MESTRADO EM

ECONOMETRIA APLICADA E PREVISÃO

MICROECONOMETRIA I

Aplicação Empírica: MODELOS DE ESCOLHA BINÁRIA (cross-section)

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1. Ler dados

```
use mroz.dta, clear
```

1.1. Descrever a base de dados

```
describe
```

```
Contains data from mroz.dta
  obs:           753
 vars:            22                          2 Sep 1996 16:04
 size:        36,897
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
inlf            byte    %9.0g                 =1 if in lab frce, 1975
hours           int     %9.0g                 hours worked, 1975
kidslt6         byte    %9.0g                 # kids < 6 years
kidsge6         byte    %9.0g                 # kids 6-18
age             byte    %9.0g                 woman's age in yrs
educ            byte    %9.0g                 years of schooling
wage            float   %9.0g                 est. wage from earn, hrs
repwage         float   %9.0g                 rep. wage at interview in 1976
hushrs          int     %9.0g                 hours worked by husband, 1975
husage          byte    %9.0g                 husband's age
huseduc         byte    %9.0g                 husband's years of schooling
huswage         float   %9.0g                 husband's hourly wage, 1975
faminc          float   %9.0g                 family income, 1975
mtr             float   %9.0g                 fed. marg. tax rte facing woman
motheduc        byte    %9.0g                 mother's years of schooling
fatheduc        byte    %9.0g                 father's years of schooling
unem            float   %9.0g                 unem. rate in county of resid.
city            byte    %9.0g                 =1 if live in SMSA
exper           byte    %9.0g                 actual labor mkt exper
nwifeinc        float   %9.0g                 (faminc - wage*hours)/1000
lwage           float   %9.0g                 log(wage)
expersq         int     %9.0g                 exper^2
-------------------------------------------------------------------------------
Sorted by:
```

2. Estatística descritiva

2.1. Tabulação de algumas variáveis

```
foreach x of varlist inlf educ exper age kidslt6 kidsge6 {
      display "`x'"
      tab `x'
}
```

```
inlf

   =1 if in |
  lab frce, |
       1975 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        325       43.16       43.16
          1 |        428       56.84      100.00
------------+-----------------------------------
      Total |        753      100.00


educ

   years of |
  schooling |      Freq.     Percent        Cum.
------------+-----------------------------------
          5 |          4        0.53        0.53
          6 |          6        0.80        1.33
          7 |          8        1.06        2.39
          8 |         30        3.98        6.37
          9 |         25        3.32        9.69
         10 |         44        5.84       15.54
         11 |         43        5.71       21.25
         12 |        381       50.60       71.85
         13 |         44        5.84       77.69
         14 |         51        6.77       84.46
         15 |         14        1.86       86.32
         16 |         57        7.57       93.89
         17 |         46        6.11      100.00
------------+-----------------------------------
      Total |        753      100.00
```

exper

actual labor mkt exper	Freq.	Percent	Cum.
0	39	5.18	5.18
1	33	4.38	9.56
2	41	5.44	15.01
3	43	5.71	20.72
4	44	5.84	26.56
5	33	4.38	30.94
6	43	5.71	36.65
7	39	5.18	41.83
8	31	4.12	45.95
9	41	5.44	51.39
10	47	6.24	57.64
11	33	4.38	62.02
12	24	3.19	65.21
13	23	3.05	68.26
14	37	4.91	73.17
15	33	4.38	77.56
16	13	1.73	79.28
17	12	1.59	80.88
18	13	1.73	82.60
19	27	3.59	86.19
20	14	1.86	88.05
21	8	1.06	89.11
22	10	1.33	90.44
23	9	1.20	91.63
24	13	1.73	93.36
25	10	1.33	94.69
26	3	0.40	95.09
27	4	0.53	95.62
28	4	0.53	96.15
29	7	0.93	97.08
30	4	0.53	97.61
31	2	0.27	97.88
32	3	0.40	98.27
33	4	0.53	98.80
34	1	0.13	98.94
(...)			
Total	753	100.00	

age

woman's age in yrs	Freq.	Percent	Cum.
30	38	5.05	5.05
31	33	4.38	9.43
32	34	4.52	13.94
33	25	3.32	17.26
34	32	4.25	21.51
35	24	3.19	24.70
36	38	5.05	29.75
37	27	3.59	33.33
38	26	3.45	36.79
39	21	2.79	39.58
40	20	2.66	42.23
41	27	3.59	45.82
42	21	2.79	48.61
43	37	4.91	53.52
44	24	3.19	56.71
45	35	4.65	61.35
46	31	4.12	65.47
47	38	5.05	70.52
48	29	3.85	74.37
49	28	3.72	78.09
50	18	2.39	80.48
51	28	3.72	84.20
52	22	2.92	87.12
53	16	2.12	89.24
54	26	3.45	92.70
55	12	1.59	94.29
56	13	1.73	96.02
57	7	0.93	96.95
58	8	1.06	98.01
59	9	1.20	99.20
60	6	0.80	100.00
Total	753	100.00	

