

**PAF 573**  
**Advanced Regression**  
**Multinomial Logit Model for Unordered Outcomes**

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```
log: C:\Documents and Settings\Mark Hugo Lopez\My Documents\wvs 508b\multinomial
logit.log
log type: text
opened on: 19 Apr 2004, 18:09:02
```

```
. do "C:\DOCUME~1\MARKHU~1\LOCALS~1\Temp\STD000000.tmp"

. #delimit;
delimiter now ;
. set more 1;

. *this log file demonstrates the mlogit command for nominal outcomes;
. *Consider data on young people that examines what political party they are likely to
> identify with;
. *the options are democrat, independent, republican or don't know;
. *First tab the data;
. tab party;
```

party id	Freq.	Percent	Cum.
democrat	446	29.93	29.93
independent	409	27.45	57.38
republican	411	27.58	84.97
4	224	15.03	100.00
Total	1490	100.00	

```
. tab party, nolabel;
```

party id	Freq.	Percent	Cum.
1	446	29.93	29.93
2	409	27.45	57.38
3	411	27.58	84.97
4	224	15.03	100.00
Total	1490	100.00	

```
. *now run the mlogit model;
. mlogit party reg_vote ed_success ed_less_success black hispanic asian other urb rural;
```

```
Iteration 0: log likelihood = -1449.9848
Iteration 1: log likelihood = -1377.1454
Iteration 2: log likelihood = -1367.0199
Iteration 3: log likelihood = -1366.8879
Iteration 4: log likelihood = -1366.8876
```

```
Multinomial regression      Number of obs   =      1097
                          LR chi2(27)             =      166.19
                          Prob > chi2              =      0.0000
Log likelihood = -1366.8876  Pseudo R2        =      0.0573
```

party	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
-----						
independent						
reg_vote	-.8235293	.177039	-4.65	0.000	-1.170519	-.4765392
ed_success	-.4612875	.3429427	-1.35	0.179	-1.133443	.2108678
ed_less_su~s	-.117138	.3243656	-0.36	0.718	-.752883	.5186069
black	-.5509379	.2330034	-2.36	0.018	-1.007616	-.0942596
hispanic	-.3033442	.231781	-1.31	0.191	-.7576267	.1509382
asian	2.135667	1.078023	1.98	0.048	.0227806	4.248554
other	-.8306018	.4588213	-1.81	0.070	-1.729875	.0686713
urb	-.147192	.1868265	-0.79	0.431	-.5133653	.2189813
rural	.1192096	.2244123	0.53	0.595	-.3206304	.5590497
_cons	.7523426	.3351729	2.24	0.025	.0954157	1.40927
-----						
republican						
reg_vote	.0378777	.1816343	0.21	0.835	-.3181191	.3938744
ed_success	-.3137391	.3312505	-0.95	0.344	-.9629781	.3354999
ed_less_su~s	-.3121905	.3198794	-0.98	0.329	-.9391426	.3147616
black	-.5461733	.2182693	-2.50	0.012	-.9739733	-.1183733
hispanic	-.1490172	.2158638	-0.69	0.490	-.5721024	.274068
asian	1.718197	1.084823	1.58	0.113	-.4080165	3.844411
other	-.4984525	.423236	-1.18	0.239	-1.32798	.3310749
urb	-.0211833	.1739739	-0.12	0.903	-.3621658	.3197993
rural	-.0387421	.2216631	-0.17	0.861	-.4731938	.3957097
_cons	.3595463	.3343658	1.08	0.282	-.2957987	1.014891
-----						
4						
reg_vote	-1.801772	.2477945	-7.27	0.000	-2.28744	-1.316104
ed_success	-1.699293	.4138051	-4.11	0.000	-2.510337	-.8882504
ed_less_su~s	-.8530115	.341405	-2.50	0.012	-1.522153	-.18387
black	-.3728584	.3279479	-1.14	0.256	-1.015624	.2699077
hispanic	-.3013979	.3210467	-0.94	0.348	-.9306379	.327842
asian	2.549594	1.197486	2.13	0.033	.202564	4.896624
other	.5047572	.4286424	1.18	0.239	-.3353665	1.344881
urb	-.1890431	.2637535	-0.72	0.474	-.7059905	.3279042
rural	.2399142	.2978122	0.81	0.420	-.343787	.8236153
_cons	.8783135	.3590192	2.45	0.014	.1746488	1.581978

(Outcome party==democrat is the comparison group)

