181553
           grade │   .0218517   .0006399    34.15   0.000     .0205976    .0
> 231058
 hs_professionali │    .021017   .0220475     0.95   0.340    −.0221954    .0
> 642293
       hs_tecnici │  −.0233567   .0243909    −0.96   0.338    −.0711619    .0
> 244486
father_elementary │  −.0444207   .0352831    −1.26   0.208    −.1135743    .0
> 247329
    father_middle │   .0203352   .0201439     1.01   0.313    −.0191462    .0
> 598165
       father_uni │    .045882   .0852468     0.54   0.590    −.1211986    .2
> 129626
  father_postgrad │  −.0586949   .0433438    −1.35   0.176    −.1436472    .0
> 262574
mother_elementary │   .1861925   .0376328     4.95   0.000     .1124336    .2
> 599515
    mother_middle │   .1053534   .0202173     5.21   0.000     .0657283    .1
> 449785
       mother_uni │  −.0097606   .0727087    −0.13   0.893    −.1522671    .1
> 327458
  mother_postgrad │   −.036176   .0460383    −0.79   0.432    −.1264094    .0
> 540573
          female │   .1392783   .0187105     7.44   0.000     .1026065    .1
> 759501
         italian │  −.2362129   .0654761    −3.61   0.000    −.3645437   −.1
> 078821
           _cons │  −1.412329   .0937535   −15.06   0.000    −1.596083   −1.
> 228576
```

```
------------------+------------------------------------------------------------
> ------
     /atrho21 |  -.5549463   .0247902   -22.39   0.000    -.6035342   -.506358
> 4
-------------+------------------------------------------------------------------
> -
     /atrho31 |  -1.660074   .0455759   -36.42   0.000    -1.749401   -1.57074
> 7
-------------+------------------------------------------------------------------
> -
     /atrho32 |   .4829924      .0401    12.04   0.000     .4043977     .56158
> 7
-------------+------------------------------------------------------------------
> -
       rho21 |  -.5042182   .0184876   -27.27   0.000    -.5395596    -.46710
> 3
-------------+------------------------------------------------------------------
> -
       rho31 |  -.9302271    .006138  -151.55   0.000    -.9413073   -.917144
> 4
-------------+------------------------------------------------------------------
> -
       rho32 |   .4486369   .0320289    14.01   0.000     .3837055     .50915
> 4
-------------+------------------------------------------------------------------
> -
Likelihood ratio test of  rho21 = rho31 = rho32 = 0:
             chi2(3) =  2139.46   Prob > chi2 = 0.0000

113 .
114 . //marginal effect of hs_satisfied
115 . replace hs_satisfied=1
    (11,793 real changes made)
```

```
116 . mvppred pred_xb, xb
    (xb will be stored in variables pred_xbi, i = 1,...,#eqs)

117 . replace hs_satisfied=0
    (20,645 real changes made)

118 . mvppred pred_xb_, xb
    (xb will be stored in variables pred_xb_i, i = 1,...,#eqs)

119 .
120 . //probabilities
121 . gen p_uni1 = normal(pred_xb1)

122 . gen p_uni0 = normal(pred_xb_1)

123 . sum p_uni0 p_uni1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
      p_uni0 |     20,645    .3146769    .1622118   .0458628   .6429212
      p_uni1 |     20,645    .7934236    .1347398   .4124922   .9664873

124 .
125 . gen p_work1 = normal(pred_xb2)

126 . gen p_work0 = normal(pred_xb_2)

127 . sum p_work0 p_work1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
     p_work0 |     20,645    .4377011    .1223542   .2030448   .6450179
     p_work1 |     20,645    .1960938    .0836353   .0588078   .3586156
```

```
128 .
129 . //marginal effect of high school satisfaction on prob(uni_ins)
130 . gen APE_hssat_uni=normal(pred_xb1)-normal(pred_xb_1)

131 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_uni
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
    > 860.........870.........880.........890.........900.........910.........920
    > .........930.........940.........950.........960.........970.........980...
    > ......990.........1,000 done

    Bootstrap results                                       Number of obs = 20,64
    > 5
                                                            Replications  =  1,00
    > 0

          Command: summarize APE_hssat_uni
            _bs_1: r(mean)
```

```
-------------+----------------------------------------------------------------
> -
             |   Observed   Bootstrap                         Normal-based
             |  coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
-------------+----------------------------------------------------------------
> -
       _bs_1 |   .4787467   .0003491  1371.45   0.000     .4780625    .479430
> 9
-------------+----------------------------------------------------------------
> -

132 .
133 . //marginal effect of high school satisfaction on prob(work2012)
134 . gen APE_hssat_work=normal(pred_xb2)-normal(pred_xb_2)

135 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_work
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
    > 860.........870.........880.........890.........900.........910.........920
    > .........930.........940.........950.........960.........970.........980...
    > ......990.........1,000 done
```

```
Bootstrap results                                       Number of obs = 20,64
> 5
                                                        Replications  =  1,00
> 0

      Command: summarize APE_hssat_work
        _bs_1: r(mean)

