# Difference in differences (DID)

2 groups $\longrightarrow$ treatment (T) and control (C)

2 pds $\longrightarrow$ pre-treatment and post-treatment

Y

T
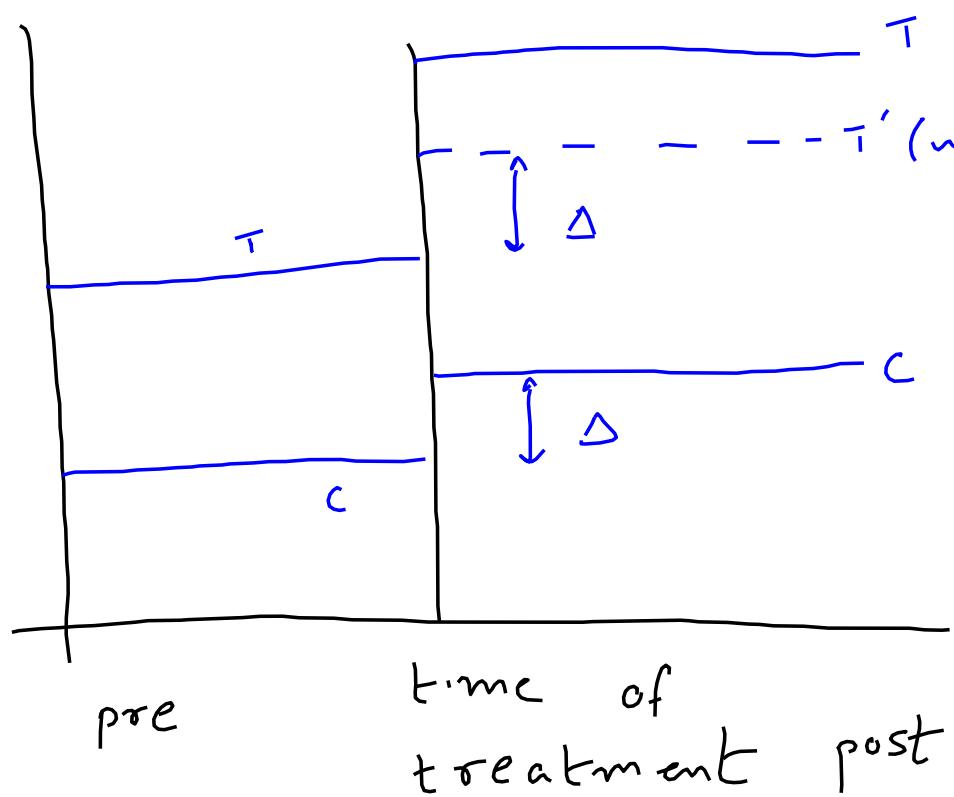
T' (w/o treatment)

$\uparrow$ effect $\sim$ $\widetilde{T} > 0$ eg $Y \rightarrow$ profit

treat $\rightarrow$ firms with employee training

Δ

C

Δ

control $\rightarrow$ firms w/o training

T

C

pre

time of treatment

post time

DID = diff in T − diff in C

DID = diff in T
    − diff in C

Y

Δ

C
Δ
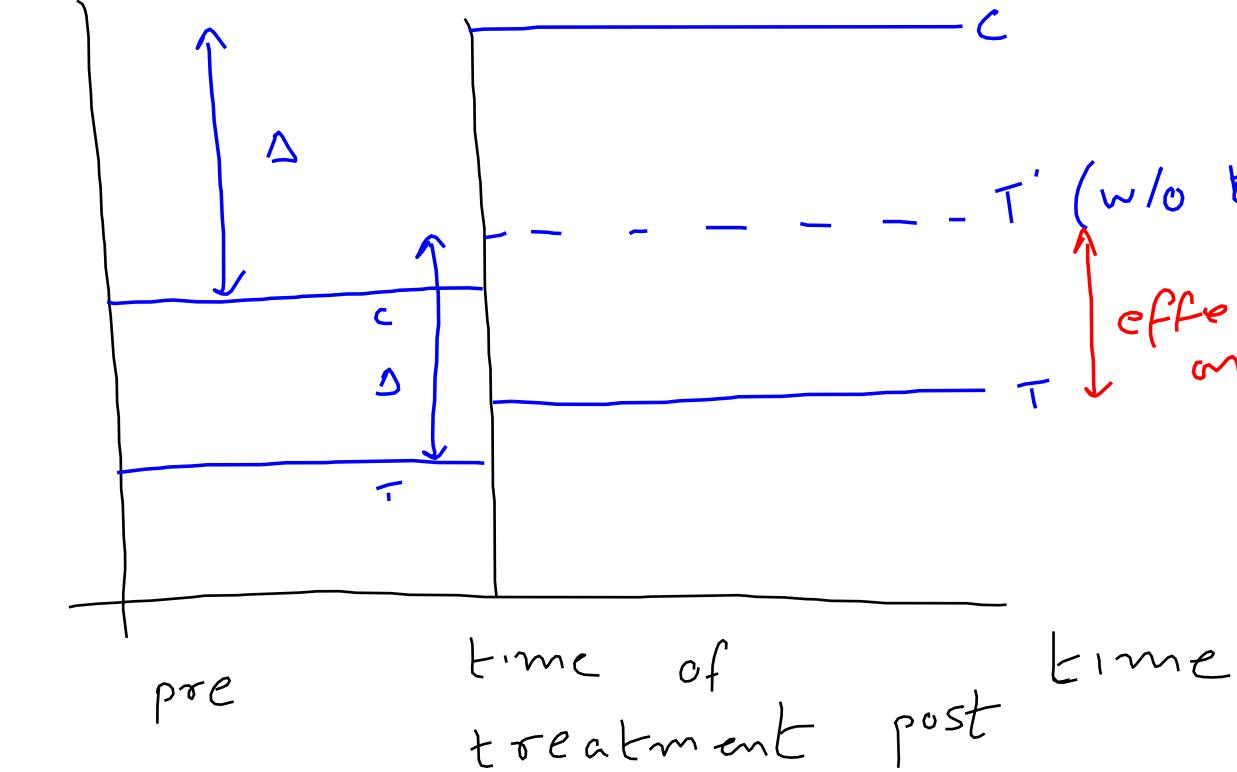
C' (w/o treatment)

