Guide for Interpreting Coefficients for Different Modeling Types:

OLS:

- Regular OLS:
  - A one unit increase in X produces a beta-coefficient increase in Y, holding all other variables constant.

- Interactions:

Table I-4: Interaction Effects on Support for Feminists	
Party Identity	3.73** (.40)
Gender	5.52** (2.03)
Party ID * Gender	-.96 (.54)
Constant	41.3 (1.5)
R^2	.1
N	1405
Note: OLS regression with standard errors in parenthesis. *p < .05; **p < .01 (two tailed).	

$$\frac{\partial feminist}{\partial pid} = 3.73 - .96gender$$

  - when gender = 0; 3.73
  - when gender = 1; 2.77
    - Thus a one-unit increase in party ID (i.e., moving from strong Republican to weak Republican) produces a 3.73 increase in support for feminists, when gender is male. The conditional effect of party ID is 2.77 when gender is female. When we consider females, a one-unit increase in party ID (i.e., moving from strong

Republican to weak Republican) produces a 2.77 increase in support for feminists. In other words, as a male becomes more liberal his support for feminists increases by 3.73 points relative to a female whose support increases by 2.77 points. Party ID proves to be statistically significant at the 0.01-level with a reported p-value of 0.000.

$$\frac{\partial feminist}{\partial gender} = 5.22 - .96pid$$

- The initial marginal effects for a strong Republican female is 5.52, meaning a strong Republican female is 5.52-points more supportive of feminists than a strong Republican male. The data show that as a female becomes more liberal the overall distance between her and her male counterpart decreases. In other words, as party ID becomes more liberal, gender is less important in explaining support for feminists. Gender proves to be statistically significant at the 0.01-level, with a reported p-value of 0.007.

- Linear Transformations:

$$voted_i = \beta_0 + \beta_1 hsdip_i + \beta_2 union_i + \beta_3 union_i^2 + \beta_4 south_i + u_i.$$

Table III-3a. Percentage of People per State who voted in the Presidential Election	
Percentage of High School Graduates	.31 (.21)
Percentage of Union Members	1.33 (.70)
Percentage of Union Members^2	-.05* (.02)
Southern State (south =1)	-4.60 (2.81)
Constant	22.94 (17.41)
R^2	.40

N	50
Note: OLS estimates with standard errors in parenthesis. **p < .01 *p < .05 (two-tailed)	

- Dealing with Union and $Union^2$

$$\frac{\partial voted}{\partial union} = 1.33 - .10(union)$$

- Union membership will produce an increase in voting up to a certain point. The question is where is that point?

$$0 = 1.33 - .10(x_i)$$
$$x_i = 12.55$$

- Union membership will increase voter turnout until 12.6% of the state population. At which point union membership will decrease voter turnout.

HLM:

- Fixed Effects:

$$Mathach_{ij} = \gamma_{00} + \beta_1 minority_{ij} + \beta_2 female_{ij} + \beta_3 ses_{ij} + \varsigma_j + \varepsilon_{ij}$$

  - The model suggest that within a given school, minorities, on average, tend to receive math achievement scores that are approximately 3 points lower than white students, within that school, hold all else constant.

- Between Model:

$$Mathach_{ij} = \gamma_{00} + \beta_1 minority_{(mean)j} + \beta_2 female_{(mean)j} + \beta_3 ses_{(mean)j} + \beta_4 sector_j + \beta_5 disclim_j + \varsigma_j + \varepsilon_{ij}$$

  - This model looks at effects between schools. Looking at the coefficient for the minority variable, we see that as the percentage of minority students increases between schools math achievement scores tend to decrease. Specifically, the data indicated that going from no minorities in a school to a school populated completely by minority students produces a decrease in math achievement scores by 2.18 points.

- Random Intercept:

$$Mathach_{ij} = \gamma_{00} + \beta_1 minority_{ij} + \beta_2 female_{ij} + \beta_3 ses_{ij} + \beta_4 sector_{ij} + \beta_5 disclim_{ij} + \varsigma_j + \varepsilon_{ij}$$

  - Looking at our random intercept model we see that within a given school as the percentage of minorities increases math achievement scores across students decreases by 3.02 points.

- Random Coefficient:

$Mathach_{ij} = \beta_{0j} + \beta_{1j}minority\_wi_{ij} + \beta_{2j}female\_wi_{ij} + \beta_{3j}ses\_wi_{ij} + \varepsilon_{ij}$
$\beta_0 = \gamma_{00} + \gamma_{01}sector_j + \gamma_{02}minority\_bw_j + \gamma_{03}female\_bw_j + \gamma_{04}\,ses\_bw_j + \zeta_{0j}$
$\beta_{1j} = \gamma_{10} + \zeta_{1j}$

  - Female student, much like minority students also see lower math achievement score, namely, a female student within a given school will, on average, perform 1.168 points lower than a male student within the same school when holding all other variables at their means. When comparing across schools, a school with all female students will have an average decrease of 1.985 in math achievement scores compared to a school with all male students, holding all other variables constant.
  - Socioeconomic status appears to be strongly correlated with math achievement. Specifically, a one-unit increase in a student's socioeconomic status yields a 1.886 increase in their math score within the same school, holding all other variables constant. When looking between schools, we see that as the average socioeconomic status of a school's student body increases so do math scores. The model above suggest that a one-unit increase in that average SES of a school is associated with a 4.144 increase in the school's scores holding all other variables constant. Lastly, on average, a private school sees math achievement scores that are 1.595 points higher compared to a public school holding all other variables constant.