─────────────┬──────────────────────────────────────────────────────────────
> ─
             │   Observed   Bootstrap                         Normal-based
             │ coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
─────────────┼──────────────────────────────────────────────────────────────
> ─
       _bs_1 │  -.2416073    .000268  -901.65   0.000    -.2421325   -.241082
> 1
─────────────┴──────────────────────────────────────────────────────────────
> ─

136 .
137 .
138 .
139 . //TYPE OF HS
140 . //liceo
141 . use "final_data.dta", clear

142 .
143 . keep if hs_tecnici == 0 & hs_professionali == 0
(11,283 observations deleted)

144 .
145 . mvprobit (uni_ins = $firsteq ) (work2012=$secondeq ) (hs_satisfied=$thirdeq
>  ), robust draws(1000) seed(683)
note: hs_professionali omitted because of collinearity.
note: hs_tecnici omitted because of collinearity.
note: hs_professionali omitted because of collinearity.
note: hs_tecnici omitted because of collinearity.
note: hs_professionali omitted because of collinearity.
note: hs_tecnici omitted because of collinearity.
```

```
Iteration 0:  Log pseudolikelihood = -16991.947  (not concave)
Iteration 1:  Log pseudolikelihood = -16813.162  (not concave)
Iteration 2:  Log pseudolikelihood = -16776.095  (not concave)
Iteration 3:  Log pseudolikelihood = -16737.874  (not concave)
Iteration 4:  Log pseudolikelihood = -16714.529  (not concave)
Iteration 5:  Log pseudolikelihood = -16688.995
Warning: cannot do Cholesky factorization of rho matrix
Warning: cannot do Cholesky factorization of rho matrix
Warning: cannot do Cholesky factorization of rho matrix
Warning: cannot do Cholesky factorization of rho matrix
Iteration 6:  Log pseudolikelihood = -16612.354
Iteration 7:  Log pseudolikelihood = -16594.117
Iteration 8:  Log pseudolikelihood = -16562.364
Iteration 9:  Log pseudolikelihood = -16561.923
Iteration 10: Log pseudolikelihood = -16561.921
Iteration 11: Log pseudolikelihood = -16561.921

Multivariate probit (SML, # draws = 1000)         Number of obs   =      1051
> 2
                                                  Wald chi2(38)   =    5951.9
> 6
Log pseudolikelihood = -16561.921                 Prob > chi2     =     0.000
> 0

------------------------------------------------------------------------------
> ------
             |               Robust
             | Coefficient  std. err.      z    P>|z|     [95% conf. int
> erval]
-------------+----------------------------------------------------------------
> ------
uni_ins      |
     hs_satisfied |   1.452031   .0241209    60.20   0.000     1.404755    1.
> 499307
    public_school |   .1142088   .0536408     2.13   0.033     .0090747     .
> 219343
father_elementary |  -.1935155   .0578663    -3.34   0.001    -.3069313   -.0
> 800996
    father_middle |  -.1406583   .0290557    -4.84   0.000    -.1976065   -.0
> 837102
       father_uni |   .0732534   .0873697     0.84   0.402    -.0979881    .2
> 444948
  father_postgrad |   .2501172    .044303     5.65   0.000     .1632849    .3
> 369495
mother_elementary |  -.4090891   .0627978    -6.51   0.000    -.5321705   -.2
> 860077
```

```
    mother_middle │  -.2554096   .0294476    -8.67   0.000    -.3131259   -.1
> 976932
       mother_uni │   .1376871   .0683849     2.01   0.044     .0036551    .2
> 717192
  mother_postgrad │   .1581148   .0443677     3.56   0.000     .0711556     .
> 245074
          female │  -.1164228   .0272799    -4.27   0.000    -.1698904   -.0
> 629552
         italian │   .1881778   .1346304     1.40   0.162     -.075693    .4
> 520486
           _cons │   -.159261   .1447066    -1.10   0.271    -.4428806    .1
> 243587
──────────────────┼──────────────────────────────────────────────────────────
> ──────
work2012          │
     hs_satisfied │  -.8624971   .0630102   -13.69   0.000    -.9859949   -.7
> 389994
    public_school │   -.050373   .0622302    -0.81   0.418     -.172342     .
> 071596
father_elementary │   .1704898   .0643753     2.65   0.008     .0443166     .
> 296663
    father_middle │   .1128979   .0329679     3.42   0.001      .048282    .1
> 775138
       father_uni │  -.0822578   .0969912    -0.85   0.396     -.272357    .1
> 078414
  father_postgrad │  -.2461492   .0488282    -5.04   0.000    -.3418507   -.1
> 504476
mother_elementary │   .1115662   .0709025     1.57   0.116    -.0274002    .2
> 505326
    mother_middle │   .1531964   .0332901     4.60   0.000      .087949    .2
> 184438
       mother_uni │  -.0705191   .0787033    -0.90   0.370    -.2247747    .0
> 837366
  mother_postgrad │  -.0995319   .0492199    -2.02   0.043    -.1960011   -.0
> 030626
          female │   .0782421   .0310566     2.52   0.012     .0173723    .1
> 391119
         italian │  -.1914804   .1421535    -1.35   0.178    -.4700962    .0
> 871354
           _cons │  -.2996244    .159757    -1.88   0.061    -.6127425    .0
> 134936
──────────────────┼──────────────────────────────────────────────────────────
> ──────
hs_satisfied      │
      ever_failed │  -.2751363   .0317589    -8.66   0.000    -.3373827     -
> .21289
```

