

Using Models to Bridge Formal Theories with Empirical Research in Social Science

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Gap between Formal Theory and Empirical Research

- A long recognized problem
- Empirical work does not provide much contribution to theory building
- Franck, Robert 2002 *The Explanatory Power of Models: bridging the gap between empirical and theoretical research in the social sciences*, Kluwer Academic Publishers
- Lieberson, Stanley 1985 *Making It Count: the improvement of social research and theory*, University of California Press
- Morton, Rebecca B. 1999 *Methods and Models: a guide to the empirical analysis of formal models in political science*, Cambridge University Press

About Theories

- Formal theory or mathematical theory is a deductive system - there are a certain number of initial objects and a certain number of rules for generating new objects from the initial objects and from those already constructed (Maslov 1987).
- Axiom, logic rules, and theorems.
- Maslov, S. Yu. 1987 Theory of Deductive Systems and Its Applications, MIT Press

About Models

- We say a statement A is a model of a structure B , if A is true statement about structure B . We say a structure C is a model of a structure B , if every statement of C is a true statement about B (Malitz 1979).
- There are many kinds of models, mainly physical models and abstract models. Statistical models as a kind of abstract models are what used in social science the most.
- Malitz, J. 1979 Introduction to Mathematical Logic, Springer-Verlag

About Empirical Work

- Empirical research is often used to test models, especially linear models of social phenomena.
- Empirical work is based on a statistical investigation of some survey datasets.
- Statistical learning approach is becoming popular.

Model as the Linkage

- A theory may consist of many models – tens to thousands.
- Empirical work often provides support to some models that may be parts of a theory. So, empirical work can be used to test theories. Empirical work may disapprove a model, which is a part of a theory, to cast doubts on a theory.
- Empirical work, especially when a statistical approach is taken, may also discover new models that lead to the building of new theories.

What is the implication

- What lacks in social science is to reach conclusion from empirical work about whether a theory has been confirmed or whether a theory is being challenged by empirical evidence.
- When empirical results are piling up, some study need to be done to understand whether some new models or new theories may be created from the results.
- As long as we can utilize our empirical results further as stated above, a separation between theory and empirical study will never happen again.

What is needed

- A study of the relationship between models and theories
- A method to build theories from models
- A method to formulate statistical models from theories