Causal Inference - session 2

2023.07.25 김정희

00. Causal Inference

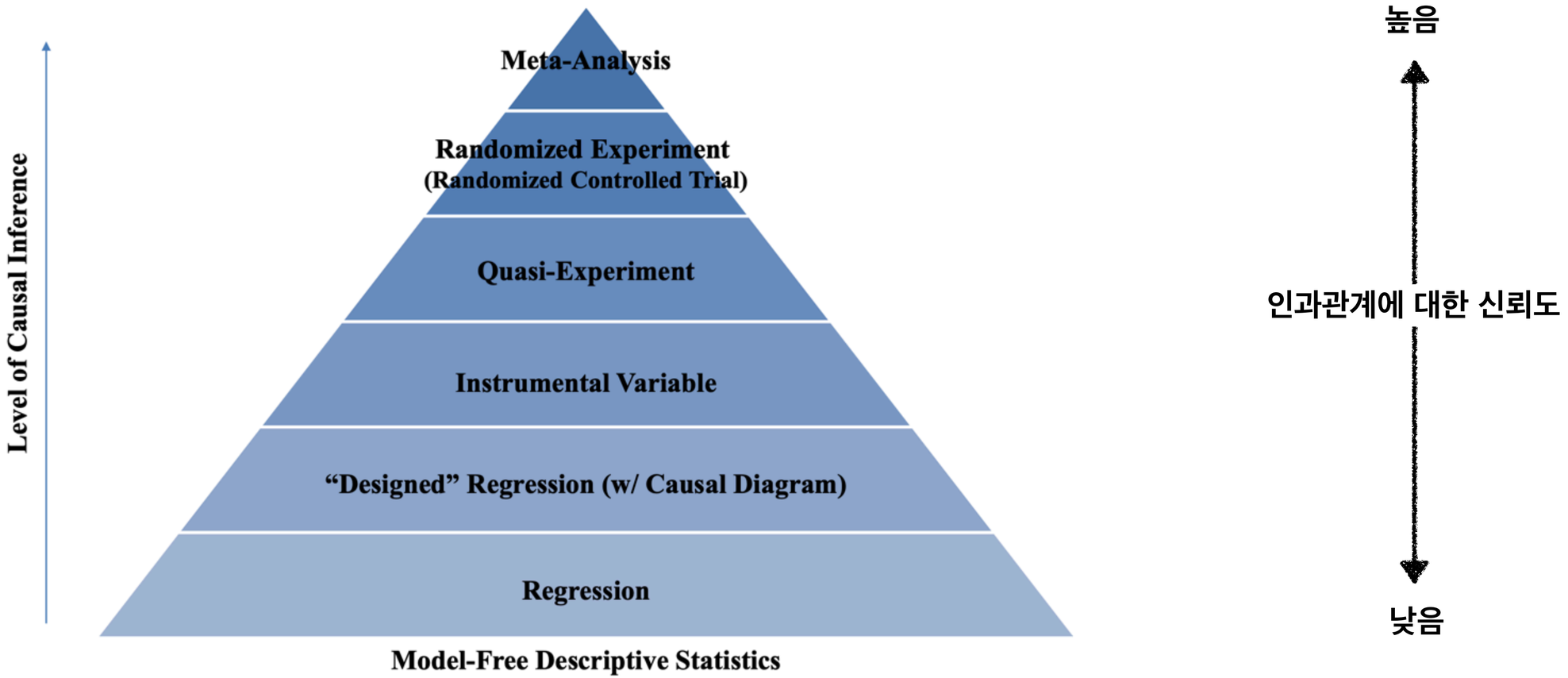
Ceteris Paribus

- ‘다른 모든 조건이 동일하다면’

