**GROUP \_\_\_\_**

**HETEROGENEOUS EFFECTS WORKSHEET**

Suppose a university is considering increasing the number of tutors it hires, but it wants a good estimate of the effect of tutoring on student outcomes first. The university chooses a representative sample comprised of 100 students and randomly assigns a tutor to half of them. *tuti* is a dummy variable equal to 1 if a tutor was assigned to student *i* and 0 otherwise. The university also collects data on test scores (*yi*), student gender (*malei*), and grade point average (*GPAi*), recorded in the preceding term.

1. The administrators start their analysis by estimating the following model:

How should we interpret , the coefficient on the tutor dummy variable? Is an unbiased estimate of the Average Treatment Effect (ATE)? Why or why not?

1. The university wants to know if the effect of tutors is different for male students relative to female students. The original regression model assumes effects for each of these groups (i.e., males and females) are the same. Suppose you estimate the following model separately for males and females:
   1. How do you interpret your two sets of estimates of and ?
   2. Write down a regression model that would be estimated on the whole sample that allows the effect of tutoring to differ for males and females but assumes the effect of GPA is the same for males and females. Interpret the coefficients of your new model.
   3. State a hypothesis in terms of your regression coefficients that you would use to test whether the effect of tutoring differs for males and females.