```
. *notice that the output produces several binary logit outputs;
. *This is somewhat overwhelming, and potentially problematic;
. *also notice that the reference group is democrats, which has the largest number of m
> embers;
. *STATA will also pick as the reference group, that group which is most numerous;
. *however, perhaps we want to use independents are the reference group to do this, run
> the following mlogit;
. mlogit party reg_vote ed_success ed_less_success black hispanic asian other urb rural
```



```
. *To conduct hypothesis tests on groups of variables, we can do the usual LR and Wald
> tests;
. *however, there is an easier way to do this;
. mlogtest, lr set(ed_success ed_less_success);
```

\*\*\*\* Likelihood-ratio tests for independent variables

Ho: All coefficients associated with given variable(s) are 0.

party	chi2	df	P>chi2
reg_vote	81.783	3	0.000
ed_success	18.354	3	0.000
ed_less_su~s	7.356	3	0.061
black	8.444	3	0.038
hispanic	1.958	3	0.581
asian	7.727	3	0.052
other	9.666	3	0.022
urb	0.986	3	0.805
rural	1.111	3	0.774
set_1: ed_success ed_less_su~s	22.634	6	0.001

```
. mlogtest, wald set(ed_success ed_less_success);
```

\*\*\*\* Wald tests for independent variables

Ho: All coefficients associated with given variable(s) are 0.

party	chi2	df	P>chi2
reg_vote	75.951	3	0.000
ed_success	17.693	3	0.001
ed_less_su~s	7.587	3	0.055
black	8.529	3	0.036
hispanic	1.958	3	0.581
asian	5.025	3	0.170
other	9.406	3	0.024
urb	0.984	3	0.805
rural	1.117	3	0.773
set_1: ed_success ed_less_su~s	21.842	6	0.001

```
. mlogtest, wald;
```

```
**** Wald tests for independent variables
```

```
Ho: All coefficients associated with given variable(s) are 0.
```

party	chi2	df	P>chi2
reg_vote	75.951	3	0.000
ed_success	17.693	3	0.001
ed_less_su~s	7.587	3	0.055
black	8.529	3	0.036
hispanic	1.958	3	0.581
asian	5.025	3	0.170
other	9.406	3	0.024
urb	0.984	3	0.805
rural	1.117	3	0.773

```
. *To calculate predicted probabilities, use the predict command;  
. predict p_dem p_ind p_rep p_dk;  
(option p assumed; predicted probabilities)  
(393 missing values generated)
```

```
. *and to calculate marginal effects, for each outcome;  
. mfx compute, predict(outcome(1));
```

```
Marginal effects after mlogit
```

```
    y = Pr(party=1) (predict, outcome(1))  
    = .32590855
```

variable	dy/dx	Std. Err.	z	P> z	[	95% C.I.	]	X
reg_vote*	.1238637	.02991	4.14	0.000	.065246	.182482	.643573	
ed_suc~s*	.1154365	.06558	1.76	0.078	-.013096	.243969	.327256	
ed_les~s*	.0654352	.05861	1.12	0.264	-.049448	.180318	.583409	
black*	.1216481	.04389	2.77	0.006	.035635	.207661	.160438	
hispanic*	.0513661	.04402	1.17	0.243	-.034915	.137648	.164084	
asian*	-.2711487	.06187	-4.38	0.000	-.392421	-.149877	.015497	
other*	.0980937	.08202	1.20	0.232	-.062661	.258848	.042844	
urb*	.0202716	.03336	0.61	0.543	-.045111	.085654	.353692	
rural*	-.0135212	.04075	-0.33	0.740	-.093397	.066354	.181404	

