Estimating treatment effects with self-selection biases

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Context

- No panel data or baseline → dependent on observational data
- Impact of an intervention where participation is non-random → (self-)selection bias
- Unit of analysis whose decision making determinants cannot be directly measured
- No good counterfactual → unobservable differences between treatment and control groups
- *Examples*:
  - Does FCS compliance increase profitability?
  - Does adoption of CSA practices increase productivity?
  - Do farmers taking banks local adopt improved oil palm varieties?
  - Do community-driven restoration initiatives reduce conversion of natural forests?
- How do we accurately estimate the ATE?

Endogeneity problem

- *Sources of endogeneity*:
  - Omitted variables or **unobserved heterogeneity**
  - Measurement error
  - **Simultaneity/reverse causality**

- Outcomes not independent from the treatment assignment

- Explanatory variable is correlated with the error term → e.g. unobservables affecting participation also affect outcome

- Violates assumption of naïve regressions models and propensity score matching → group assignment based on observables

Endogenous treatment effect model

- Simultaneously estimate an **outcome equation** with a continuous DV and a **selection equation** with a binary DV (STATA command: etregress)
- Requires **exclusion restriction** --> explanatory variable in selection equation but NOT in outcome equation
- **Instrumental variable** (IV) → predicts participation decision NOT outcome
- Many variations:
  - Endogenous switching regression: 2 separate outcome equations (STATA command: movestay)
  - Count DV (STATA command: etpoisson)
  - Multinomial selection equation (STATA command: gsem or cmp)

Parsimonious example – Contract farmers in Tanzania

Effect of participation in contract farming on household food security

Variable	OLS (DV=FSI)	Selection equation (DV=Participation)	Outcome equation (DV = FSI)
Household head age	0.060	-0.181	0.062
Most educated person	0.029	0.234	0.052
Dependency ratio	0.191**	-0.042**	0.206***
Female headed	-0.279**	-0.203	-0.242***
Household size	0.136***	0.028	0.158***
Migration	-0.021	-0.094	-0.048
Participation	**0.183*** **	-	**0.667*** **
Ownership time (IV)	-	0.007***	-
LR test (Chi2)		15.2***	

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Parsimonious example – Independent oil palm farmers

The effect of formal land titles on adoption of BMP

Variable	OLS (DV=BMPI)	Selection equation (DV=Title)	Outcome equation (DV = BMPI)
Education	0.007	0.031	0.003
Dependency ratio	0.003	-0.062	0.006
Area of oil palm	-0.0001	-0.0023	0.0001
Gender of title holder	-0.041**	0.231	-0.055**
Migration	0.028***	-0.104**	0.008
Distance to mill	-0.135***	0.046	-0.172***
Title	**0.013**	-	**0.1858*** **
Distance to administrative center (IV)		0. 148***	
LR test (Chi2)		28.93***	

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