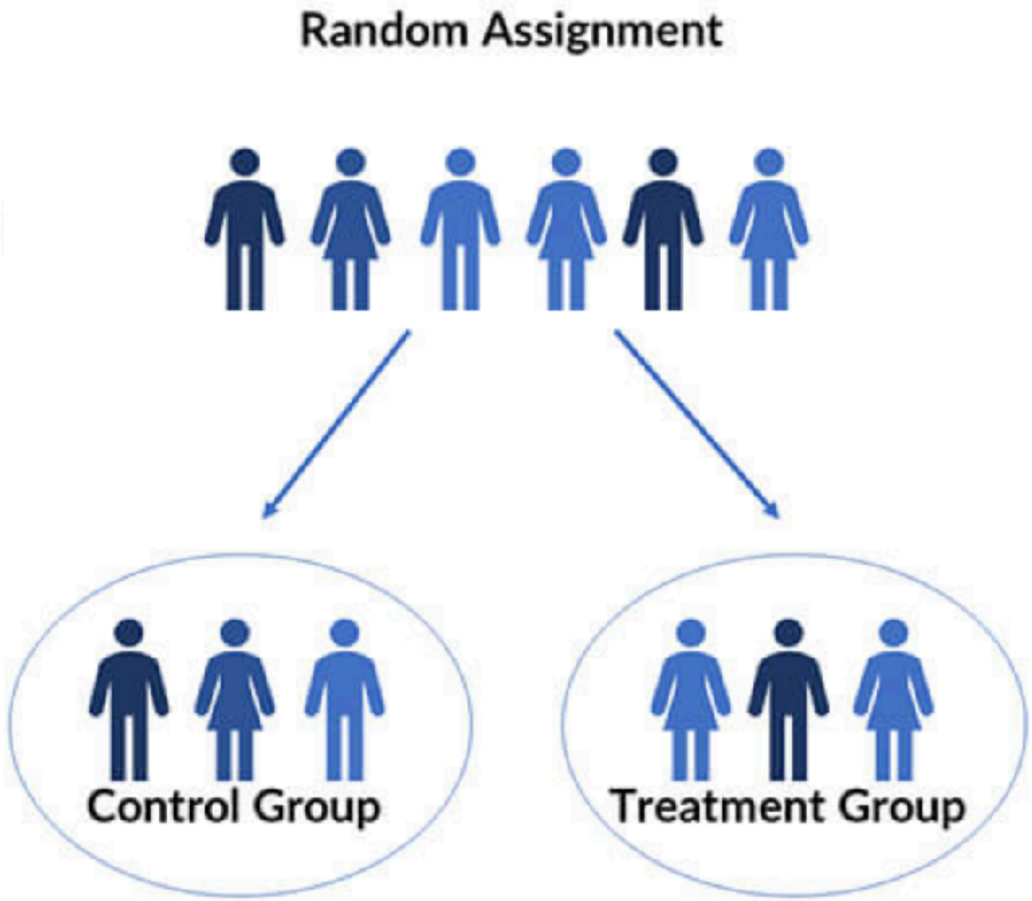
- ‘Ceteris Paribus’를 만족하는 Control Group을 찾을 수 있게 연구 디자인을 고안한다면, 인과관계 추론을 성공적으로 할 수 있을것임.