```
(*) dy/dx is for discrete change of dummy variable from 0 to 1
```

```
. mfx compute, predict(outcome(2));
```

Marginal effects after mlogit

```
y = Pr(party==2) (predict, outcome(2))  
= .27549471
```

variable	dy/dx	Std. Err.	z	P> z	[ 95% C.I. ]	X
reg_vote*	-.1150937	.03075	-3.74	0.000	-.175371 -.054817	.643573
ed_suc~s*	-.03242	.0551	-0.59	0.556	-.140418 .075578	.327256
ed_les~s*	.023942	.052	0.46	0.645	-.077981 .125865	.583409
black*	-.0555639	.03768	-1.47	0.140	-.129418 .01829	.160438
hispanic*	-.0401482	.03495	-1.15	0.251	-.108649 .028353	.164084
asian*	.1539502	.12239	1.26	0.208	-.085933 .393833	.015497
other*	-.1212201	.05582	-2.17	0.030	-.230618 -.011822	.042844
urb*	-.0232622	.0317	-0.73	0.463	-.085392 .038867	.353692
rural*	.0217741	.03871	0.56	0.574	-.054088 .097636	.181404

(\*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx compute, predict(outcome(3));
```

Marginal effects after mlogit

```
y = Pr(party==3) (predict, outcome(3))  
= .31874925
```

variable	dy/dx	Std. Err.	z	P> z	[ 95% C.I. ]	X
reg_vote*	.1316217	.02954	4.46	0.000	.07372 .189524	.643573
ed_suc~s*	.0078903	.05998	0.13	0.895	-.109669 .12545	.327256
ed_les~s*	-.0341878	.05736	-0.60	0.551	-.146615 .078239	.583409
black*	-.0629772	.03923	-1.61	0.108	-.139876 .013922	.160438
hispanic*	.000278	.04077	0.01	0.995	-.079638 .080194	.164084
asian*	.009955	.11679	0.09	0.932	-.218951 .238861	.015497
other*	-.0663735	.07192	-0.92	0.356	-.207326 .074579	.042844
urb*	.0129744	.0331	0.39	0.695	-.051899 .077848	.353692
rural*	-.0250962	.03985	-0.63	0.529	-.103193 .053	.181404

(\*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx compute, predict(outcome(4));
```

Marginal effects after mlogit

