

# MODELOS DE ESCOLHA BINÁRIA (CROSS-SECTION)

## 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
35	3	0.40	99.34
36	1	0.13	99.47
37	2	0.27	99.73
38	1	0.13	99.87
45	1	0.13	100.00
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				[95% Conf. Interval]	
	inlf	Coef.	Std. Err.	t	P> t		
	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

➔ Guardar o output:

```
estimates store MPL_OLS
```

#### 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				[95% Conf. Interval]	
		dy/dx	Std. Err.	t	P> t		
	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
```

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

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

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

Expression      : Linear prediction, 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.	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_PEA
```

### 3.3. Efeitos Parciais avaliados nos valores máximos dos regressores

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

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

Expression      : Linear prediction, 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.	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	-.0144244	.0117756	-1.22	0.221	-.0375417	.0086929
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_atMax
```

### 3.4. Efeitos Parciais avaliados nos valores mínimos dos regressores

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

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

```
Expression      : Linear prediction, 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.	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
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_atMin
```



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

```
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]
```

} Gera variância do MPL  
estimado pelo OLS

```
(sum of wgt is 1.3902e+02)
```

Source	SS	df	MS	Number of obs =	721
Model	30.7951022	6	5.13251703	F( 6, 714) =	24.70
Residual	148.353348	714	.207777799	Prob > F =	0.0000
Total	179.14845	720	.248817292	R-squared =	0.1719
				Adj R-squared =	0.1649
				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

→ Guardar o output:

```
estimates store MPL_WLS
```

#### 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		t	P> t	[95% Conf. Interval]	
	dy/dx	Std. Err.					
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
```

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

```
quietly reg inlf nwifeinc educ exper c.exper#c.exper age kidslt6 [aweight=condvar_mpl]
margins, dydx(nwifeinc educ exper age kidslt6) atmeans post
```

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

Expression    : Linear prediction, predict()
dy/dx w.r.t. : nwifeinc educ exper age kidslt6
at           : nwifeinc      =      20.3819 (mean)
              educ          =      12.19905 (mean)
              exper         =      9.935059 (mean)
              age           =      42.73539 (mean)
              kidslt6       =      .2372572 (mean)
```

	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_PEA
```

## 4.3. Efeitos Parciais avaliados nos valores máximos dos regressores

```
quietly reg inlf nwifeinc educ exper c.exper#c.exper age kidslt6 [aweight=condvar_mpl]
margins, dydx(nwifeinc educ exper age kidslt6) at((max) nwifeinc educ exper age kidslt6) post
```

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

Expression    : Linear prediction, 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       =           2 (max)
```

	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	-.0172557	.0125065	-1.38	0.168	-.0418096	.0072983
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_atMax
```

#### 4.4. Efeitos Parciais avaliados nos valores mínimos dos regressores

```
quietly reg inlf nwifeinc educ exper c.exper#c.exper age kidslt6 [aweight=condvar_mpl]
margins, dydx(nwifeinc educ exper age kidslt6) at((min) nwifeinc educ exper age kidslt6) post
```

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

```
Expression      : Linear prediction, 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.	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
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_atMin
```

## 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
k~bit_APE_01	753	-.0549142	.0607725	-.3368334	-.0002519
k~bit_APE_12	753	-.1545479	.100116	-.3403717	-.0045301
k~bit_APE_23	753	-.261176	.0771467	-.3403888	-.0388605

## 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_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_PEA_01=normal(xb_PEA+_b[kidslt6])-normal(xb_PEA)
```

- PEA de 1 para 2 filhos:

```
gen kidslt6_PEA_12=normal(xb_PEA+_b[kidslt6]*2)-normal(xb_PEA+_b[kidslt6]*1)
```

- PEA de 2 para 3 filhos:

```
gen kidslt6_PEA_23=normal(xb_PEA+_b[kidslt6]*3)-normal(xb_PEA+_b[kidslt6]*2)
```

- Sumário dos PEAs de `kidslt6`:

```
sum kidslt6_PEA_01 kidslt6_PEA_12 kidslt6_PEA_23
```

Variable	Obs	Mean	Std. Dev.	Min	Max
k~bit_PEA_01	753	-.0316915	0	-.0316915	-.0316915
k~bit_PEA_12	753	-.14156	0	-.14156	-.14156
k~bit_PEA_23	753	-.3045816	0	-.3045816	-.3045816



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

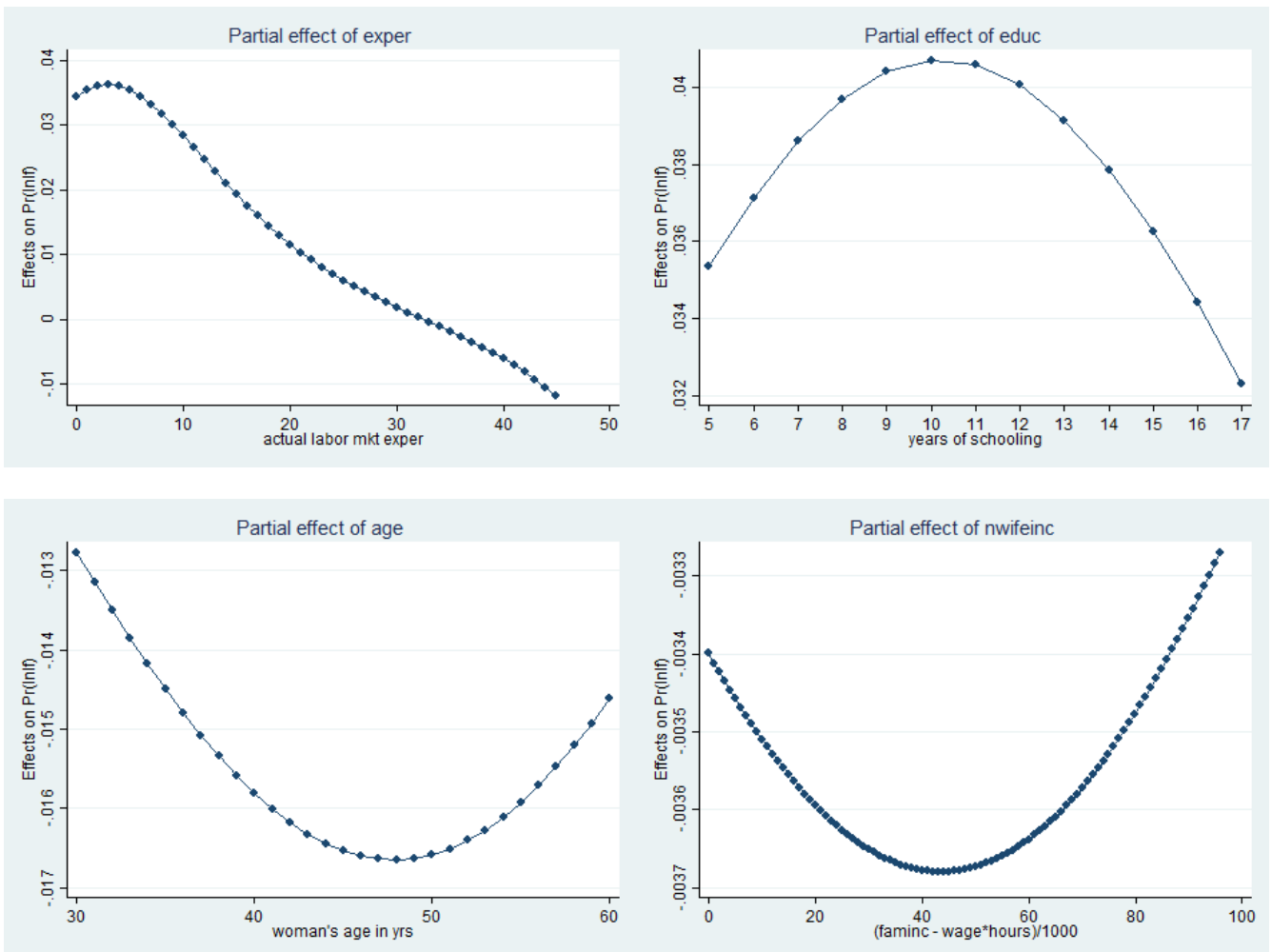
```
quietly probit lnlf nwifeinc educ exper c.exper#c.exper age kidslt6
```

→ 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
}
```



