The questions below are based upon the Duncan and Prestige datasets from the car library. More information about the respective datasets can be found by typing ?Duncan and ?Prestige, after loading the car library.

1. As you already know, the Duncan data provide information about occupational prestige in the United States, while the Prestige data are from Canada. In each of these datasets, fit a linear model with prestige regressed on income and education. Provide brief verbal descriptions of the two models, explaining the substantive conclusions that you would draw in each case.

2. Which is the more important determinant of occupational prestige: Income or education? Does the structure of these variables’ effects seem to be the same in the United States and Canada? Is it possible to answer this question using the OLS estimates? Discuss (briefly) the considerations involved in comparing the various effects.

3. Continuing the analysis from the previous question, install the relimp library and use the relimp function to compare the relative impacts of income and education. Do these tests provide any useful information about possible differences between the United States and Canada?

4. Using either the Duncan data or the Prestige data, show the vector geometry of the occupational prestige model. (Assume that all of the variables are measured as deviations from their means, so you don’t have to worry about including the intercept). You are welcome to use informal sketches to illustrate the vectors. But, please be sure to label all relevant parts of the model (i.e., vector lengths, angles, etc.) and relate them explicitly to the various parts of the multiple regression model. Also, show the vector representation of the bivariate regression of prestige on education. Explain how this differs from the depiction of education in the multiple regression model.

5. Extra Credit: Use the Prestige data to regress occupational prestige on education, income, and the proportion of women in each occupation (i.e., the variable called women). Sketch the vector space for the independent variables in this model, labeling all of the elements contained within it. Where is the dependent variable vector in this geometric model?