



Beispiel: Difference-in-Differences

Grundlagen der Ökonometrie

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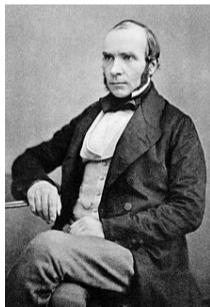
www.hsto.info/econometrics

Difference-in-Differences (DiD)

- 1853/-54 Cholera Ausbruch in Soho (London), ca. 14 000 Tote

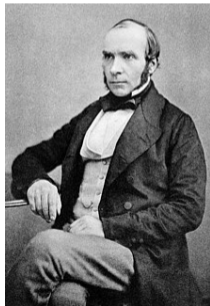
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 - **John Snow** (1813-1858): Arzt & Pionier des Diff-in-diff Ansatzes
- Doppelte Differenz: Treatment – Control & Vorher – Nachher



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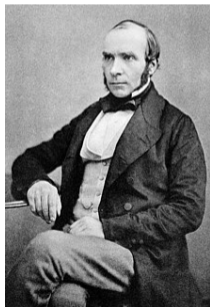


Zwei Firmen:

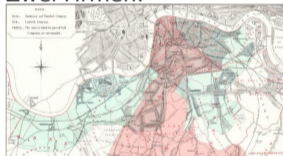


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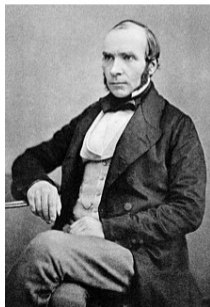


Hot-spots:

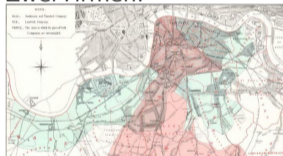


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Zwei Firmen:



Hot-spots:



Intervention:



Difference-in-Differences (DiD)

- DiD: Methode für Kausalanalysen
- **Kausalität:** viele philosoph. Definitionen und Ansätze; derzeit wichtig ...

Kontrafaktischer Vergleich einer Intervention: was wäre passiert, wenn Maßnahme (*Treatment*) *nicht* ergriffen worden wäre → Kontrollgruppe

- ‘Doppelte’ Differenzen: Treatment – Control & Before – After

	Treatment Group	Control Group
Before	T_B	C_B
After	T_A	C_A

$$\text{“Difference-in-Differences”} = (T_A - T_B) - (C_A - C_B)$$

Difference-in-Differences (DiD)

- Mit Regression:

$$y_i = b_1 + b_2 \text{treat} + b_3 \text{after} + b_4 (\text{treat} \times \text{after}) + b_5 x_i + e_i$$

$$\text{treat} = \begin{cases} 1 & \text{wenn in 'Treatment Group',} \\ 0 & \text{wenn in 'Control Group'}. \end{cases} \quad \text{after} = \begin{cases} 0 & \text{vor 'Treatment',} \\ 1 & \text{nach 'Treatment'}. \end{cases}$$

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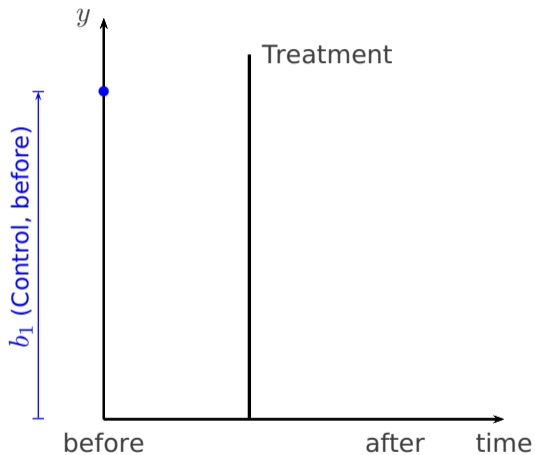
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- Koeffizient des *Interaktionsterms* zwischen der Treatment- und After-Dummy misst Difference-in Differences

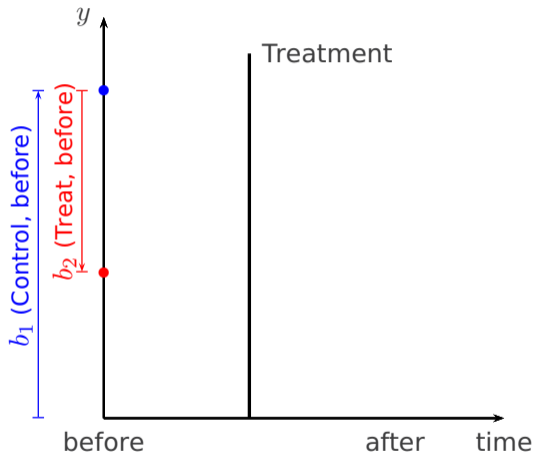
	Treatment Group	Control Group	Difference
Before	$b_1 + b_2 + b_5 x$	$b_1 + b_5 x$	b_2
After	$b_1 + b_2 + b_3 + b_4 + b_5 x$	$b_1 + b_3 + b_5 x$	$b_2 + b_4$
Difference	$b_3 + b_4$	b_3	b_4

Difference-in-Differences: $\hat{y}_i = b_1 + b_2\text{treat} + b_3\text{after} + b_4(\text{treat} \times \text{after})$



$$\hat{y}_i = b_1$$

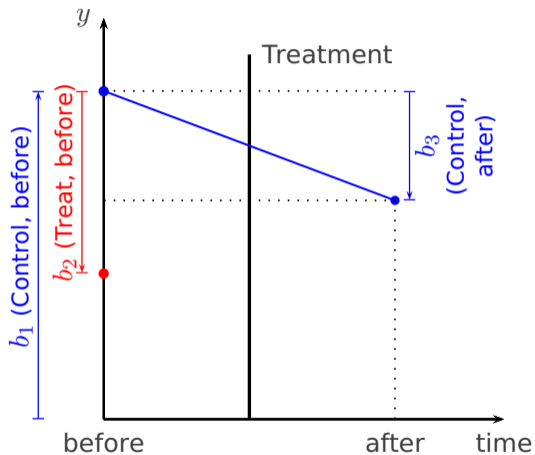
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$$\hat{y}_i = b_1 + b_2\text{treat}$$

b_2 : Diff. between Control und Treatment before!