kidslt6

# kids < 6 years	Freq.	Percent	Cum.
0	606	80.48	80.48
1	118	15.67	96.15
2	26	3.45	99.60
3	3	0.40	100.00
Total	753	100.00	

kidsge6

# kids 6-18	Freq.	Percent	Cum.
0	258	34.26	34.26
1	185	24.57	58.83
2	162	21.51	80.35
3	103	13.68	94.02
4	30	3.98	98.01
5	12	1.59	99.60
6	1	0.13	99.73
7	1	0.13	99.87
8	1	0.13	100.00
Total	753	100.00	

2.2. Sumário de algumas variáveis

```
sum nwifeinc educ exper expersq age kidslt6 kidsge6
```

Variable	Obs	Mean	Std. Dev.	Min	Max
nwifeinc	753	20.12896	11.6348	-.0290575	96
educ	753	12.28685	2.280246	5	17
exper	753	10.63081	8.06913	0	45
expersq	753	178.0385	249.6308	0	2025
age	753	42.53785	8.072574	30	60
kidslt6	753	.2377158	.523959	0	3
kidsge6	753	1.353254	1.319874	0	8

3. Modelo Probabilístico Linear (MPL)

```
reg inlf nwifeinc educ exper c.exper#c.exper age kidslt6, robust
```

```
Linear regression                               Number of obs =     753
                                                F(  6,   746) =   72.28
                                                Prob > F      =  0.0000
                                                R-squared     =  0.2633
                                                Root MSE      =  .42713

------------------------------------------------------------------------------
             |               Robust
        inlf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0033344   .0015234    -2.19   0.029    -.006325   -.0003438
        educ |   .0372848   .0072383     5.15   0.000      .023075    .0514946
       exper |    .039058   .0057827     6.75   0.000     .0277056    .0504104
             |
c.exper#c.exper |  -.0005942   .0001893    -3.14   0.002    -.000966   -.0002225
             |
         age |  -.0169228   .0022709    -7.45   0.000    -.0213809   -.0124646
     kidslt6 |  -.2654556   .0317391    -8.36   0.000    -.3277642   -.2031471
       _cons |   .6509414   .1404617     4.63   0.000     .3751941    .9266887
------------------------------------------------------------------------------
```

3.1. *Efeitos Parciais Médios (Average Partial Effect – APE)*

```
margins, dydx(nwifeinc educ exper age kidslt6) post
```

```
Average marginal effects                        Number of obs     =        753
Model VCE    : Robust

Expression   : Linear prediction, predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0033344   .0015234    -2.19   0.029     -.006325   -.0003438
        educ |   .0372848   .0072383     5.15   0.000      .023075    .0514946
       exper |   .0264233   .0024297    10.88   0.000     .0216535    .0311932
         age |  -.0169228   .0022709    -7.45   0.000    -.0213809   -.0124646
     kidslt6 |  -.2654556   .0317391    -8.36   0.000    -.3277642   -.2031471
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store MPL_OLS_APE
```

NOTA:

Neste caso apresenta-se o efeito parcial médio da variável *exper* sobre *inlf*

$$APE_{exper} = \frac{1}{N}\sum_{i=1}^{N}\frac{\partial\, inlf_i}{\partial\, exper_i} = \frac{1}{N}\sum_{i=1}^{N}\left(\beta_3 + 2\beta_4\, exper_i\right) = \beta_3 + 2\beta_4 \times \overline{exper}$$

onde $\overline{exper}$ é a média da variável *exper* .