- Random Coefficient with Cross-level Interactions:

$Mathach_{ij} = \beta_{0j} + \beta_{1j}minority\_wi_{ij} + \beta_{2j}female\_wi_{ij} + \beta_{3j}ses\_wi_{ij} + \varepsilon_{ij}$
$\beta_0 = \gamma_{00} + \gamma_{01}sector_j + \gamma_{02}minority\_bw_j + \gamma_{03}female\_bw_j + \gamma_{04}\,ses\_bw_j + \zeta_{0j}$
$\beta_{1j} = \gamma_{10} + \gamma_{11}sector_j + \gamma_{12}minority\_bw_j + \zeta_{1j}$

- Interpretations:
  - Dealing with the first interaction term, we see that the slope coefficient for the constituent term minority within produces a 4.846 decrease in math achievement scores, all else held constant. Meaning that -4.846 represents the conditional effects of being a minority student within a given school on math achievement scores when sector is equal to zero (in this case meaning a public school). This suggests that a minority student within a given public school will have math achievement scores that are 4.846 lower than a white student in that same public school, holding all other variables constant. The conditional effects of being a

minority within a private school are -2.609. This means that a minority student within a given private school will have math achievement scores that are 2.609 points lower that a white student in the same private school, *ceteris paribus.* Generally speaking, minority students will do better with respect to their math achievement scores if they are in private schools compared to being in public schools.

  - The marginal effects of sector are 1.660 when minority within is zero. This means that when there are no minority students in a private school, math achievement scores will be 1.660 points higher for the white students in the private school compared to the white students in a public school. As minority within increases, that is an all minority private school will see math achievement scores that are 3.897 points higher than an all minority public school, holding all else constant. This overall suggests that the effects of being in a private school substantively benefit minority students with respect to their math achievement scores.
  - Dealing next with the second interaction term, we see that minority student within an all white public school will perform 4.846 points worse on their math achievement scores than a white student within that same white public school, holding all other variables constant. However, as minority between increases math achievement tends to be only 2.703 points lower. More specifically, a minority student in a school with all minority students will perform 2.703 points lower on their math achievement scores compared to a minority student in an all white school, holding all other variables constant. The marginal effect of minority between is -2.377, suggesting that a white student in an all minority school will have a math achievement score that is 2.377 points lowers than a white student in an all white school. A minority student in an all minority school will have a math achievement score that is .234 points lower than a minority student in an all white school, holding all else constant.

Binary Regression (Logit and Probit)

- Cannot directly interpret the coefficients from a logit or probit table, so instead need to calculate marginal effects.
  - There are three types of marginal effects
    - MEM (marginal effects at the mean): computes marginal effects of x_i with all other vars held at their means.
      - Interpreting: for someone who is average on all characteristics, the a one-unit increase in x_i produces a beta-marginal change in the likelihood of Y, when all other vars are held at their means.

- MER (marginal effects at representative values): computes marginal effects of x_i with all other var held at specific value.
  - Interpreting: same as MEM, just replace "who is average" with a description of the values of the covariates.
- AME (average marginal effects): computes marginal effects for x_i at the average of the observed values.
  - Interpreting: in general, a one-unit increase in x_i increases the likelihood of Y by beta.

Ordered Logit and Probit:

- Here the interpretations are looking at the likelihood of some covariate influencing the category outcome. Let's say we are interested in the likelihood of education on perceptions of social class. When we compute the marginal effects what we are seeing are the predicted probabilities of a change in the covariate on the DV (which is an ordered category).
  - For example: on average, having graduated from college increases a person's probability of identifying as middle class by 0.22 compared with having graduated only from high school. Also, on average graduating from college increases the likelihood that a person will identify as middle class by 0.29 compared to having not graduated high school.
  - It is akin to interpreting dummy variables (that is relative to each other).

Unordered Logit and Probit:

- This is very similar to the ordered models, the only difference being that the DV is not seen as an ordered preference. The reason to go with Multinomial model (MNM) is in the case that the researchers believes the outcomes aren't ordered, OR they could be ordered but there will be bias if modeled as ordered.
  - For example: If you have a survey where you include "I Don't Know" if a respondent selects this then an ordered outcomes model is violated. If a researcher has concerns about ordinality (e.g., should modes of judicial selection be ordered - I would say no).
  - Interpretation: The important thing it to know that the base is and what it is being compared to.

Event Count Models:

- Depends how you present the results. You can do this as a percent change, percent std. dev. change, direct factor interpretation of the exponentiation of beta.