```
y = Pr(party==4) (predict, outcome(4))  
= .07984749
```

variable	dy/dx	Std. Err.	z	P> z	[ 95% C.I. ]	X
reg_vote*	-.1403917	.02361	-5.95	0.000	-.186657 -.094127	.643573
ed_suc~s*	-.0909069	.02065	-4.40	0.000	-.131385 -.050428	.327256
ed_les~s*	-.0551894	.02383	-2.32	0.021	-.10189 -.008489	.583409
black*	-.003107	.0219	-0.14	0.887	-.046035 .039821	.160438
hispanic*	-.0114959	.01964	-0.59	0.558	-.049997 .027005	.164084
asian*	.1072435	.10318	1.04	0.299	-.094977 .309464	.015497
other*	.0894999	.05041	1.78	0.076	-.009297 .188296	.042844
urb*	-.0099838	.01721	-0.58	0.562	-.043712 .023744	.353692
rural*	.0168434	.0219	0.77	0.442	-.026088 .059775	.181404

(\*) dy/dx is for discrete change of dummy variable from 0 to 1

. \*or to obtain odds ratios;  
. listcoef, help;

mlogit (N=1097): Factor Change in the Odds of party

Variable: reg\_vote (sd=.47916175)

Odds comparing Group 1 vs Group 2	b	z	P> z	e^b	e^bStdX
democrat-republic	-0.03788	-0.209	0.835	0.9628	0.9820
democrat-4	1.80177	7.271	0.000	6.0604	2.3711
democrat-independ	0.82353	4.652	0.000	2.2785	1.4838
republic-democrat	0.03788	0.209	0.835	1.0386	1.0183
republic-4	1.83965	7.379	0.000	6.2943	2.4145
republic-independ	0.86141	4.816	0.000	2.3665	1.5110
4 -democrat	-1.80177	-7.271	0.000	0.1650	0.4218
4 -republic	-1.83965	-7.379	0.000	0.1589	0.4142
4 -independ	-0.97824	-3.989	0.000	0.3760	0.6258
independ-democrat	-0.82353	-4.652	0.000	0.4389	0.6739
independ-republic	-0.86141	-4.816	0.000	0.4226	0.6618
independ-4	0.97824	3.989	0.000	2.6598	1.5980

Variable: ed\_success (sd=.46942565)

Odds comparing Group 1 vs Group 2	b	z	P> z	e^b	e^bStdX
democrat-republic	0.31374	0.947	0.344	1.3685	1.1587
democrat-4	1.69929	4.107	0.000	5.4701	2.2204
democrat-independ	0.46129	1.345	0.179	1.5861	1.2418
republic-democrat	-0.31374	-0.947	0.344	0.7307	0.8631
republic-4	1.38555	3.419	0.001	3.9970	1.9163
republic-independ	0.14755	0.445	0.656	1.1590	1.0717
4 -democrat	-1.69929	-4.107	0.000	0.1828	0.4504
4 -republic	-1.38555	-3.419	0.001	0.2502	0.5218
4 -independ	-1.23801	-3.079	0.002	0.2900	0.5593
independ-democrat	-0.46129	-1.345	0.179	0.6305	0.8053
independ-republic	-0.14755	-0.445	0.656	0.8628	0.9331
independ-4	1.23801	3.079	0.002	3.4487	1.7881

Variable: ed\_less\_success (sd=.49321866)

Odds comparing Group 1 vs Group 2	b	z	P> z	e^b	e^bStdX
democrat-republic	0.31219	0.976	0.329	1.3664	1.1665
democrat-4	0.85301	2.499	0.012	2.3467	1.5231
democrat-independ	0.11714	0.361	0.718	1.1243	1.0595
republic-democrat	-0.31219	-0.976	0.329	0.7318	0.8573
republic-4	0.54082	1.631	0.103	1.7174	1.3057
republic-independ	-0.19505	-0.624	0.533	0.8228	0.9083
4 -democrat	-0.85301	-2.499	0.012	0.4261	0.6566
4 -republic	-0.54082	-1.631	0.103	0.5823	0.7659
4 -independ	-0.73587	-2.289	0.022	0.4791	0.6956
independ-democrat	-0.11714	-0.361	0.718	0.8895	0.9439
independ-republic	0.19505	0.624	0.533	1.2154	1.1010
independ-4	0.73587	2.289	0.022	2.0873	1.4376

Variable: black (sd=.36717877)

Odds comparing Group 1 vs Group 2	b	z	P> z	e^b	e^bStdX
democrat-republic	0.54617	2.502	0.012	1.7266	1.2221
democrat-4	0.37286	1.137	0.256	1.4519	1.1467
democrat-independ	0.55094	2.365	0.018	1.7349	1.2242
republic-democrat	-0.54617	-2.502	0.012	0.5792	0.8183
republic-4	-0.17331	-0.512	0.609	0.8409	0.9383
republic-independ	0.00476	0.019	0.985	1.0048	1.0018
4 -democrat	-0.37286	-1.137	0.256	0.6888	0.8721
4 -republic	0.17331	0.512	0.609	1.1892	1.0657
4 -independ	0.17808	0.529	0.597	1.1949	1.0676
independ-democrat	-0.55094	-2.365	0.018	0.5764	0.8169
independ-republic	-0.00476	-0.019	0.985	0.9952	0.9983
independ-4	-0.17808	-0.529	0.597	0.8369	0.9367

Variable: hispanic (sd=.37052058)