4. Modelo Probabilístico Linear (MPL), estimação por Mínimos Quadrados Ponderados (WLS)

Gera variância do MPL estimado por via do OLS

```
quietly reg inlf nwifeinc educ exper c.exper#c.exper age kidslt6, robust
predict y_hat, xb
gen condvar_mpl=y_hat*(1-y_hat)
reg inlf nwifeinc educ exper c.exper#c.exper age kidslt6 [aweight=condvar_mpl]
```

```
(sum of wgt is   1.3902e+02)
      Source |       SS       df       MS              Number of obs =     721
-------------+------------------------------           F(  6,   714) =   24.70
       Model |  30.7951022     6  5.13251703           Prob > F      =  0.0000
    Residual |  148.353348   714  .207777799           R-squared     =  0.1719
-------------+------------------------------           Adj R-squared =  0.1649
       Total |   179.14845   720  .248817292           Root MSE      =  .45583

------------------------------------------------------------------------------
           inlf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
       nwifeinc |  -.0049962   .0016553    -3.02   0.003    -.0082461   -.0017463
           educ |   .0449496   .0086666     5.19   0.000     .0279344    .0619647
          exper |   .0420274   .0063443     6.62   0.000     .0295717     .054483
                |
c.exper#c.exper |  -.0006587   .0002004    -3.29   0.001    -.0010522   -.0002652
                |
            age |  -.0181814   .0027424    -6.63   0.000    -.0235655   -.0127974
        kidslt6 |  -.2942047   .0405936    -7.25   0.000    -.3739017   -.2145077
          _cons |   .6242113    .149584     4.17   0.000     .3305342    .9178885
------------------------------------------------------------------------------
```

4.1. *Efeitos Parciais Médios (Average Partial Effect – APE)*

```
margins, dydx(nwifeinc educ exper age kidslt6) post
```

```
Average marginal effects                        Number of obs     =        721
Model VCE    : OLS

Expression   : Linear prediction, predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0049962   .0016553    -3.02   0.003    -.0082461   -.0017463
        educ |   .0449496   .0086666     5.19   0.000     .0279344    .0619647
       exper |   .0289389   .0031474     9.19   0.000     .0227596    .0351182
         age |  -.0181814   .0027424    -6.63   0.000    -.0235655   -.0127974
     kidslt6 |  -.2942047   .0405936    -7.25   0.000    -.3739017   -.2145077
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store MPL_WLS_APE
```

5. Probit

```
probit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
```

```
Iteration 0:   log likelihood =  -514.8732
Iteration 1:   log likelihood = -402.42245
Iteration 2:   log likelihood = -401.64597
Iteration 3:   log likelihood = -401.64546
Iteration 4:   log likelihood = -401.64546

Probit regression                                 Number of obs   =        753
                                                  LR chi2(6)      =     226.46
                                                  Prob > chi2     =     0.0000
Log likelihood = -401.64546                       Pseudo R2       =     0.2199

------------------------------------------------------------------------------
           inlf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
       nwifeinc |  -.0118298   .0048357    -2.45   0.014    -.0213077   -.0023519
           educ |   .1286938   .0250943     5.13   0.000     .0795099    .1778778
          exper |   .1221105    .018644     6.55   0.000     .0855689    .1586521
                |
c.exper#c.exper |  -.0018828   .0005999    -3.14   0.002    -.0030586   -.0007069
                |
            age |  -.0553178   .0079581    -6.95   0.000    -.0709154   -.0397202
        kidslt6 |  -.8809003     .11776    -7.48   0.000    -1.111706    -.650095
          _cons |   .4633524   .4522318     1.02   0.306    -.4230055     1.34971
------------------------------------------------------------------------------
```

5.1. *Teste de Wald, de nulidade conjunta dos coeficientes*

```
testparm nwifeinc educ exper c.exper#c.exper age kidslt6
```

```
 ( 1)  [inlf]nwifeinc = 0
 ( 2)  [inlf]educ = 0
 ( 3)  [inlf]exper = 0
 ( 4)  [inlf]c.exper#c.exper = 0
 ( 5)  [inlf]age = 0
 ( 6)  [inlf]kidslt6 = 0

           chi2(  6) =  177.53
         Prob > chi2 =    0.0000
```

5.2. Efeitos Parciais Médios (Average Partial Effect – APE)

```
margins, dydx(nwifeinc educ exper age kidslt6) post
```

```
Average marginal effects                        Number of obs   =        753
Model VCE    : OIM

Expression   : Pr(inlf), predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0035616   .0014422    -2.47   0.014    -.0063882    -.000735
        educ |   .0387461    .007192     5.39   0.000     .0246501    .0528421
       exper |   .0252732   .0022035    11.47   0.000     .0209544    .0295919
         age |  -.0166546   .0021705    -7.67   0.000    -.0209088   -.0124005
     kidslt6 |  -.2652145   .0315412    -8.41   0.000    -.3270341   -.2033948
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store Probit_APE
```

5.3. Efeitos Parciais na Média (Partial Effect at the Average – PEA)

```
quietly probit inlf nwifeinc educ exper c.exper#c.exper age
kidslt6
margins, dydx(nwifeinc educ exper age kidslt6) atmeans post
```

```
Conditional marginal effects                      Number of obs   =        753
Model VCE    : OIM

Expression   : Pr(inlf), predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6
at           : nwifeinc        =    20.12896 (mean)
               educ            =    12.28685 (mean)
               exper           =    10.63081 (mean)
               age             =    42.53785 (mean)
               kidslt6         =    .2377158 (mean)

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0044703   .0018265    -2.45   0.014    -.0080501   -.0008905
        educ |   .0486315   .0095217     5.11   0.000     .0299692    .0672938
       exper |   .0310166   .0030709    10.10   0.000     .0249978    .0370354
         age |  -.0209038   .0030502    -6.85   0.000    -.0268821   -.0149255
     kidslt6 |  -.3328793   .0449704    -7.40   0.000    -.4210196   -.2447389
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store Probit_PEA
```