00. Causal Inference

Causal Hierarchy of Research Design for Causal Inference

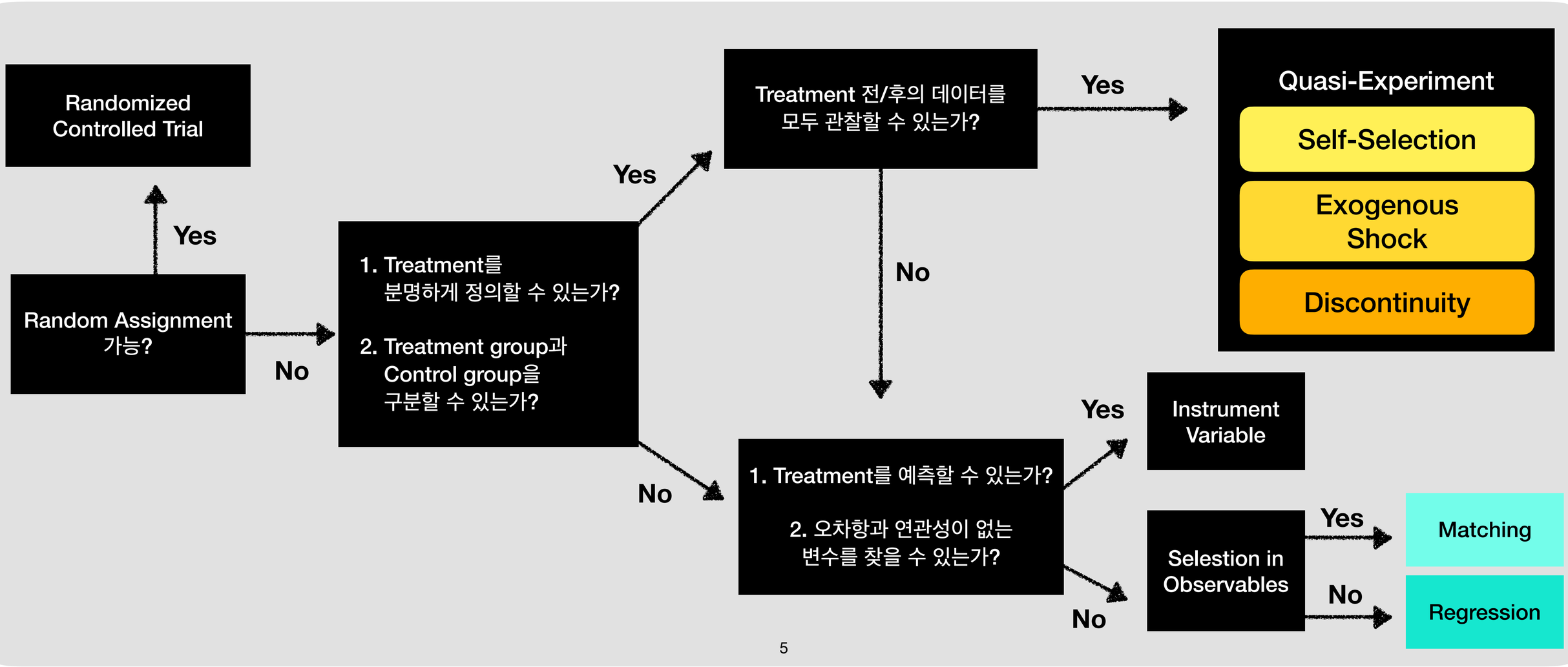


01. Random Assignment



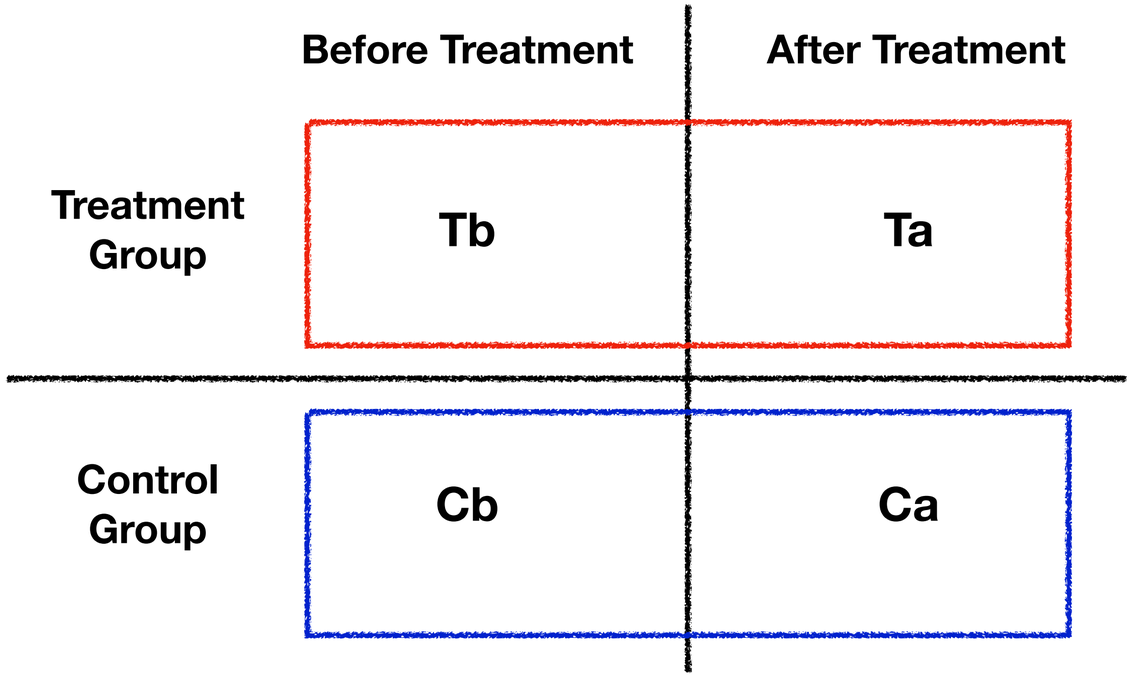
02. Quasi-Experiment

2-1) Research Design



03. Difference-in-Differences

3-1) DID estimator

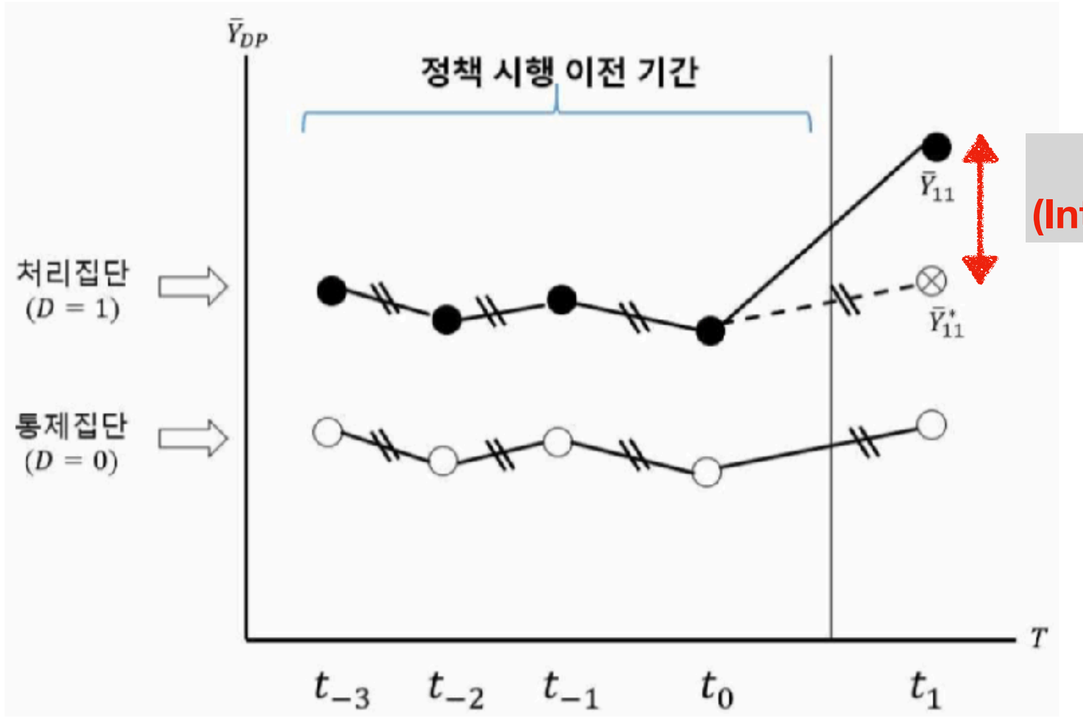


DID estimator = (Ta - Tb) - (Ca - Cb)

03. Difference-in-Differences

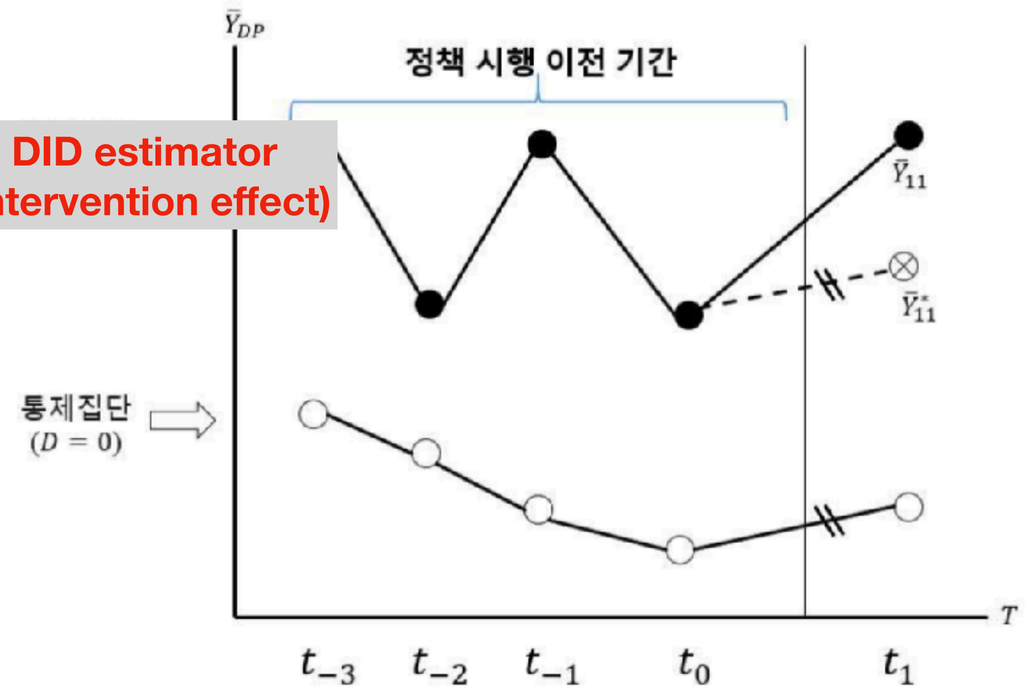
3-2) Parallel trend assumption

<그림 7> DiD 추정량의 평행 추세 가정이 만족할만한 상황



<그림 8> DiD 추정량의 평행 추세 가정이 만족하지 않을만한 상황

DID estimator
(Intervention effect)



03. Difference-in-Differences

??????????

	Before Treatment	After Treatment	
Treatment Group	T_B	T_A (*counterfactual*: T'_A)	
Control Group	C_B	C_A	
Counterfactual outcome in the absence of treatment	T_B	$T_B + (T'_A - T_B)$	Change for the treated in the absence of treatment (not observed)
Counterfactual outcome inferred from the control group	T_B	$T_B + (C_A - C_B)$	Inferred from the control group unaffected by the treatment