```
       changed_hs │  -.1993282   .0373439    -5.34   0.000     -.272521   -.1
> 261354
    public_school │  -.2960011   .0540182    -5.48   0.000    -.4018748   -.1
> 901274
            grade │   .0217051   .0009211    23.56   0.000     .0198998    .0
> 235104
father_elementary │  -.0647974   .0617429    -1.05   0.294    -.1858112    .0
> 562164
    father_middle │   .0196166   .0299333     0.66   0.512    -.0390515    .0
> 782847
       father_uni │   .0210873   .0859382     0.25   0.806    -.1473484     .
> 189523
  father_postgrad │  -.0357781   .0403577    -0.89   0.375    -.1148777    .0
> 433215
mother_elementary │     .08331   .0670906     1.24   0.214    -.0481851    .2
> 148051
    mother_middle │   .1010841   .0305028     3.31   0.001     .0412998    .1
> 608685
       mother_uni │  -.1495669   .0676997    -2.21   0.027    -.2822559   -.0
> 168779
  mother_postgrad │  -.0434737   .0413187    -1.05   0.293    -.1244569    .0
> 375094
          female │   .1346388   .0275026     4.90   0.000     .0807347    .1
> 885428
         italian │  -.0098173   .1375683    -0.07   0.943    -.2794462    .2
> 598116
           _cons │  -1.601459    .162995    -9.83   0.000    -1.920924   -1.
> 281995
──────────────────┼──────────────────────────────────────────────────────────
> ──────
    /atrho21 │  -.5614493    .032569   -17.24   0.000    -.6252835   -.497615
> 2
─────────────┼──────────────────────────────────────────────────────────
> ─
    /atrho31 │  -1.508862   .0623525   -24.20   0.000    -1.631071   -1.38665
> 4
─────────────┼──────────────────────────────────────────────────────────
> ─
    /atrho32 │   .5871164    .054759    10.72   0.000     .4797908    .694442
> 1
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho21 │   -.509052   .0241293   -21.10   0.000     -.554796   -.460239
> 6
─────────────┼──────────────────────────────────────────────────────────
> ─
```

```
       rho31 |  -.9067369    .011088   -81.78   0.000    -.9262139   -.882432
> 5
-------------+------------------------------------------------------------
> -
       rho32 |   .5278185   .0395035    13.36   0.000     .4460761    .600828
> 1
-------------+------------------------------------------------------------
> -
Likelihood ratio test of  rho21 = rho31 = rho32 = 0:
             chi2(3) =  860.052   Prob > chi2 = 0.0000

146 .
147 . //marginal effect of hs_satisfied
148 . replace hs_satisfied=1
    (5,723 real changes made)

149 . mvppred pred_xb, xb
    (xb will be stored in variables pred_xbi, i = 1,...,#eqs)

150 . replace hs_satisfied=0
    (10,512 real changes made)

151 . mvppred pred_xb_, xb
    (xb will be stored in variables pred_xb_i, i = 1,...,#eqs)

152 .
153 . //probabilities
154 . gen p_uni1 = normal(pred_xb1)

155 . gen p_uni0 = normal(pred_xb_1)

156 . sum p_uni0 p_uni1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
      p_uni0 |     10,512    .4883714     .104019   .1898936   .7093058
      p_uni1 |     10,512    .9152794    .0398351   .7169291   .9774323
```

```
157 .
158 . gen p_work1 = normal(pred_xb2)

159 . gen p_work0 = normal(pred_xb_2)

160 . sum p_work0 p_work1
```

Variable	Obs	Mean	Std. dev.	Min	Max
p_work0	**10,512**	**.3327024**	**.0670835**	**.1874967**	**.5241904**
p_work1	**10,512**	**.100197**	**.0312511**	**.0400888**	**.2113275**

```
161 .
162 . //marginal effect of high school satisfaction on prob(uni_ins)
163 . gen APE_hssat_uni=normal(pred_xb1)-normal(pred_xb_1)

164 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_uni
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
    > 860.........870.........880.........890.........900.........910.........920
    > .........930.........940.........950.........960.........970.........980...
    > ......990.........1,000 done
```

```
Bootstrap results                                       Number of obs = 10,51
> 2
                                                        Replications  =  1,00
> 0

      Command: summarize APE_hssat_uni
        _bs_1: r(mean)

─────────────┬──────────────────────────────────────────────────────────────
> ─
             │   Observed   Bootstrap                         Normal-based
             │ coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
─────────────┼──────────────────────────────────────────────────────────────
> ─
       _bs_1 │    .426908   .0006479   658.89   0.000     .4256381    .428177
> 9
─────────────┴──────────────────────────────────────────────────────────────
> ─

