⊛ Panel Data - $t = 4, i = 2$

Time ↑ t	Individual ↑ i	D1	D2	D3	Constant	y	x
1	1	$D1_1$	$D2_1$	$D3_1$	1		
2	1	$D1_1$	$D2_1$	$D3_1$	1		
3	1	$D1_1$	$D2_1$	$D3_1$	1		
4	1	$D1_1$	$D2_1$	$D3_1$	1		
1	2	$D1_2$	$D2_2$	$D3_2$	1		
2	2	$D1_2$	$D2_2$	$D3_2$	1		
3	2	$D1_2$	$D2_2$	$D3_2$	1		
4	2	$D1_2$	$D2_2$	$D3_2$	1		

↳ Note 1: $Constant_{it} = 1 \quad \forall i,t$

↳ Note 2: Fixed effects (time-invariant):
$$\begin{cases} D1_{it} = D1_i \\ D2_{it} = D2_i \\ D3_{it} = D3_i \end{cases} \quad \forall i,t$$

↳ Note 3: $D1_i + D2_i + D3_i = 1 \quad \forall i$

(Since they are binary indicators for 1 state-specific variable (e.g. province) → For each observation, exactly 1 of them equals 1, others equal 0)

↳ Therefore: $D1_i + D2_i + D3_i = Constant_{it} \ (=1) \quad \forall i,t$

If we write

$$y_{it} = \beta_0 \times Constant_{it} + \beta_1 x_{it} + \gamma_1 D1_i + \gamma_2 D2_i + \gamma_3 D3_i + u_{it}$$

$$Constant_{it} = 1 = D1_i + D_{2i} + D3_i \quad \forall i,t$$

→ Perfect multicollinearity !