5.4. Efeitos Parciais avaliados nos valores máximos dos regressores

```
quietly probit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
margins, dydx(nwifeinc educ exper age kidslt6) at((max) nwifeinc educ exper age kidslt6) post
```

```
Conditional marginal effects                    Number of obs   =        753
Model VCE    : OIM

Expression   : Pr(inlf), predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6
at           : nwifeinc        =          96 (max)
               educ            =          17 (max)
               exper           =          45 (max)
               age             =          60 (max)
               kidslt6         =           3 (max)

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0001035   .0002048    -0.51   0.613    -.0005049    .0002979
        educ |   .0011261     .00242     0.47   0.642     -.003617    .0058692
       exper |  -.0004142    .000694    -0.60   0.551    -.0017744    .0009459
         age |  -.0004841   .0010372    -0.47   0.641    -.0025169    .0015487
     kidslt6 |  -.0077083   .0161314    -0.48   0.633    -.0393252    .0239087
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store Probit_atMax
```

5.5. Efeitos Parciais avaliados nos valores mínimos dos regressores

```
quietly probit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
margins, dydx(nwifeinc educ exper age kidslt6) at((min) nwifeinc educ exper age kidslt6) post
```

```
Conditional marginal effects                    Number of obs   =        753
Model VCE    : OIM

Expression   : Pr(inlf), predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6
at           : nwifeinc        =   -.0290575 (min)
               educ            =           5 (min)
               exper           =           0 (min)
               age             =          30 (min)
               kidslt6         =           0 (min)

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0040517   .0018074    -2.24   0.025    -.0075942   -.0005092
        educ |   .0440772   .0066859     6.59   0.000     .0309731    .0571812
       exper |   .0418224   .0064864     6.45   0.000     .0291093    .0545355
         age |  -.0189461   .0042406    -4.47   0.000    -.0272576   -.0106347
     kidslt6 |  -.3017051   .0605336    -4.98   0.000    -.4203487   -.1830615
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store Probit_atMin
```

5.6. *Efeitos Parciais Médios (Average Partial Effect – APE) para o regressor* **`kidslt6`**

```
quietly probit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
```

➔ Gerar argumento da função $G(\bullet)$:

```
gen xb_Pbit_APE = _b[nwifeinc] * nwifeinc + _b[educ] * educ + _b[exper] * exper + _b[c.exper#c.exper] * expersq + _b[c.exper#c.exper] * age + _b[_cons]
```

- APE de 0 para 1 filho:

```
gen kidslt6_Pbit_APE_01 = normal(xb_Pbit_APE+_b[kidslt6])-normal(xb_Pbit_APE)
```

- APE de 1 para 2 filhos:

```
gen kidslt6_Pbit_APE_12 = normal(xb_Pbit_APE+_b[kidslt6]*2)-
normal(xb_Pbit_APE+_b[kidslt6]*1)
```

- APE de 2 para 3 filhos:

```
gen kidslt6_Pbit_APE_23 = normal(xb_Pbit_APE+_b[kidslt6]*3)-
normal(xb_Pbit_APE+_b[kidslt6]*2)
```

- Sumário dos APEs de **`kidslt6`**:

```
sum kidslt6_Pbit_APE_01 kidslt6_Pbit_APE_12 kidslt6_Pbit_APE_23
```

```
    Variable | Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
kidslt6_Pbit_APE_01 | 753   -.275629    .0694723  -.3403889  -.0132454
kidslt6_Pbit_APE_12 | 753   -.2203961   .1019092  -.3403887  -.0010335
kidslt6_Pbit_APE_23 | 753   -.1058765   .0877707  -.3379531  -.0000384
```

5.7. *Efeitos Parciais na Média (Partial Effect at the Average – PEA) para o regressor* **`kidslt6`**

```
quietly probit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
```

➔ Gerar médias dos regressores:

```
foreach x of varlist nwifeinc educ exper expersq age kidslt6 kidsge6 {
     quietly sum `x'
     scalar mean_`x'=r(mean)
}
```

➔ Gerar argumento da função $G(\bullet)$:

```
gen xb_Pbit_PEA = _b[nwifeinc] * `=mean_nwifeinc' + _b[educ] *  `=mean_educ'  +  _b[exper]  *  `=mean_exper'  + _b[c.exper#c.exper] * `=mean_expersq' + _b[c.exper#c.exper] * `=mean_age' + _b[_cons]
```

