

(a) The new model will not perform better than the old one. The new model is

$$y = x^T \beta + z \alpha$$

Note that, z is only a linear combination of x . Thus,

$$y = x^T \beta + x^T \gamma \alpha = x^T (\beta + \gamma \alpha).$$

This is equivalent to the old model.

(b) For the new model, the matrix $\tilde{A}$ is not of full rank, so it is a singular matrix.