165 .
166 . //marginal effect of high school satisfaction on prob(work2012)
167 . gen APE_hssat_work=normal(pred_xb2)-normal(pred_xb_2)

168 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_work
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
```

```
> 860.........870.........880.........890.........900.........910.........920
> .........930.........940.........950.........960.........970.........980...
> ......990.........1,000 done

Bootstrap results                                       Number of obs = 10,51
> 2
                                                        Replications  =  1,00
> 0

      Command: summarize APE_hssat_work
        _bs_1: r(mean)

─────────────┬──────────────────────────────────────────────────────────────
> ─
             │   Observed   Bootstrap                         Normal-based
             │ coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
─────────────┼──────────────────────────────────────────────────────────────
> ─
       _bs_1 │  -.2325054   .0003581  -649.26   0.000    -.2332073   -.231803
> 5
─────────────┴──────────────────────────────────────────────────────────────
> ─
```

```
169 .
170 .
171 . //hs tecnico
172 . use "final_data.dta", clear

173 .
174 . keep if hs_tecnici == 1
    (17,214 observations deleted)

175 .
```

```
176 . mvprobit (uni_ins = $firsteq ) (work2012=$secondeq ) (hs_satisfied=$thirdeq
    >  ), robust draws(1000) seed(683)
    note: hs_professionali omitted because of collinearity.
    note: hs_tecnici omitted because of collinearity.
    note: hs_professionali omitted because of collinearity.
    note: hs_tecnici omitted because of collinearity.
    note: hs_professionali omitted because of collinearity.
    note: hs_tecnici omitted because of collinearity.

    Iteration 0:  Log pseudolikelihood = -8990.8355  (not concave)
    Iteration 1:  Log pseudolikelihood = -8746.2589  (not concave)
    Iteration 2:  Log pseudolikelihood = -8711.5249  (not concave)
    Iteration 3:  Log pseudolikelihood = -8697.3844  (not concave)
    Iteration 4:  Log pseudolikelihood = -8685.3238  (not concave)
    Iteration 5:  Log pseudolikelihood = -8673.7999  (not concave)
    Iteration 6:  Log pseudolikelihood = -8661.9425  (not concave)
    Iteration 7:  Log pseudolikelihood = -8649.8028  (not concave)
    Iteration 8:  Log pseudolikelihood = -8637.4549  (not concave)
    Iteration 9:  Log pseudolikelihood = -8624.8874  (not concave)
    Iteration 10: Log pseudolikelihood = -8612.2134  (not concave)
    Iteration 11: Log pseudolikelihood = -8599.7632  (not concave)
    Iteration 12: Log pseudolikelihood = -8588.2475
    Warning: cannot do Cholesky factorization of rho matrix
    Iteration 13: Log pseudolikelihood = -8548.2069
    Iteration 14: Log pseudolikelihood = -8540.2755  (not concave)
    Iteration 15: Log pseudolikelihood = -8533.8878
    Iteration 16: Log pseudolikelihood = -8530.8895
    Iteration 17: Log pseudolikelihood = -8530.6211
    Iteration 18: Log pseudolikelihood = -8530.6163
    Iteration 19: Log pseudolikelihood = -8530.6163

    Multivariate probit (SML, # draws = 1000)         Number of obs   =       458
    > 1
                                                      Wald chi2(38)   =    3518.1
    > 2
    Log pseudolikelihood = -8530.6163                 Prob > chi2     =     0.000
    > 0
```

	Coefficient	Robust std. err.	z	P>|z|	[95% conf.	int erval]
uni_ins						
hs_satisfied	**1.427819**	**.0256073**	**55.76**	**0.000**	**1.37763**	**1.478009**
public_school	**.4902116**	**.0793865**	**6.17**	**0.000**	**.3346169**	**.6458064**
father_elementary	**−.0958665**	**.0672652**	**−1.43**	**0.154**	**−.2277039**	**.035971**
father_middle	**−.1272958**	**.0384168**	**−3.31**	**0.001**	**−.2025914**	**−.0520001**
father_uni	**.2360933**	**.1565418**	**1.51**	**0.132**	**−.0707231**	**.5429096**
father_postgrad	**.395247**	**.0846598**	**4.67**	**0.000**	**.2293169**	**.5611772**
mother_elementary	**−.4443333**	**.070915**	**−6.27**	**0.000**	**−.5833241**	**−.3053425**
mother_middle	**−.2710249**	**.0382009**	**−7.09**	**0.000**	**−.3458973**	**−.1961525**
mother_uni	**.1148104**	**.1505652**	**0.76**	**0.446**	**−.1802919**	**.4099128**
mother_postgrad	**.106689**	**.0905908**	**1.18**	**0.239**	**−.0708656**	**.2842437**
female	**−.0460367**	**.0356578**	**−1.29**	**0.197**	**−.1159246**	**.0238512**
italian	**.12813**	**.1348176**	**0.95**	**0.342**	**−.1361077**	**.3923677**
_cons	**−.9742196**	**.1560244**	**−6.24**	**0.000**	**−1.280022**	**−.6684174**
work2012						
hs_satisfied	**−.6196155**	**.0881452**	**−7.03**	**0.000**	**−.792377**	**−.446854**
public_school	**−.1787119**	**.0843628**	**−2.12**	**0.034**	**−.34406**	**−.0133639**
father_elementary	**.1220729**	**.0715624**	**1.71**	**0.088**	**−.0181869**	**.2623326**
father_middle	**.1771537**	**.0424727**	**4.17**	**0.000**	**.0939088**	**.2603986**
father_uni	**−.077566**	**.1822052**	**−0.43**	**0.670**	**−.4346817**	**.2**

