

Difference-in-differences

$$y = \alpha_0 + \alpha_1 P + \alpha_2 T + \alpha_3 (PT) + \text{other factors} + \epsilon$$

e.g. $E[Y|P=1, T=0] = \alpha_0 + \alpha_1 + \text{other factors}$

	Before (older)	After (younger)	After - Before
Control (low-intensity)	α_0	$\alpha_0 + \alpha_2$	α_2
Treatment (high-intensity)	$\alpha_0 + \alpha_1$	$\alpha_0 + \alpha_1 + \alpha_2 + \alpha_3$	$\alpha_2 + \alpha_3$
Treatment - Control	α_1	$\alpha_1 + \alpha_3$	α_3

$$DD = (Y_4 - Y_0) - (Y_3 - Y_1)$$

Gap between the two trends (control and counterfactual outcomes) is the same over the period: $(Y_3 - Y_2) = (Y_1 - Y_0)$

An Example of DD

