Linear Transformation on $\mathbf{X}$

X_1: size of a house in sq. ft. $\Longrightarrow$
$\tilde{X}_1$: size of a house in sq. meters.

X_1: % of population above age 75;
X_2: % of population below age 18;
$\Longrightarrow$
$\tilde{X}_1$: % of population below age 75;
$\tilde{X}_2$: % of population between 18 and 75.

If we scale or shift a predictor, say, $\tilde{x}_{i2} = 2 \times x_{i2}$ or $(1 + x_{i2})$, how would this affect the LS fit?

- $\hat{\mathbf{y}}$, $\mathbf{r}$, and R^2 stay the same;
- $\hat{\boldsymbol{\beta}}$ would be different.

The statements hold true, if we apply any linear transformation on the p predictors, i.e., the new design matrix $\tilde{\mathbf{X}} = \mathbf{X}_{n\times(p+1)} A_{(p+1)\times(p+1)}$, as long as the transformation does not change the rank of $\mathbf{X}$.