```
> 795497
  father_postgrad │  -.2924362   .1038202    -2.82   0.005    -.4959201   -.0
> 889523
mother_elementary │   .1649537   .0774437     2.13   0.033     .0131669    .3
> 167405
    mother_middle │   .1253104   .0421262     2.97   0.003     .0427446    .2
> 078763
       mother_uni │  -.0219322   .1566655    -0.14   0.889     -.328991    .2
> 851266
  mother_postgrad │  -.0929819   .1060553    -0.88   0.381    -.3008465    .1
> 148828
           female │   -.121772   .0408553    -2.98   0.003     -.201847    -.
> 041697
          italian │   .1091199   .1579342     0.69   0.490    -.2004254    .4
> 186651
            _cons │  -.0745577   .1864855    -0.40   0.689    -.4400626    .2
> 909472
──────────────────┼──────────────────────────────────────────────────────────
> ──────
hs_satisfied      │
      ever_failed │  -.1748128   .0353877    -4.94   0.000    -.2441715   -.1
> 054542
       changed_hs │   .0387423   .0488559     0.79   0.428    -.0570135    .1
> 344982
    public_school │  -.4097688   .0860467    -4.76   0.000    -.5784172   -.2
> 411204
            grade │   .0266786   .0012617    21.15   0.000     .0242057    .0
> 291514
father_elementary │  -.0472591    .074272    -0.64   0.525    -.1928296    .0
> 983113
    father_middle │   .0602133   .0421001     1.43   0.153    -.0223014    .1
> 427279
       father_uni │  -.2202409    .169542    -1.30   0.194    -.5525372    .1
> 120553
  father_postgrad │  -.2940808   .0964849    -3.05   0.002    -.4831876    -.
> 104974
mother_elementary │   .2763401   .0807551     3.42   0.001     .1180631    .4
> 346172
    mother_middle │   .0930339    .041881     2.22   0.026     .0109486    .1
> 751192
       mother_uni │   .1352641   .1539013     0.88   0.379    -.1663769     .
> 436905
  mother_postgrad │   .1247497   .1001948     1.25   0.213    -.0716285    .3
> 211278
           female │   .1554846   .0390236     3.98   0.000     .0789997    .2
> 319695
```

```
          italian │  -.3101511   .1482401    -2.09   0.036    -.6006964   -.0
> 196058
            _cons │  -1.654186   .1956097    -8.46   0.000    -2.037574   -1.
> 270798
──────────────────┼──────────────────────────────────────────────────────────
> ──────
    /atrho21 │  -.6254112   .0453998   -13.78   0.000    -.7143933   -.536429
> 2
─────────────┼──────────────────────────────────────────────────────────
> ─
    /atrho31 │  -2.001993   .1141811   -17.53   0.000    -2.225783   -1.77820
> 2
─────────────┼──────────────────────────────────────────────────────────
> ─
    /atrho32 │   .4334809   .0646356     6.71   0.000     .3067975    .560164
> 3
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho21 │  -.5548844   .0314214   -17.66   0.000    -.6134243   -.490280
> 2
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho31 │  -.9641681   .0080361  -119.98   0.000    -.9769482   -.944501
> 4
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho32 │   .4082262   .0538641     7.58   0.000     .2975209    .508099
> 3
─────────────┴──────────────────────────────────────────────────────────
> ─
Likelihood ratio test of  rho21 = rho31 = rho32 = 0:
            chi2(3) =  920.438   Prob > chi2 = 0.0000

177 .
```

```
178 . //marginal effect of hs_satisfied
179 . replace hs_satisfied=1
    (2,732 real changes made)

180 . mvppred pred_xb, xb
    (xb will be stored in variables pred_xbi, i = 1,...,#eqs)

181 . replace hs_satisfied=0
    (4,581 real changes made)

182 . mvppred pred_xb_, xb
    (xb will be stored in variables pred_xb_i, i = 1,...,#eqs)

183 .
184 . //probabilities
185 . gen p_uni1 = normal(pred_xb1)

186 . gen p_uni0 = normal(pred_xb_1)

187 . sum p_uni0 p_uni1
```

Variable	Obs	Mean	Std. dev.	Min	Max
p_uni0	**4,581**	**.2848059**	**.0854733**	**.0593261**	**.5612659**
p_uni1	**4,581**	**.7924272**	**.070867**	**.4472404**	**.9431751**

```
188 .
189 . gen p_work1 = normal(pred_xb2)

190 . gen p_work0 = normal(pred_xb_2)