- PEA de 0 para 1 filho:

```
gen kidslt6_Pbit_PEA_01 = normal(xb_Pbit_PEA+_b[kidslt6])-normal(xb_Pbit_PEA)
```

- PEA de 1 para 2 filhos:

```
gen kidslt6_Pbit_PEA_12 = normal(xb_Pbit_PEA+_b[kidslt6]*2)-
normal(xb_Pbit_PEA+_b[kidslt6]*1)
```

- PEA de 2 para 3 filhos:

```
gen kidslt6_Pbit_PEA_23 = normal(xb_Pbit_PEA+_b[kidslt6]*3)-
normal(xb_Pbit_PEA+_b[kidslt6]*2)
```

- Sumário dos PEAs de **kidslt6**:

```
sum      kidslt6_Pbit_PEA_01      kidslt6_Pbit_PEA_12
kidslt6_Pbit_PEA_23
```

```
           Variable | Obs        Mean    Std. Dev.       Min        Max
--------------------+---------------------------------------------------
kidslt6_Pbit_PEA_01 | 753   -.3402959           0  -.3402959  -.3402959
kidslt6_Pbit_PEA_12 | 753   -.2318765           0  -.2318765  -.2318765
kidslt6_Pbit_PEA_23 | 753   -.0762378           0  -.0762378  -.0762378
```

5.8. Gráficos dos efeitos parciais como função dos valores dos regressores

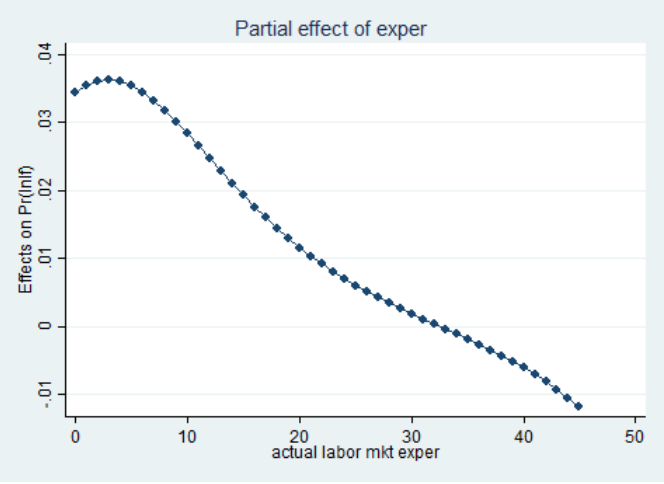
```
quietly probit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
```

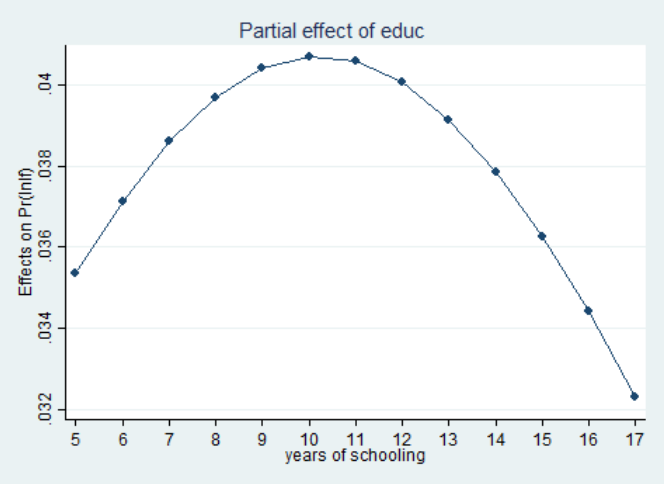
➔ Gerar mínimos e máximos dos regressores:

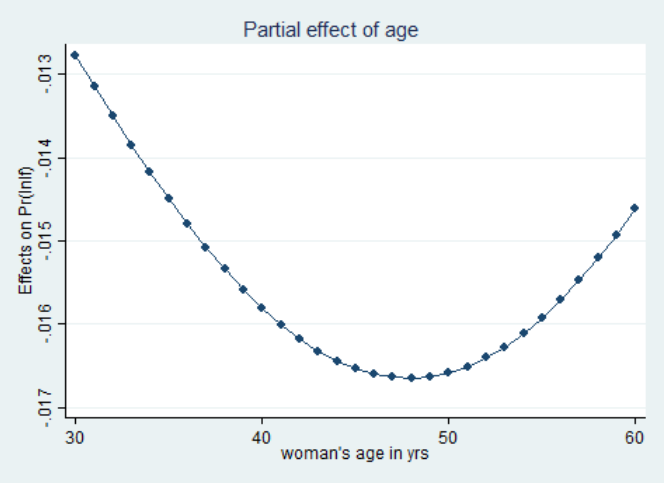
```
foreach x of varlist nwifeinc educ exper expersq age kidslt6 kidsge6 {
      quietly sum `x'
      scalar min_`x'=r(min)
      scalar max_`x'=r(max)

}
```