Odds comparing Group 1 vs Group 2	b	z	P> z	e^b	e^bStdX
democrat-republic	0.14902	0.690	0.490	1.1607	1.0568
democrat-4	0.30140	0.939	0.348	1.3517	1.1181
democrat-independ	0.30334	1.309	0.191	1.3544	1.1190
republic-democrat	-0.14902	-0.690	0.490	0.8616	0.9463
republic-4	0.15238	0.474	0.635	1.1646	1.0581
republic-independ	0.15433	0.662	0.508	1.1669	1.0588
4 -democrat	-0.30140	-0.939	0.348	0.7398	0.8943
4 -republic	-0.15238	-0.474	0.635	0.8587	0.9451
4 -independ	0.00195	0.006	0.995	1.0019	1.0007
independ-democrat	-0.30334	-1.309	0.191	0.7383	0.8937
independ-republic	-0.15433	-0.662	0.508	0.8570	0.9444
independ-4	-0.00195	-0.006	0.995	0.9981	0.9993

Variable: asian (sd=.12357418)

Odds comparing Group 1 vs Group 2	b	z	P> z	e^b	e^bStdX
democrat-republic	-1.71820	-1.584	0.113	0.1794	0.8087
democrat-4	-2.54959	-2.129	0.033	0.0781	0.7297
democrat-independ	-2.13567	-1.981	0.048	0.1182	0.7680
republic-democrat	1.71820	1.584	0.113	5.5745	1.2365
republic-4	-0.83140	-1.074	0.283	0.4354	0.9024
republic-independ	-0.41747	-0.728	0.466	0.6587	0.9497
4 -democrat	2.54959	2.129	0.033	12.8019	1.3703
4 -republic	0.83140	1.074	0.283	2.2965	1.1082
4 -independ	0.41393	0.564	0.573	1.5127	1.0525
independ-democrat	2.13567	1.981	0.048	8.4627	1.3020
independ-republic	0.41747	0.728	0.466	1.5181	1.0529
independ-4	-0.41393	-0.564	0.573	0.6610	0.9501

Variable: other (sd=.20259792)

Odds comparing Group 1 vs Group 2	b	z	P> z	e^b	e^bStdX
democrat-republic	0.49845	1.178	0.239	1.6462	1.1063
democrat-4	-0.50476	-1.178	0.239	0.6037	0.9028
democrat-independ	0.83060	1.810	0.070	2.2947	1.1833
republic-democrat	-0.49845	-1.178	0.239	0.6075	0.9039
republic-4	-1.00321	-2.156	0.031	0.3667	0.8161
republic-independ	0.33215	0.673	0.501	1.3940	1.0696
4 -democrat	0.50476	1.178	0.239	1.6566	1.1077
4 -republic	1.00321	2.156	0.031	2.7270	1.2254
4 -independ	1.33536	2.807	0.005	3.8014	1.3107
independ-democrat	-0.83060	-1.810	0.070	0.4358	0.8451
independ-republic	-0.33215	-0.673	0.501	0.7174	0.9349
independ-4	-1.33536	-2.807	0.005	0.2631	0.7630

Variable: urb (sd=.47833305)

Odds comparing Group 1 vs Group 2	b	z	P> z	e^b	e^bStdX
democrat-republic	0.02118	0.122	0.903	1.0214	1.0102
democrat-4	0.18904	0.717	0.474	1.2081	1.0946
democrat-independ	0.14719	0.788	0.431	1.1586	1.0729
republic-democrat	-0.02118	-0.122	0.903	0.9790	0.9899
republic-4	0.16786	0.634	0.526	1.1828	1.0836
republic-independ	0.12601	0.672	0.502	1.1343	1.0621
4 -democrat	-0.18904	-0.717	0.474	0.8278	0.9135
4 -republic	-0.16786	-0.634	0.526	0.8455	0.9228
4 -independ	-0.04185	-0.158	0.875	0.9590	0.9802
independ-democrat	-0.14719	-0.788	0.431	0.8631	0.9320
independ-republic	-0.12601	-0.672	0.502	0.8816	0.9415
independ-4	0.04185	0.158	0.875	1.0427	1.0202

Variable: rural (sd=.38552817)

Odds comparing Group 1 vs Group 2	b	z	P> z	e^b	e^bStdX
democrat-republic	0.03874	0.175	0.861	1.0395	1.0150
democrat-4	-0.23991	-0.806	0.420	0.7867	0.9117
democrat-independ	-0.11921	-0.531	0.595	0.8876	0.9551
republic-democrat	-0.03874	-0.175	0.861	0.9620	0.9852
republic-4	-0.27866	-0.933	0.351	0.7568	0.8981
republic-independ	-0.15795	-0.702	0.482	0.8539	0.9409
4 -democrat	0.23991	0.806	0.420	1.2711	1.0969
4 -republic	0.27866	0.933	0.351	1.3214	1.1134
4 -independ	0.12070	0.417	0.677	1.1283	1.0476
independ-democrat	0.11921	0.531	0.595	1.1266	1.0470
independ-republic	0.15795	0.702	0.482	1.1711	1.0628
independ-4	-0.12070	-0.417	0.677	0.8863	0.9545

b = raw coefficient

z = z-score for test of b=0

P>|z| = p-value for z-test

e^b = exp(b) = factor change in odds for unit increase in X

e^bStdX = exp(b\*SD of X) = change in odds for SD increase in X

. \*notice how much output is produced!;