$$\text{DID estimator} = (T_A - T_B) - (C_A - C_B)$$

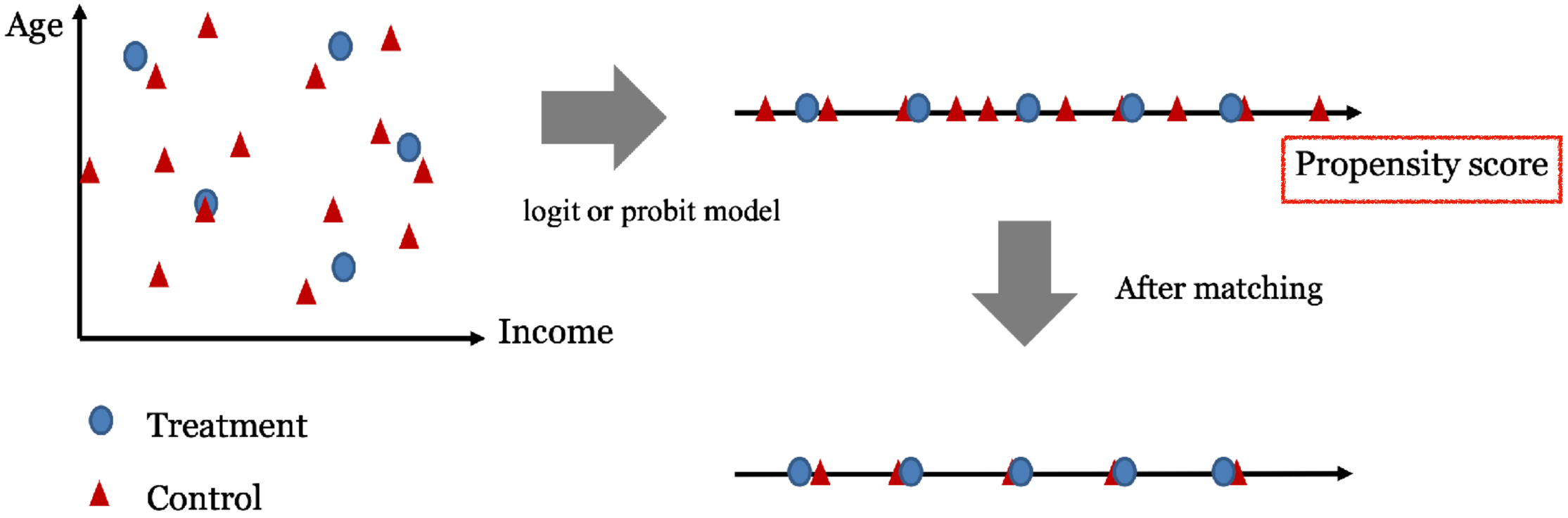
How similar is the control group to the treatment group in the absence of the treatment?

04. Matching Techniques

- Propensity Score Matching (PSM)
- Coarsened exact Matching (CEM)

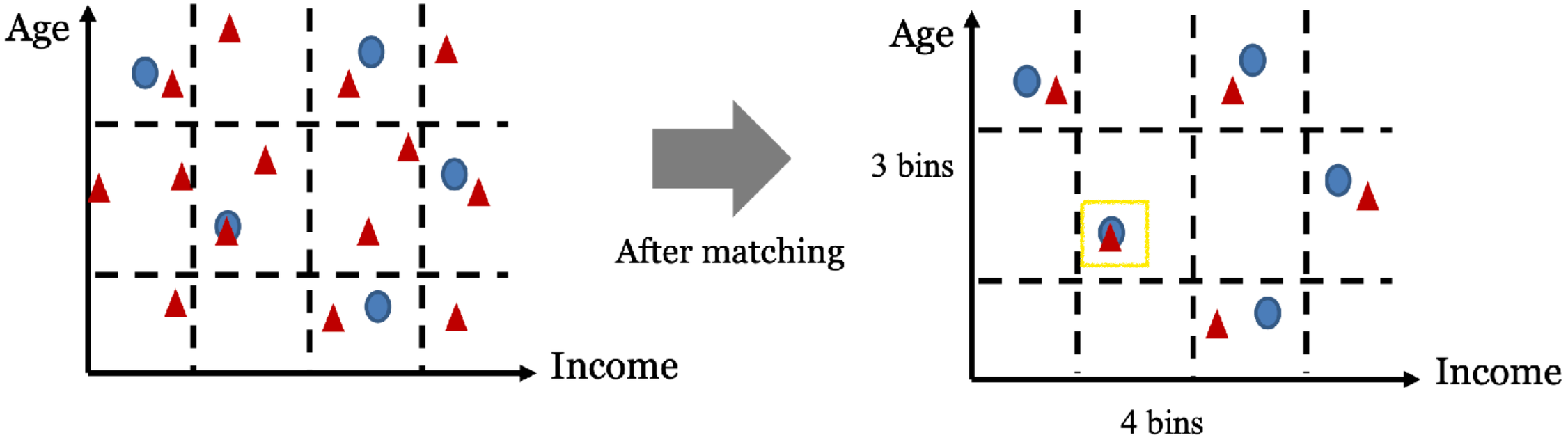
04. Matching Techniques

4-1) Propensity Score Matching (PSM)



