Motivating Interaction Terms

- Consider the partial effect of predictor x_j on y: $\delta_y / \delta x_j$.
- If x_j is put into linear population model directly, marginal effect of x on y is a constant.
- Marginal effect of x_j can depend on value of x_j.
- We may want effect of x to depend on values of other variables.

Scenarios to Model With OLS

- Health risks of genetic marker may differ by gender.
- Effect of teacher training program may differ by grade level.
- Effectiveness of promotion on customer retention may differ by contract length.

In these scenarios, one variable changes effect of another variable.

Interaction Terms

- **Interaction term:** term in regression where two variables are multiplied together
- $\beta_k x_i x_j$ where $i \neq j$.
  - Effect of x_j on y is now linear in x_i : $\delta y / \delta x_j = \beta_k x_i$
  - Simple way to make one variable's effects depend on another variable
- Can make population models more realistic
- Must be careful in interpreting coefficients; understanding dependent on whether continuous or indicator variables