191 . sum p_work0 p_work1
```

Variable	Obs	Mean	Std. dev.	Min	Max
p_work0	**4,581**	**.4821332**	**.0667914**	**.2234899**	**.6467904**
p_work1	**4,581**	**.2559724**	**.0524534**	**.0837817**	**.4040236**

```
192 .
193 . //marginal effect of high school satisfaction on prob(uni_ins)
194 . gen APE_hssat_uni=normal(pred_xb1)-normal(pred_xb_1)

195 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_uni
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
    > 860.........870.........880.........890.........900.........910.........920
    > .........930.........940.........950.........960.........970.........980...
    > ......990.........1,000 done

    Bootstrap results                                       Number of obs = 4,58
    > 1
                                                            Replications  = 1,00
    > 0

          Command: summarize APE_hssat_uni
            _bs_1: r(mean)
```

```
-------------+----------------------------------------------------------------
> -
             |   Observed   Bootstrap                         Normal-based
             |  coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
-------------+----------------------------------------------------------------
> -
       _bs_1 |   .5076213    .000381  1332.21   0.000     .5068745    .508368
> 1
-------------+----------------------------------------------------------------
> -

196 .
197 . //marginal effect of high school satisfaction on prob(work2012)
198 . gen APE_hssat_work=normal(pred_xb2)-normal(pred_xb_2)

199 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_work
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
    > 860.........870.........880.........890.........900.........910.........920
    > .........930.........940.........950.........960.........970.........980...
    > ......990.........1,000 done
```

```
Bootstrap results                                       Number of obs = 4,58
> 1
                                                        Replications  = 1,00
> 0

      Command: summarize APE_hssat_work
        _bs_1: r(mean)

─────────────┬──────────────────────────────────────────────────────────────
> ─
             │   Observed   Bootstrap                         Normal-based
             │ coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
─────────────┼──────────────────────────────────────────────────────────────
> ─
       _bs_1 │  -.2261608   .0002209 -1023.95   0.000    -.2265937   -.225727
> 9
─────────────┴──────────────────────────────────────────────────────────────
> ─

200 .
201 .
202 . //hs professionali
203 . use "final_data.dta", clear

204 .
205 . keep if hs_professionali == 1
    (15,093 observations deleted)

206 .
207 . mvprobit (uni_ins = $firsteq ) (work2012=$secondeq ) (hs_satisfied=$thirdeq
>  ), robust draws(1000) seed(683)
    note: hs_professionali omitted because of collinearity.
    note: hs_tecnici omitted because of collinearity.
    note: hs_professionali omitted because of collinearity.
    note: hs_tecnici omitted because of collinearity.
    note: hs_professionali omitted because of collinearity.
    note: hs_tecnici omitted because of collinearity.
```

```
Iteration 0:  Log pseudolikelihood = -12372.413  (not concave)
Iteration 1:  Log pseudolikelihood =  -12238.71  (not concave)
Iteration 2:  Log pseudolikelihood = -12235.916  (not concave)
Iteration 3:  Log pseudolikelihood =   -12233.6  (not concave)
Iteration 4:  Log pseudolikelihood = -12231.653  (not concave)
Iteration 5:  Log pseudolikelihood = -12229.824  (not concave)
Iteration 6:  Log pseudolikelihood = -12226.466  (not concave)
Iteration 7:  Log pseudolikelihood = -12223.671  (not concave)
Iteration 8:  Log pseudolikelihood = -12220.188  (not concave)
Iteration 9:  Log pseudolikelihood = -12214.677  (not concave)
Iteration 10: Log pseudolikelihood = -12210.209  (not concave)
Iteration 11: Log pseudolikelihood = -12205.745  (not concave)
Iteration 12: Log pseudolikelihood = -12196.348  (not concave)
Iteration 13: Log pseudolikelihood = -12190.563  (not concave)
Iteration 14: Log pseudolikelihood = -12187.795  (not concave)
Iteration 15: Log pseudolikelihood = -12183.852  (not concave)
Iteration 16: Log pseudolikelihood =  -12179.32  (not concave)
Iteration 17: Log pseudolikelihood = -12176.376  (not concave)
Iteration 18: Log pseudolikelihood = -12173.466  (not concave)
Iteration 19: Log pseudolikelihood = -12167.592
Warning: cannot do Cholesky factorization of rho matrix
Warning: cannot do Cholesky factorization of rho matrix
Iteration 20: Log pseudolikelihood = -12138.273
Iteration 21: Log pseudolikelihood = -12109.388
Iteration 22: Log pseudolikelihood = -12105.844
Iteration 23: Log pseudolikelihood = -12105.533
Iteration 24: Log pseudolikelihood = -12105.531
Iteration 25: Log pseudolikelihood = -12105.531