## 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 |   -0.0210297   .0084272    -2.50   0.013   -0.0375468   -0.0045127
            educ |    .2175914   .0431275     5.05   0.000    .133063    .3021198
            exper |    .2036869   .0318759     6.39   0.000    .1412114    .2661625
            |
c.exper#c.exper |   -0.0031425   .0010145    -3.10   0.002   -0.005131   -0.0011541
            |
            age |   -0.0922022   .0136754    -6.74   0.000   -0.1190055   -0.0653988
      kidslt6 |   -1.468153   .2023964    -7.25   0.000   -1.864842   -1.071463
            _cons |    .7502201   .7603718     0.99   0.324   -0.7400813    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=normal(xb_Lgit_APE+_b[kidslt6])-normal(xb_Lgit_APE)
```

- APE de 1 para 2 filhos:

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

- APE de 2 para 3 filhos:

```
gen kidslt6_Lgit_APE_23=normal(xb_Lgit_APE+_b[kidslt6]*3)-normal(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
k~git_APE_01	753	-.0218605	.0563263	-.5312082	-3.35e-09
k~git_APE_12	753	-.1360376	.1592032	-.5369759	-7.45e-06
k~git_APE_23	753	-.320867	.1766579	-.5370932	-.0020982

## 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  $G(\bullet)$ :

```
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=normal(xb_Lgit_PEA+_b[kidslt6])-normal(xb_Lgit_PEA)
```

- PEA de 1 para 2 filhos:

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

- PEA de 2 para 3 filhos:

```
gen kidslt6_Lgit_PEA_23=normal(xb_Lgit_PEA+_b[kidslt6]*3)-normal(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
k~git_PEA_01	753	-.0013264	0	-.0013264	-.0013264
k~git_PEA_12	753	-.0609006	0	-.0609006	-.0609006

## 7. Revisão de todos os resultados

**estimates table MPL\_OLS\_APE MPL\_OLS\_PEA MPL\_OLS\_atMax MPL\_OLS\_atMin, star(.1 .05 .01)**

Variable	MPL_OLS_APE	MPL_OLS_PEA	MPL_OLS_atMax	MPL_OLS_atMin
nwifeinc	-.0033344**	-.0033344**	-.0033344**	-.0033344**
educ	.03728479***	.03728479***	.03728479***	.03728479***
exper	.02642332***	.02642332***	-.01442438	.03905802***
age	-.01692279***	-.01692279***	-.01692279***	-.01692279***
kidslt6	-.26545565***	-.26545565***	-.26545565***	-.26545565***

legend: \* p<.1; \*\* p<.05; \*\*\* p<.01

**estimates table MPL\_WLS\_APE MPL\_WLS\_PEA MPL\_WLS\_atMax MPL\_WLS\_atMin, star(.1 .05 .01)**

Variable	MPL_WLS_APE	MPL_WLS_PEA	MPL_WLS_atMax	MPL_WLS_atMin
nwifeinc	-.00499618***	-.00499618***	-.00499618***	-.00499618***
educ	.04494956***	.04494956***	.04494956***	.04494956***
exper	.0289389***	.0289389***	-.01725567	.04202735***
age	-.01818142***	-.01818142***	-.01818142***	-.01818142***
kidslt6	-.29420466***	-.29420466***	-.29420466***	-.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*, 2<sup>nd</sup> edition, MIT Press