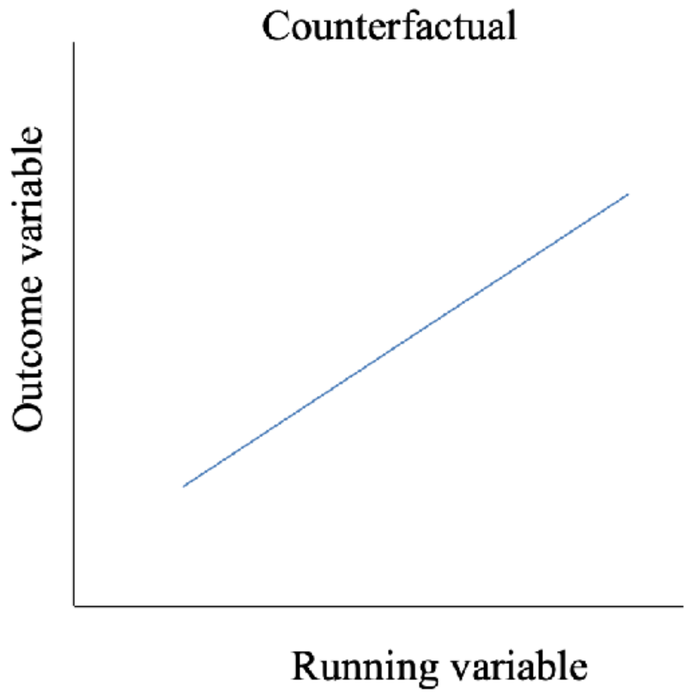
04. Matching Techniques

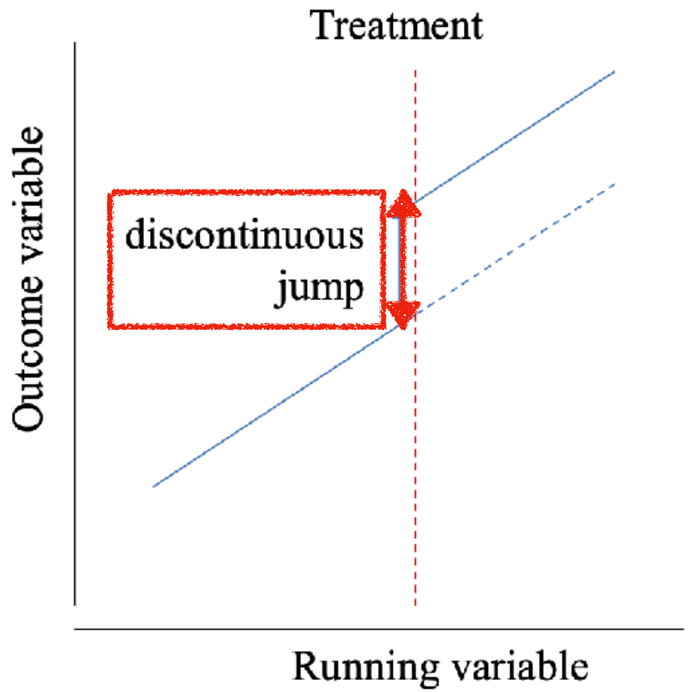
4-2) Coarsened Exact Matching (CEM)



