Topic 6 Limitations of Linear Regression

MG202 Econometrics: Theory and Applications

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Last week

Recap of functional forms
Exercises.

Today

Happy to go again over Topic 5 Exercises.
Q&A in general.
How are you feeling about the course and life?
Exercises related to OVB, reverse causality, and non-random sampling.

Q1. Linear projection model

$$\mathcal{P}(y|X) = X'(\mathbb{E}[XX'])^{-1}\mathbb{E}[XY]$$

$$X \cdot \text{var}(x)^{-1} \cdot \text{cov}(x,y)$$

Predictive model ≠ causal model

$\hat{\phi}_t = 45 + 0.3 \cdot \text{car sales}_t$ ✓

$\mathbb{E}[e_t | \text{car sales}_t] \neq 0$ but $\mathbb{E}[e_t \cdot \text{car sales}_t] = 0$.

$\mathbb{E}[e_t] = 0$.

Q2. Good predictors

Discussion in past classes. Post-Lasso selection.

Predictive

Causal

Focus on good predictors.
Controls are not that important.

Controls deal with OVB

Q3.

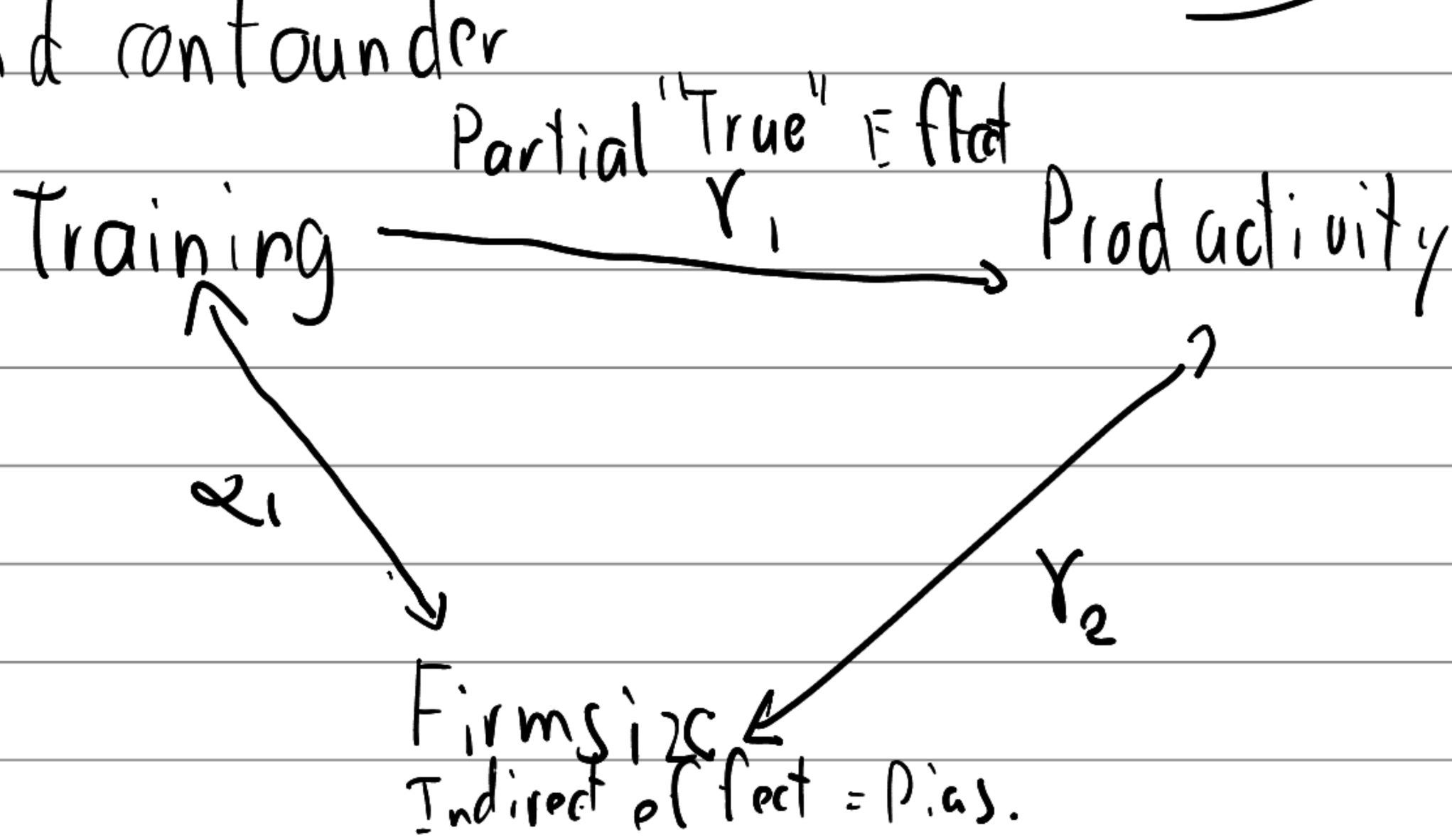
Repeated

Q4. Effect of training on productivity.

Model

productivity = $\beta_0 + \beta_1$ training $+ \epsilon$ Causality OVB

Find confounder



QS. Does beauty increase my wage?

beauty ⟷ wage

beauty$_+$ ⟶ Δwage$_{t+1}$

?

I take a loan, have aesthetic surgery

DiD: Compare workers who had surgery before and after to those who didn't have.

Q6. Similar to S.

Comoral ens effect on wide eyes.

Difficult to change.

Extreme ⟶ wages.

Q7.] iid =>] β unbiased?

A2. iid sampling. sufficient.

A5. $\mathbb{E}[e|x)$ unbiasedness.

Violated or not violated

non-random sampling around y or X.

otherwise

Q8. Earning and seat assignment at school.

$earnings_i = \beta_0 + \beta_1 \cdot desk\ number_i + \epsilon_i$

Sampling: random from attendants to meeting.

↑ desk number ↑ achievement ↑ likelihood of attending

↑ earnings ⇒ exaggerated effect.

$\hat{E}[earn^A] = \beta_0^* + \beta_1^* \cdot desk\ number_i + \mathbb{E}[\epsilon_i | attended = 1]$

Summary

OVB
Sample selection
Projection vs. regression
Non-random sampling
Unbiasedness.
Reverse causality.