Multivariate probit (SML, # draws = 1000)        Number of obs   =       670
> 2
                                                 Wald chi2(38)   =    4383.8
> 9
Log pseudolikelihood = -12105.531                Prob > chi2     =     0.000
> 0
```

	Coefficient	Robust std. err.	z	P>|z|	[95% conf.	int erval]
uni_ins						
hs_satisfied	**1.56092**	**.030567**	**51.07**	**0.000**	**1.50101**	**1.620831**
public_school	**−.1671411**	**.1480136**	**−1.13**	**0.259**	**−.4572424**	**.229602**
father_elementary	**−.2157011**	**.0531893**	**−4.06**	**0.000**	**−.3199503**	**−.111452**
father_middle	**−.1264949**	**.0339433**	**−3.73**	**0.000**	**−.1930226**	**−.0599671**
father_uni	**.153862**	**.1637799**	**0.94**	**0.348**	**−.1671408**	**.748648**
father_postgrad	**.2559883**	**.0918591**	**2.79**	**0.005**	**.0759477**	**.4360289**
mother_elementary	**−.3722262**	**.055134**	**−6.75**	**0.000**	**−.4802868**	**−.2641656**
mother_middle	**−.2198138**	**.0335236**	**−6.56**	**0.000**	**−.2855189**	**−.1541087**
mother_uni	**.1769192**	**.169027**	**1.05**	**0.295**	**−.1543676**	**.5082061**
mother_postgrad	**.1317447**	**.1045383**	**1.26**	**0.208**	**−.0731467**	**.336636**
female	**.1344919**	**.0316073**	**4.26**	**0.000**	**.0725428**	**.196441**
italian	**−.0011269**	**.0800457**	**−0.01**	**0.989**	**−.1580136**	**.157597**
_cons	**−.8218979**	**.1699762**	**−4.84**	**0.000**	**−1.155045**	**−.4887507**
work2012						
hs_satisfied	**−.5744854**	**.0964152**	**−5.96**	**0.000**	**−.7634557**	**−.3855151**
public_school	**.1395245**	**.1496724**	**0.93**	**0.351**	**−.153828**	**.432877**
father_elementary	**.0780998**	**.0542906**	**1.44**	**0.150**	**−.0283077**	**.1845074**
father_middle	**.0445492**	**.0356711**	**1.25**	**0.212**	**−.0253649**	**.144633**
father_uni	**−.2307045**	**.2007783**	**−1.15**	**0.251**	**−.6242228**	**.1**

```
> 628138
  father_postgrad │  -.1640504   .0972508    -1.69   0.092    -.3546584    .0
> 265577
mother_elementary │   .0192131   .0567902     0.34   0.735    -.0920937    .1
> 305199
    mother_middle │   .0693211   .0354313     1.96   0.050     -.000123    .1
> 387652
       mother_uni │  -.1143367   .1790089    -0.64   0.523    -.4651876    .2
> 365142
  mother_postgrad │  -.0261846   .1052543    -0.25   0.804    -.2324793    .1
> 801101
           female │  -.2134615   .0326805    -6.53   0.000    -.2775141   -.1
> 494089
          italian │   -.053826   .0811304    -0.66   0.507    -.2128387    .1
> 051866
            _cons │   .0488112   .1791871     0.27   0.785    -.3023891    .4
> 000115
──────────────────┼──────────────────────────────────────────────────────────
> ──────
hs_satisfied      │
      ever_failed │  -.1079774   .0292386    -3.69   0.000     -.165284   -.0
> 506709
       changed_hs │   .0255053   .0322635     0.79   0.429    -.0377299    .0
> 887405
    public_school │  -.1962215    .158199    -1.24   0.215    -.5062859    .1
> 138428
            grade │   .0184705    .001117    16.54   0.000     .0162812    .0
> 206598
father_elementary │  -.0117291   .0533411    -0.22   0.826    -.1162758    .0
> 928177
    father_middle │   .0134735   .0354927     0.38   0.704     -.056091    .0
> 830379
       father_uni │  -.0796806   .1801822    -0.44   0.658    -.4328312
> .27347
  father_postgrad │  -.0213465   .0996361    -0.21   0.830    -.2166297    .1
> 739368
mother_elementary │   .2089457   .0554706     3.77   0.000     .1002253    .3
> 176661
    mother_middle │   .1182754    .035068     3.37   0.001     .0495435    .1
> 870074
       mother_uni │  -.0627598   .1765219    -0.36   0.722    -.4087363    .2
> 832167
  mother_postgrad │  -.1174396   .1098985    -1.07   0.285    -.3328366    .0
> 979575
           female │   .1274034   .0307613     4.14   0.000     .0671124    .1
> 876945
```

```
          italian │  -.2886602   .0824382    -3.50   0.000    -.4502361   -.1
> 270844
           _cons │  -1.246974   .1954922    -6.38   0.000    -1.630132   -.8
> 638167
──────────────────┼──────────────────────────────────────────────────────────
> ──────
    /atrho21 │  -.4491854   .0444482   -10.11   0.000    -.5363022   -.362068
> 5
─────────────┼──────────────────────────────────────────────────────────
> ─
    /atrho31 │  -1.922471   .1347827   -14.26   0.000     -2.18664   -1.65830
> 1
─────────────┼──────────────────────────────────────────────────────────
> ─
    /atrho32 │   .3574227   .0663852     5.38   0.000     .2273102    .487535
> 2
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho21 │  -.4212291   .0365616   -11.52   0.000    -.4901838   -.347034
> 7
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho31 │  -.9581204   .0110529   -86.69   0.000    -.9750944    -.92998
> 8
─────────────┼──────────────────────────────────────────────────────────
> ─
       rho32 │   .3429419   .0585777     5.85   0.000     .2234744     .45225
> 8
─────────────┴──────────────────────────────────────────────────────────
> ─
Likelihood ratio test of  rho21 = rho31 = rho32 = 0:
            chi2(3) =  533.765   Prob > chi2 = 0.0000