05. Regression Discontinuity

5-1) Discontinuous jump



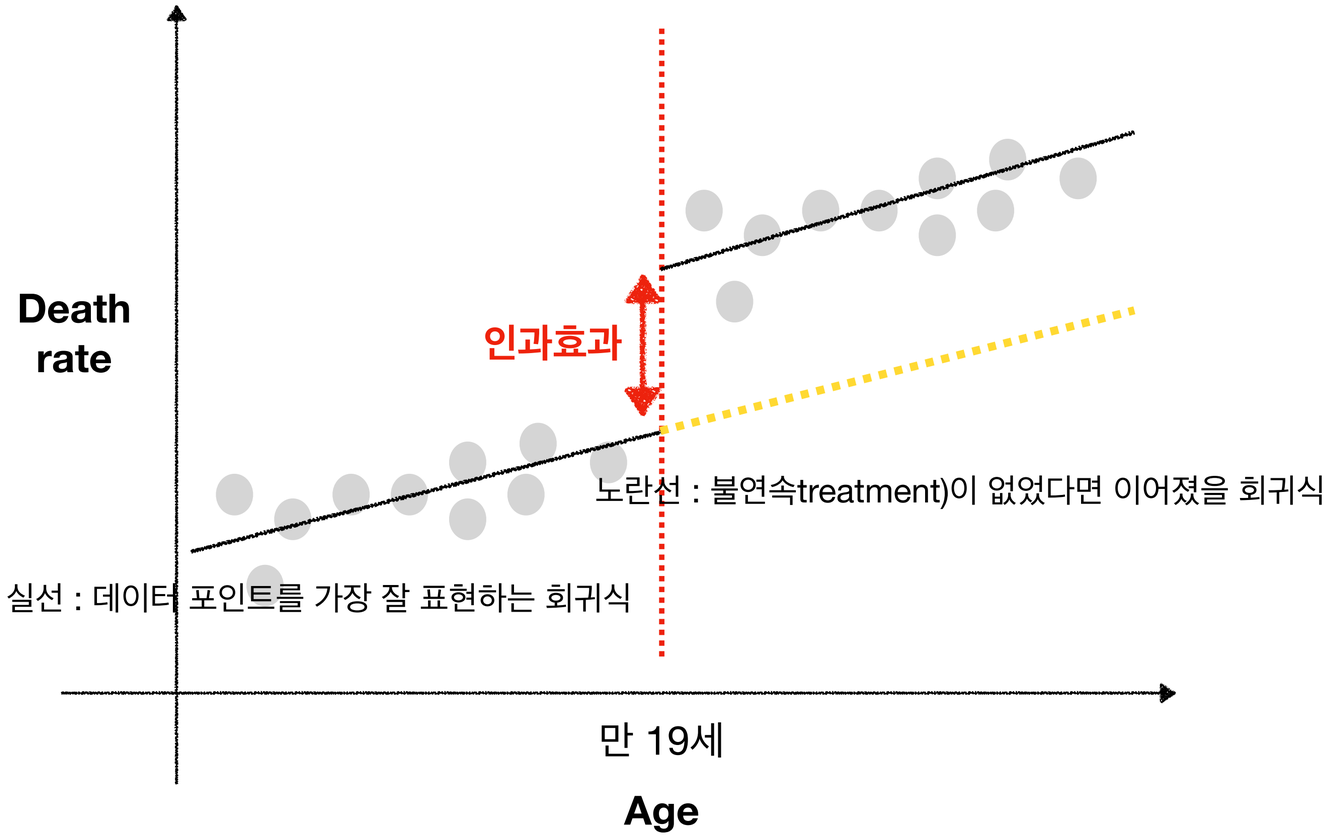


05. Regression Discontinuity

5-1) Discontinuous jump

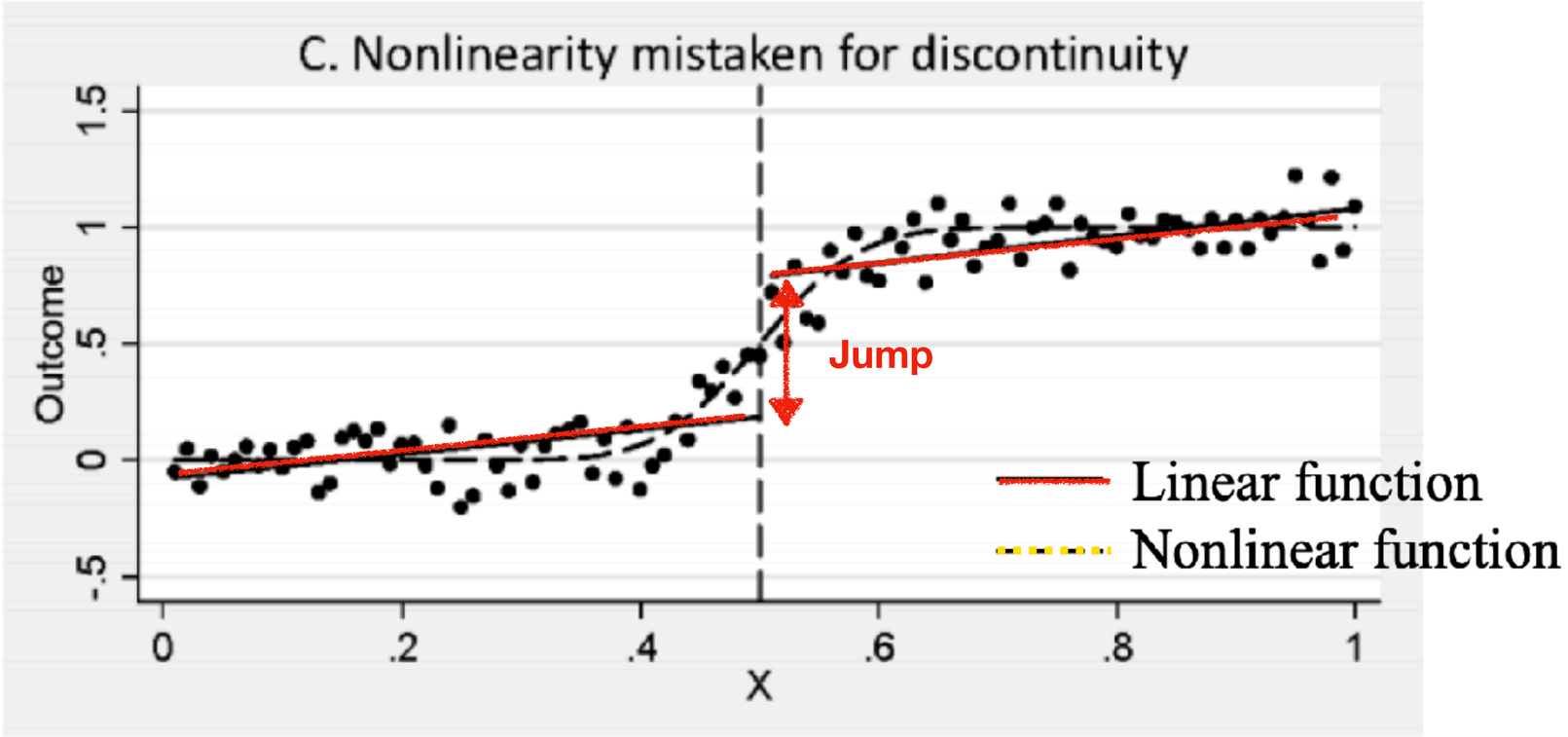
처치 결과변수

< 법적 최소 음주 연령제도가 사망률에 주는 영향 >



