

STAT 151A Lecture 18

Henry Liev

8 October 2025

Remark 0.1 (Categorized Regressors)

Type $\in \{ \text{bc, wc, prof} \}$

$$D_{prof_i} = \begin{cases} 1 & \text{professional job} \\ 0 & \text{else} \end{cases}$$

$$D_{wc_i} = \begin{cases} 1 & \text{white collar} \\ 0 & \text{else} \end{cases}$$

$$D_{bc_i} = \begin{cases} 1 & \text{blue collar} \\ 0 & \text{else} \end{cases}$$

First attempt:

$y_i = \gamma_p D_{prof_i} + \gamma_{wc} D_{wc_i} + \gamma_{bc} D_{bc_i} + \varepsilon_i$, assume normal linear model
 $\mathbb{E}(y_i | D_{prof_i}, D_{wc_i}, D_{bc_i}) ??$

$$\hat{y} = \mathbf{X}\hat{\beta} \rightarrow \hat{\beta} = \begin{pmatrix} \hat{\gamma}_{bc} \\ \hat{\gamma}_{wc} \\ \hat{\gamma}_p \end{pmatrix} = \begin{pmatrix} \bar{y}_{bc} \\ \bar{y}_{wc} \\ \bar{y}_p \end{pmatrix}$$

Instead omit D_{bc} and use intercept, make it reference category

$$\text{Project } Y \text{ onto } \mathbf{X} : \mathbf{X}\hat{\beta} \rightarrow \hat{\beta} = \begin{pmatrix} \bar{y}_{bc} \\ \bar{y}_{wc} - \bar{y}_{bc} \\ \bar{y}_p - \bar{y}_{bc} \end{pmatrix}$$