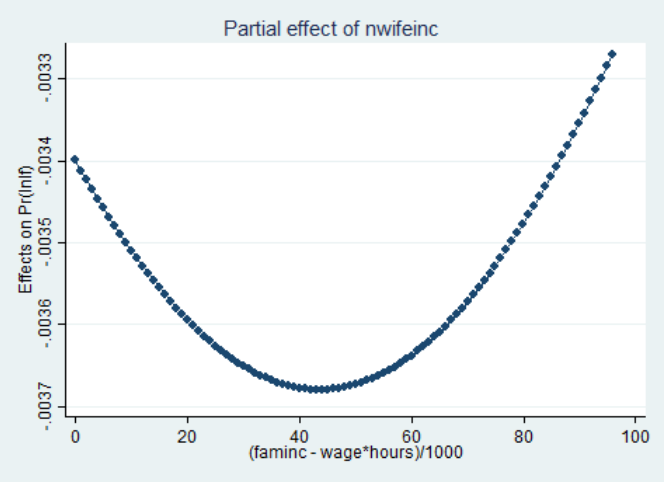
➔ *Loop* de produção e gravação dos gráficos dos efeitos parciais:

```
foreach x of varlist nwifeinc educ exper age kidslt6 {
      quietly                    margins,                    dydx(`x')
      at(`x'==(`=min_`x''(1)`=max_`x''))
      marginsplot, noci title(Partial effect of `x')
      graph export dydx_`x'_Probit.png, replace
}
```




Partial effect of educ
Effects on Pr(inlf)
.032
.034
.036
.038
.04
5
6
7
8
9
10
11
12
13
14
15
16
17
years of schooling


Partial effect of age
Effects on Pr(inlf)
-.017
-.016
-.015
-.014
-.013
30
40
50
60
woman's age in yrs


Partial effect of nwifeinc
Effects on Pr(inlf)
-.0037
-.0036
-.0035
-.0034
-.0033
0
20
40
60
80
100
(faminc - wage*hours)/1000

6. Logit

```
logit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
```

```
Iteration 0:   log likelihood =  -514.8732
Iteration 1:   log likelihood = -402.71541
Iteration 2:   log likelihood = -402.08965
Iteration 3:   log likelihood = -402.08917
Iteration 4:   log likelihood = -402.08917

Logistic regression                             Number of obs   =        753
                                                LR chi2(6)      =     225.57
                                                Prob > chi2     =     0.0000
Log likelihood = -402.08917                     Pseudo R2       =     0.2191

------------------------------------------------------------------------------
           inlf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
       nwifeinc |  -.0210297   .0084272    -2.50   0.013    -.0375468   -.0045127
           educ |   .2175914   .0431275     5.05   0.000      .133063    .3021198
          exper |   .2036869   .0318759     6.39   0.000     .1412114    .2661625
                |
c.exper#c.exper |  -.0031425   .0010145    -3.10   0.002     -.005131   -.0011541
                |
            age |  -.0922022   .0136754    -6.74   0.000    -.1190055   -.0653988
        kidslt6 |  -1.468153   .2023964    -7.25   0.000    -1.864842   -1.071463
          _cons |   .7502201   .7603718     0.99   0.324    -.7400813    2.240521
------------------------------------------------------------------------------
```

6.1. *Teste de Wald, de nulidade conjunta dos coeficientes*

```
testparm nwifeinc educ exper c.exper#c.exper age kidslt6
```

```
 ( 1)  [inlf]nwifeinc = 0
 ( 2)  [inlf]educ = 0
 ( 3)  [inlf]exper = 0
 ( 4)  [inlf]c.exper#c.exper = 0
 ( 5)  [inlf]age = 0
 ( 6)  [inlf]kidslt6 = 0

           chi2(  6) =  151.87
         Prob > chi2 =    0.0000
```

6.2. *Efeitos Parciais Médios (Average Partial Effect – APE)*

```
margins, dydx(nwifeinc educ exper age kidslt6) post
```

```
Average marginal effects                        Number of obs   =        753
Model VCE    : OIM

Expression   : Pr(inlf), predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0037602    .001486    -2.53   0.011    -.0066726   -.0008477
        educ |   .0389059   .0072606     5.36   0.000     .0246754    .0531363
       exper |   .0251198   .0022106    11.36   0.000     .0207871    .0294525
         age |   -.016486   .0021804    -7.56   0.000    -.0207595   -.0122124
     kidslt6 |  -.2625092   .0315679    -8.32   0.000     -.324381   -.2006373
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store Logit_APE
```