208 .
```

```
209 . //marginal effect of hs_satisfied
210 . replace hs_satisfied=1
    (4,004 real changes made)

211 . mvppred pred_xb, xb
    (xb will be stored in variables pred_xbi, i = 1,...,#eqs)

212 . replace hs_satisfied=0
    (6,702 real changes made)

213 . mvppred pred_xb_, xb
    (xb will be stored in variables pred_xb_i, i = 1,...,#eqs)

214 .
215 . //probabilities
216 . gen p_uni1 = normal(pred_xb1)

217 . gen p_uni0 = normal(pred_xb_1)

218 . sum p_uni0 p_uni1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
      p_uni0 |      6,702    .1288372    .0449998   .0572721   .3362328
      p_uni1 |      6,702    .6541355    .0728216   .4931493   .8724719

219 .
220 . gen p_work1 = normal(pred_xb2)

221 . gen p_work0 = normal(pred_xb_2)

222 . sum p_work0 p_work1

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
     p_work0 |      6,702      .53713     .049196   .3357855   .6314728
     p_work1 |      6,702    .3167164    .0435959   .1590237    .405658
```

```
223 .
224 . //marginal effect of high school satisfaction on prob(uni_ins)
225 . gen APE_hssat_uni=normal(pred_xb1)-normal(pred_xb_1)

226 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_uni
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
    > 860.........870.........880.........890.........900.........910.........920
    > .........930.........940.........950.........960.........970.........980...
    > ......990.........1,000 done

    Bootstrap results                                       Number of obs = 6,70
    > 2
                                                            Replications  = 1,00
    > 0

          Command: summarize APE_hssat_uni
            _bs_1: r(mean)
```

```
-------------+----------------------------------------------------------------
> -
             |   Observed   Bootstrap                         Normal-based
             |  coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
-------------+----------------------------------------------------------------
> -
       _bs_1 |   .5252983    .000377  1393.34   0.000     .5245594    .526037
> 3
-------------+----------------------------------------------------------------
> -

227 .
228 . //marginal effect of high school satisfaction on prob(work2012)
229 . gen APE_hssat_work=normal(pred_xb2)-normal(pred_xb_2)

230 . bootstrap r(mean), seed(683) reps(1000): sum APE_hssat_work
    (running summarize on estimation sample)

    warning: summarize does not set e(sample), so no observations will be
             excluded from the resampling because of missing values or other
             reasons. To exclude observations, press Break, save the data, drop
             any observations that are to be excluded, and rerun bootstrap.

    Bootstrap replications (1,000): .........10.........20.........30.........40.
    > .........50.........60.........70.........80.........90.........100.........
    > 110.........120.........130.........140.........150.........160.........170
    > .........180.........190.........200.........210.........220.........230...
    > ......240.........250.........260.........270.........280.........290......
    > ...300.........310.........320.........330.........340.........350.........
    > 360.........370.........380.........390.........400.........410.........420
    > .........430.........440.........450.........460.........470.........480...
    > ......490.........500.........510.........520.........530.........540......
    > ...550.........560.........570.........580.........590.........600.........
    > 610.........620.........630.........640.........650.........660.........670
    > .........680.........690.........700.........710.........720.........730...
    > ......740.........750.........760.........770.........780.........790......
    > ...800.........810.........820.........830.........840.........850.........
    > 860.........870.........880.........890.........900.........910.........920
    > .........930.........940.........950.........960.........970.........980...
    > ......990.........1,000 done
```

```
Bootstrap results                                       Number of obs = 6,70
> 2
                                                        Replications  = 1,00
> 0

      Command: summarize APE_hssat_work
        _bs_1: r(mean)

─────────────┬──────────────────────────────────────────────────────────────
> ─
             │   Observed   Bootstrap                         Normal-based
             │ coefficient  std. err.      z    P>|z|     [95% conf. interval
> ]
─────────────┼──────────────────────────────────────────────────────────────
> ─
       _bs_1 │  -.2204136   .0000736 -2993.67   0.000    -.2205579   -.220269
> 3
─────────────┴──────────────────────────────────────────────────────────────
> ─

231 .
232 . //timer
233 . scalar t2 = c(current_time)

234 . display (clock(t2, "hms") - clock(t1, "hms")) / 1000 " seconds"
41684 seconds

235 .
236 . log close
          name:  <unnamed>
           log:  /Users/samueleborsini/Library/Mobile Documents/com~apple~CloudDo
> cs/Universita`/Economics and econometrics/II anno/Advanced Microeconometric
> s/Project/Data analysis/heterogeneous effects.smcl
      log type:  smcl
     closed on:  28 Nov 2023, 11:36:41
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```