

Prelude to Comparing Coefficients Between Nested Models

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Following are results of two bivariate and one multivariate logistic regressions using a data set I constructed:

```
. use https://www3.nd.edu/~rwilliam/statafiles/standardized.dta, clear
. logit ybinary x1, nolog
```

```
Logit estimates                Number of obs   =          500
                               LR chi2(1)           =          161.77
                               Prob > chi2          =           0.0000
Log likelihood = -265.54468     Pseudo R2      =           0.2335
```

ybinary	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
x1	.7388678	.072961	10.13	0.000	.5958668 .8818687
_cons	-.0529777	.105911	-0.50	0.617	-.2605593 .154604

```
. logit ybinary x2, nolog
```

```
Logit estimates                Number of obs   =          500
                               LR chi2(1)           =          160.35
                               Prob > chi2          =           0.0000
Log likelihood = -266.25298     Pseudo R2      =           0.2314
```

ybinary	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
x2	.4886751	.0482208	10.13	0.000	.3941641 .5831861
_cons	-.0723833	.1058261	-0.68	0.494	-.2797986 .135032

```
. logit ybinary x1 x2, nolog
```

```
Logit estimates                Number of obs   =          500
                               LR chi2(2)           =          443.39
                               Prob > chi2          =           0.0000
Log likelihood = -124.73508     Pseudo R2      =           0.6399
```

ybinary	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
x1	1.78923	.1823005	9.81	0.000	1.431927 2.146532
x2	1.173144	.1207712	9.71	0.000	.9364369 1.409851
_cons	-.2144856	.1626906	-1.32	0.187	-.5333532 .1043821

Usually, when we add variables to a model (at least in OLS regression), the effects of variables added earlier go down. However, in this case, we see that the coefficients for x1 and x2 increase (seemingly) dramatically when both variables are in the model, i.e. in the separate bivariate regressions the effects of x1 and x2 are .7388678 and .4886751, but in the multivariate regressions the effects are 1.78923 and 1.173144, more than twice as large as before. This leads to two questions:

1. If we saw something similar in an OLS regression, what would we suspect was going on? In other words, in an OLS regression, what can cause coefficients to get bigger rather than smaller as more variables are added?
2. In a logistic regression, why might such an interpretation be totally wrong? 😊