6.3. Efeitos Parciais na Média (Partial Effect at the Average – PEA)

```
quietly logit inlf nwifeinc educ exper c.exper#c.exper age
kidslt6
margins, dydx(nwifeinc educ exper age kidslt6) atmeans post
```

```
Conditional marginal effects                      Number of obs   =        753
Model VCE    : OIM

Expression   : Pr(inlf), predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6
at           : nwifeinc        =    20.12896 (mean)
               educ            =    12.28685 (mean)
               exper           =    10.63081 (mean)
               age             =    42.53785 (mean)
               kidslt6         =    .2377158 (mean)

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0048926   .0019598    -2.50   0.013    -.0087337   -.0010516
        educ |   .0506233   .0101121     5.01   0.000     .0308039    .0704427
       exper |   .0318437   .0032417     9.82   0.000     .0254901    .0381973
         age |  -.0214511   .0032334    -6.63   0.000    -.0277884   -.0151138
     kidslt6 |  -.3415702   .0477782    -7.15   0.000    -.4352137   -.2479268
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store Logit_PEA
```

6.4. *Efeitos Parciais avaliados nos valores máximos dos regressores*

```
quietly logit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
margins, dydx(nwifeinc educ exper age kidslt6) at((max) nwifeinc educ exper age kidslt6) post
```

```
Conditional marginal effects                    Number of obs   =        753
Model VCE    : OIM

Expression   : Pr(inlf), predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6
at           : nwifeinc        =          96 (max)
               educ            =          17 (max)
               exper           =          45 (max)
               age             =          60 (max)
               kidslt6         =           3 (max)

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0001871   .0002179    -0.86   0.390    -.0006142    .0002399
        educ |   .0019362   .0025601     0.76   0.449    -.0030815    .0069539
       exper |  -.0007042   .0006537    -1.08   0.281    -.0019855    .0005771
         age |  -.0008204   .0010756    -0.76   0.446    -.0029286    .0012877
     kidslt6 |   -.013064   .0164686    -0.79   0.428    -.0453419    .0192138
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store Logit_atMax
```

6.5. Efeitos Parciais avaliados nos valores mínimos dos regressores

```
quietly logit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
margins, dydx(nwifeinc educ exper age kidslt6) at((min) nwifeinc educ exper age kidslt6) post
```

```
Conditional marginal effects                    Number of obs   =        753
Model VCE    : OIM

Expression   : Pr(inlf), predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6
at           : nwifeinc        =   -.0290575 (min)
               educ            =           5 (min)
               exper           =           0 (min)
               age             =          30 (min)
               kidslt6         =           0 (min)

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0042715   .0019517    -2.19   0.029    -.0080967   -.0004463
        educ |   .0441967     .00701     6.30   0.000     .0304574    .0579361
       exper |   .0413725   .0074322     5.57   0.000     .0268057    .0559393
         age |  -.0187279   .0048293    -3.88   0.000    -.0281932   -.0092626
     kidslt6 |  -.2982083   .0695175    -4.29   0.000    -.4344601   -.1619565
------------------------------------------------------------------------------
```

➔ Guardar o *output*:

```
estimates store Logit_atMin
```

6.6. Efeitos Parciais Médios (Average Partial Effect – APE) para o regressor **kidslt6**

```
quietly logit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
```

➔ Gerar argumento da função $G(\bullet)$:

```
gen xb_Lgit_APE = _b[nwifeinc] * nwifeinc + _b[educ] * educ + _b[exper] * exper + _b[c.exper#c.exper] * expersq + _b[c.exper#c.exper] * age + _b[_cons]
```

- APE de 0 para 1 filho:

```
gen kidslt6_Lgit_APE_01 = logistic(xb_Lgit_APE+_b[kidslt6])-logistic(xb_Lgit_APE)
```

- APE de 1 para 2 filhos:

```
gen kidslt6_Lgit_APE_12 = logistic(xb_Lgit_APE+_b[kidslt6]*2)-logistic(xb_Lgit_APE+_b[kidslt6]*1)
```

- APE de 2 para 3 filhos:

```
gen kidslt6_Lgit_APE_23 = logistic(xb_Lgit_APE+_b[kidslt6]*3)-logistic(xb_Lgit_APE+_b[kidslt6]*2)
```