effect on T < 0

e.g Y → property value

T

T

T. houses close to incinerator

C. houses away

pre

time of treatment post time

Y

C

Δ

C

T

Δ

T

T' (w/o treatment)

effect on T > 0

pre

time of treatment post time
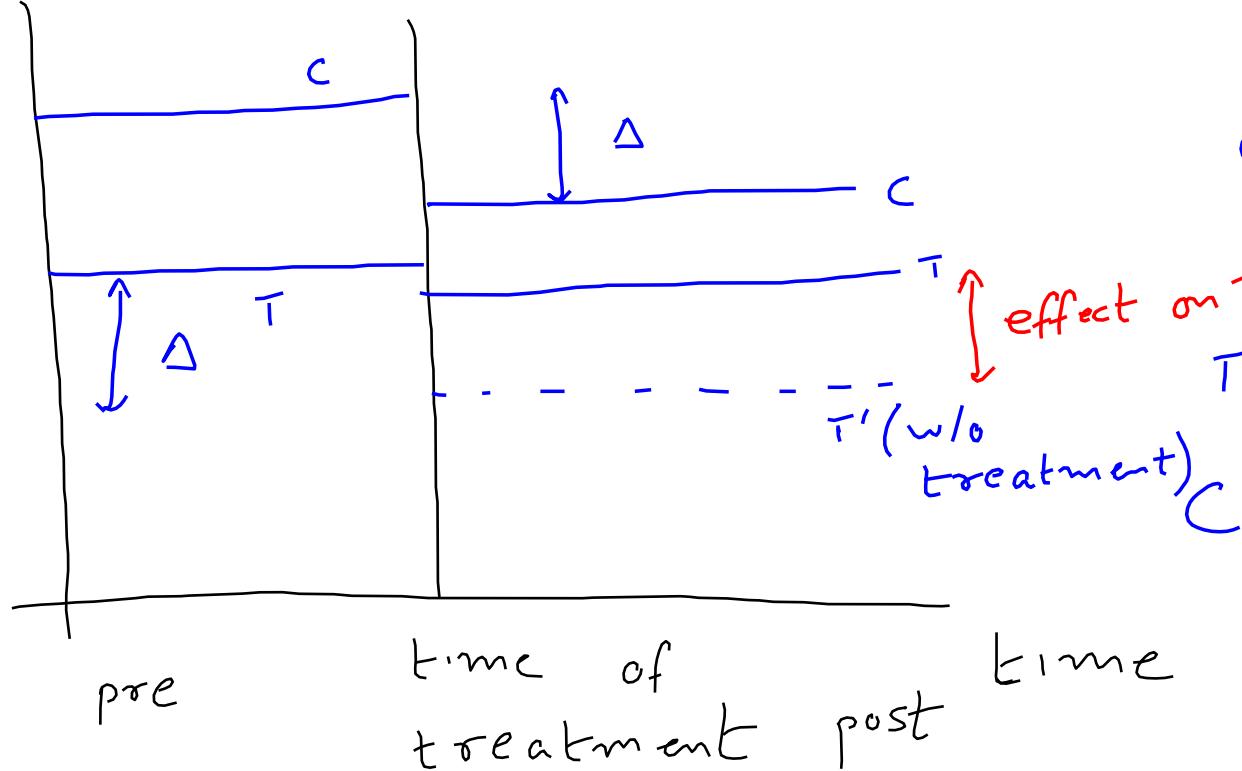
e g Y employment
(fast food)
T min wage ↑ (NJ)

C min wage same
(PA)

DID diff in T
    – diff in C

DID estimates often obtained from linear
regression models

$$Y = \beta_0 + \delta_0 \, post + \beta_1 \, treat + \delta_1 \, treat \times post + u$$

dummy post-1
for post treatment
p0 & 0 ow

dummy
treat-1 for T
& 0 ow

	Pre	Post	Post - Pre
C	β_0	$\beta_0 + \delta_0$	δ_0
T	$\beta_0 + \beta_1$	$\beta_0 + \delta_0 + \beta_1 + \delta_1$	$\delta_0 + \delta_1$
T - C	β_1	$\beta_1 + \delta_1$	δ_1