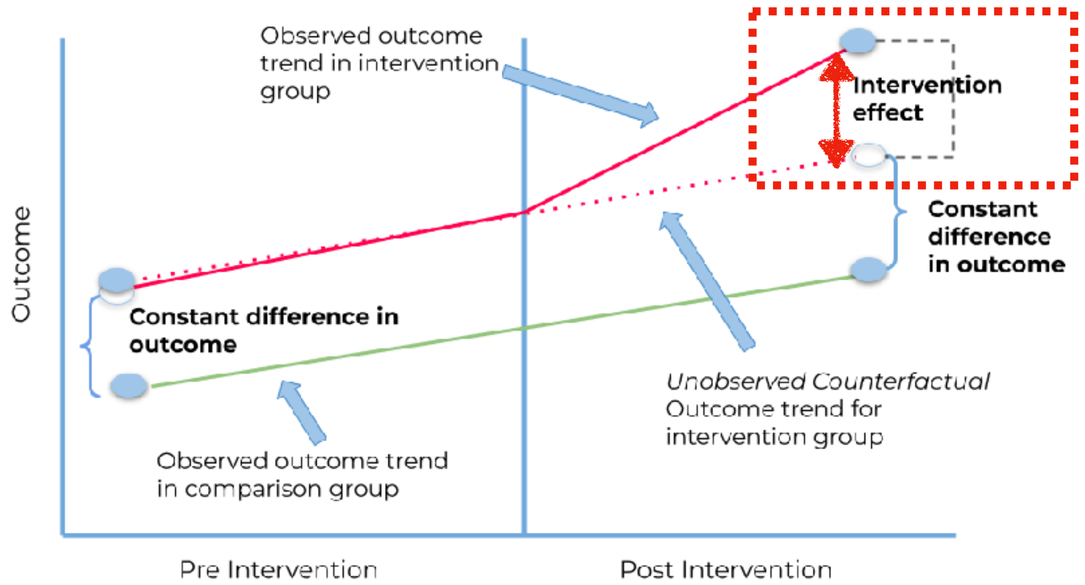
05. Regression Discontinuity

5-1) Discontinuous jump

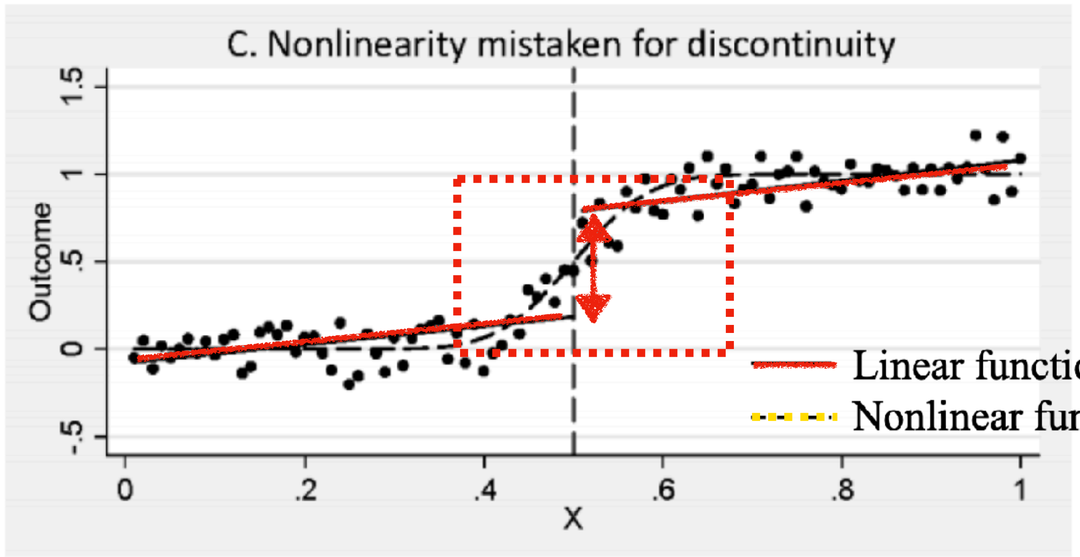


05. Regression Discontinuity

5-2) DID vs RD



< Difference in Difference >



< Regression Discontinuity >