RESEARCH DESIGN
TOPICS

- Non experimental research design
- Experimental vs. quasi-experimental (natural) research designs
- Research designs with limited power to assess cause and effect
- Research design with more power to assess cause and effect
Non experimental

- Cross sectional studies
- Panel (somewhat rare)
- Longitudinal (pooled time series)
- Case (s) study
The economic development theory suggests that as countries get richer income distribution worsens but eventually income distribution improves.
NON EXPERIMENTAL RESEARCH

- CROSS SECTIONAL: The researcher would take a sample of countries with different levels of development (low, medium, high) and analyze the match between the theory and facts.

- This approach is the weakest to determine causality, but strong in generalizing.
NON EXPERIMENTAL RESEARCH

- LONGITUDINAL: The researcher would select a country or countries that have moved from lower to higher levels of development (e.g., USA, Canada, etc.) and determine whether income distribution over time followed the trend suggested by the theory.

- Causality can be inferred but lacks detail about the true causes as well as weak on generalization.
Longitudinal studies are also known as Pooled time series.

Each unit is measured for series of time points.

- Example, I study all countries annually (over decades) to see if they become involved in a war.
Panel Studies

- Between cross-sectional and longitudinal, there are panel studies.
- These studies only measure a few time periods and are similar to a pretest/post-test type format.
- These studies are rare and are usually used when data is missing for pooled time series studies.
CASE (S) STUDY

- The researcher will take a case (s) study and analyze in depth what factors (policies, institutions, political systems, culture, etc.) are associated with improving income distribution in a given country.
- Why income distribution is better in Chile than in Mexico and Brazil despite having the same level of development?
- Improves details and understanding of causes and effect but lacks generalization.
Experimental vs. Quasi-experimental Research Designs

- Experimental research design: The researcher has control over the experiment in terms of sample selection, treatment, environment, etc.
- Experimental designs are typical in psychology, medicine, education, etc.
- Quasi-experiments: The researcher does not have control over the experiment, rather the experiment occurs in a “natural” setting.
- Quasi-experimental design are typical in economics, sociology, public administration, urban planning, political sciences, etc.
RESEARCH DESIGN

$0_t = \text{Observation in time } t \text{ of experimental group}$

$X = \text{Treatment}$

$0_c = \text{Control group}$
Research design with limited power

- POST-TEST ONLY

  \[
  \begin{array}{c}
  X \\
  O_1 \\
  \end{array}
  \]

- POST-TEST WITH CONTROL GROUP

  \[
  \begin{array}{c}
  X \\
  O_1 \\
  O_2 \\
  \end{array}
  \]
- PRE-TEST POST-TEST

\[
\begin{array}{c}
O_1 \\
X \\
O_2
\end{array}
\]

- PRE-TEST POST-TEST WITH CONTROL GROUP

\[
\begin{array}{c}
O_1 \\
X \\
O_2
\end{array}
\]

\[
\begin{array}{c}
O_1 \\
\end{array}
\]

\[
O_1 \\
\end{array}
\]
Research designs with more causal power

- CONTROL WITH MORE OBSERVATION IN THE PRETEST

\[
\begin{array}{cccccc}
O_1 & O_2 & O_3 & X & O_4 \\
0_1 & 0_2 & O_3 & X & O_4 \\
0_1 & 0_2 & O_3 & 0_4 \\
\end{array}
\]
PRE-TEST POST-TEST REMOVING THE TREATMENT

O₁ X O₂ X O₃ X O₄
CHANGES TO LOOK FOR

- CONVERGENCE-DIVERGENCE
  1. Positive change in the treatment group without change in the control group
Divergence

- Positive increments at a different rate
Convergence

- The treatment group catches up with the control group
Cross pattern

- The treatment group overpass the control group
Research design with more power (time series)

- Pre-test post-test

\[
\begin{array}{ccccccc}
O_1 & O_2 & O_3 & X & O_4 & O_5 & O_6 \\
\end{array}
\]

- Pre-test post-test with control group

\[
\begin{array}{ccccccc}
O_1 & O_2 & O_3 & X & O_4 & O_5 & O_6 \\
O_1 & O_2 & O_3 & O_4 & O_5 & O_6 \\
\end{array}
\]
Changes to look for

- Change in the rate or slope
- No effect
- Change in the intercept
• We need to take care that our theory is not missing other factors that may undermine the validity of our theory and tests.

• Our inferences will be flawed if we are actually capturing other processes through our variables. This is why we use control groups and variables depending on the type of study.

• Without controlling for confounding or alternative processes, the internal validity of our studies would be undermined.
Several possible problems arise that are related to model misspecification and spurious relationships.

Thus, we need to control for confounding factors and alternative explanations!!!
Model Misspecification and Spuriousness

- **Antecedent variable**: A variable that indirectly affecting the relationship between two other variables.

- For example, Ivy league education increases income.

- However, parental wealth and legacy admissions affect Ivy league education. Thus, income of graduates from Ivy League schools may not be random.
Model Misspecification and Spuriousness

- **Intervening Variable**: These may be spuriously related to another relationship.
  - Drinking coffee causes cancer..
  - Drinking coffee may not be the cause of cancer, but rather the fact that smokers are also coffee drinkers.
Model Misspecification and Spuriousness

- **Alternative Variables**: We also want to control for variables that would bias our results if omitted.

- In this case, the X variables in a model would produce biased estimates, undermining their validity and producing error that leads to inaccurate inferences.