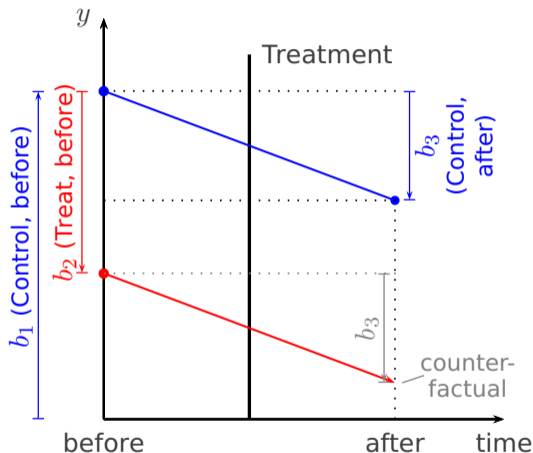
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$$\hat{y}_i = b_1 + b_2\text{treat} + b_3\text{after}$$

$b_1 + b_3$: Control after

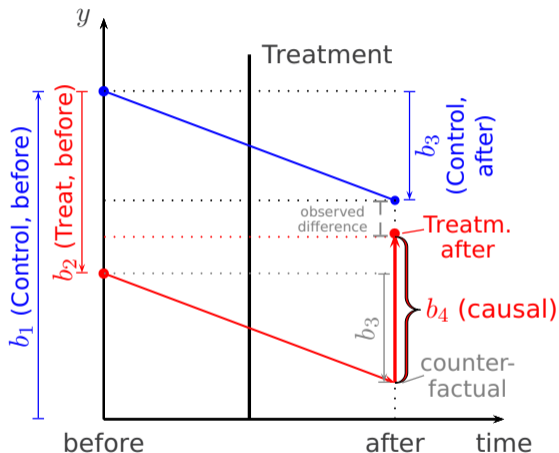
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$$\hat{y}_i = b_1 + b_2\text{treat} + b_3\text{after}$$

$b_1 + b_2 + b_3$: Counterfactual! (NOT observable!)

Difference-in-Differences: $\hat{y}_i = b_1 + b_2\text{treat} + b_3\text{after} + b_4(\text{treat} \times \text{after})$



$$\hat{y}_i = b_1 + b_2\text{treat} + b_3\text{after} + b_4(\text{treat} \times \text{after})$$

b_4 : measures "causal effect"! (if all assumpt. fulfilled!)

Difference-in-Differences (DiD)

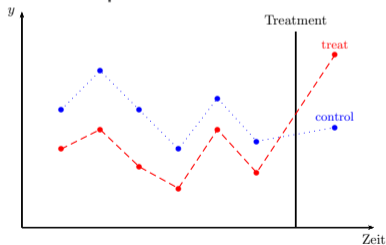
Parallel Trends Assumption:

- Identifizierende Annahme: *Ohne* Treatment wären Control- und Treatment Gruppe annähernd parallelen Trends gefolgt
→ *kann nicht direkt überprüft werden!* ('Counterfactual')

Difference-in-Differences (DiD)

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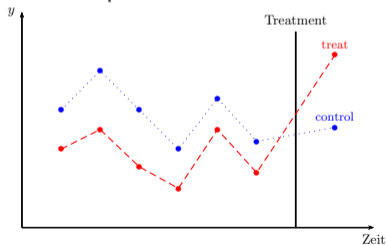
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- kein Beweis, aber stärkt das Vertrauen ...

Difference-in-Differences (DiD)

Beschäftigungseffekte von Mindestlöhnen (Card & Krueger 1994)

Erhöhung des Mindestlohns in New Jersey (NJ) April 1992.
Benachbartes Pennsylvania (PA) dient als Kontrollgruppe.

	State		
	PA	NJ	Diff.
Feb	23.33	20.44	-2.89
Nov	21.17	21.03	-0.14
Diff.	2.17	-0.59	2.75

Difference-in-Differences (DiD)

Beschäftigungseffekte von Mindestlöhnen (Card & Krueger 1994)

$$\text{Empl} = 23.33 - 2.89 \text{ NJ} - 2.17 \text{ Nov} + 2.754 \text{ Nov} \times \text{NJ}$$

(1.072)^{***} (1.194)^{**} (1.516) (1.688)

$$R^2 = 0.007, \quad n = 794$$

(Standardfehler in Klammern)

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Mit firmen-fixen Effekten (\rightarrow LSDV Modell):

$$\text{Emp} = - 2.283 \text{ Nov} + 2.75 \text{ Nov} \times \text{NJ}$$

(1.036)^{**} (1.154)^{**}

$$R^2 = 0.015, \quad n = 794$$

(firmen-fixe Effekte, Standardfehler in Klammern)

Difference-in-Differences (DiD)

Literaturtipp:

Manning, Alan (2021) "The Elusive Employment Effect of the Minimum Wage." *Journal of Economic Perspectives*, 35 (1): 3-26.

<https://www.aeaweb.org/articles?id=10.1257/jep.35.1.3>

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