- Sumário dos APEs de **kidslt6**:

```
sum kidslt6_Lgit_APE_01 kidslt6_Lgit_APE_12 kidslt6_Lgit_APE_23
```

```
    Variable | Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
kidslt6_Lgit_APE_01 | 753   -.0556768    .055777  -.3493671  -.0023257
kidslt6_Lgit_APE_12 | 753   -.1504998   .0996012  -.3513564   -.009972
kidslt6_Lgit_APE_23 | 753   -.2588905   .0846887  -.3513967  -.0410742
```

6.7. *Efeitos Parciais na Média (Partial Effect at the Average – PEA) para o regressor* **`kidslt6`**

```
quietly logit inlf nwifeinc educ exper c.exper#c.exper age kidslt6
```

➔ Gerar argumento da função $G(\bullet)$ – as médias dos regressores já foram geradas atrás:

```
gen xb_Lgit_PEA = _b[nwifeinc] * `=mean_nwifeinc' + _b[educ] *  `=mean_educ'  +  _b[exper]  *  `=mean_exper'  + _b[c.exper#c.exper] * `=mean_expersq' + _b[c.exper#c.exper] * `=mean_age' + _b[_cons]
```

- PEA de 0 para 1 filho:

```
gen              kidslt6_Lgit_PEA_01              = logistic(xb_Lgit_PEA+_b[kidslt6])-logistic(xb_Lgit_PEA)
```

- PEA de 1 para 2 filhos:

```
gen              kidslt6_Lgit_PEA_12              = logistic(xb_Lgit_PEA+_b[kidslt6]*2)-logistic(xb_Lgit_PEA+_b[kidslt6]*1)
```

- PEA de 2 para 3 filhos:

```
gen              kidslt6_Lgit_PEA_23              = logistic(xb_Lgit_PEA+_b[kidslt6]*3)-logistic(xb_Lgit_PEA+_b[kidslt6]*2)
```

- Sumário dos PEAs de **`kidslt6`**:

```
sum     kidslt6_Lgit_PEA_01     kidslt6_Lgit_PEA_12 kidslt6_Lgit_PEA_23
```

```
             Variable | Obs        Mean    Std. Dev.       Min        Max
----------------------+---------------------------------------------------
kidslt6_Lgit_PEA_01 |  753   -.0359361           0  -.0359361  -.0359361
kidslt6_Lgit_PEA_12 |  753   -.1298474           0  -.1298474  -.1298474
kidslt6_Lgit_PEA_23 |  753   -.3058947           0  -.3058947  -.3058947
```

7. Revisão de todos os resultados

```
estimates table MPL_OLS_APE MPL_WLS_APE, star(.1 .05 .01)
```

```
---------------------------------------------
    Variable |  MPL_OLS_APE     MPL_WLS_APE
-------------+-------------------------------
    nwifeinc |  -.0033344**    -.00499618***
        educ |  .03728479***    .04494956***
       exper |  .02642332***     .0289389***
         age | -.01692279***   -.01818142***
     kidslt6 | -.26545565***   -.29420466***
---------------------------------------------
                                    legend: * p<.1; ** p<.05; *** p<.01
```

```
estimates table Probit_APE Probit_PEA Probit_atMax Probit_atMin, star(.1 .05 .01)
```

```
------------------------------------------------------------------------------
    Variable |  Probit_APE      Probit_PEA     Probit_atMax    Probit_atMin
-------------+----------------------------------------------------------------
    nwifeinc | -.00356162**    -.00447031**    -.00010352      -.00405166**
        educ |  .03874611***     .0486315***    .00112613       .04407716***
       exper |  .02527315***    .03101661***   -.00041425        .0418224***
         age | -.01665465***   -.02090379***   -.00048406      -.01894615***
     kidslt6 | -.26521447***   -.33287929***   -.00770826      -.30170513***
------------------------------------------------------------------------------
                                    legend: * p<.1; ** p<.05; *** p<.01
```

```
estimates table Logit_APE Logit_PEA Logit_atMax Logit_atMin, star(.1 .05 .01)
```

```
------------------------------------------------------------------------------
    Variable |   Logit_APE       Logit_PEA      Logit_atMax     Logit_atMin
-------------+----------------------------------------------------------------
    nwifeinc | -.00376017**    -.00489263**    -.00018713      -.00427152**
        educ |  .03890585***     .0506233***    .00193619       .04419674***
       exper |  .02511982***    .03184366***   -.00070421       .04137249***
         age | -.01648596***   -.02145111***   -.00082044      -.01872792***
     kidslt6 | -.26250917***   -.34157022***   -.01306402      -.29820831***
------------------------------------------------------------------------------
                                    legend: * p<.1; ** p<.05; *** p<.01
```

Bibliografia:

Wooldridge, J. (2010), *Econometric Analysis of Cross Section and Panel Data*, 2nd edition, MIT Press