Structural Estimation PS1 Q2

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To establish convincing causal relationship in economic setting with nonexperimental data, experiment approach with IV and structural model with economic theory based on assumptions are used to alleviate the problem of endogeneity. By specifying optimization behavioral explicitly, structural model can be used to conduct ex ante policy evaluation, welfare analysis and counterfactuals. While experimental approach reveals the DGP by exogenously varying variables of interest to quantify treatment effect. Keane(2010) and Rust(2010) both emphasized the power of structural approach and pointed out the drawbacks of experimental or atheoretic approach to economics problems. I find both approach powerful and can be used as complementary tools to do empirically analysis.

I am for the claim that "Economic model are always needed to provide a window through which we interpret data". Structural model can provide a "mechanism" underlying the sign and value of parameters so they have clear theoretical interpretation. By laying out explicitly objection function, optimizing variables, equilibrium concept and information structure, structural model provide a framework to interpret and make it possible for out of sample prediction and policy counterfactuals. Structural model incorporates the essential ideals of rational choice, optimization, equilibrium and strategic interaction, which are the core idea of economics. Consider running the regression of quantity (Q) and price (P)

$$Q = \alpha + \beta P + \varepsilon \tag{1}$$

we can expect that β is statistically significant with high absolute value. But one can hardly say if it is a demand estimation or supply estimation solely from the experimental approach since we can hardly make exogenous variation of P. Even if we can deal with this problem with VAR, without economics theory we can hardly develop convincing causal reasoning. Economic theory tells us that P and Q are equilibrium results in market setting with several agents interact with each other statically or dynamically.

Experiments reveal the DGP by exogenously varying key variables to measure outcomes under various treatment conditions. "Theory free" can be a drawback as well as a virtue. Abstracting away from rational agents, optimization behavior and equilibrium concepts, experimental approach is suitable for frontier topics lacking economic theory and requiring a bit of "data mining" to reveal the unobservable correlation. Indeed, if we can find a ideal instrument to simulate randomized controlled experiment, the results are incontrovertible, at least from the statistic point. But we should be suspicious about the gap between correlation and causality because omitted variable bias is a common yet serious problem, as is proposed by Keane "randomization alone does not guarantee exogeneity". Even econometric tool like Granger causality test that trying to capture causality can only capture the casualty in statistic sense.[1]

[1] Granger causality is not testing a true cause-and-effect relationship but precedence; it can only tell if a variable "helps to predict" another in time series.

Structural and experimental analysis can be used as compliments. An identification strategy for establishing convincing causal relationship in IO topics is carrying out randomized controlled experiments in a well-specified economic model. "Reduced form evidence — structural model — counterfactuals" are becoming "standard format" of empirical IO paper nowadays.

Reference

Keane, Michael P. "Structural vs. atheoretic approaches to econometrics." Journal of Econometrics 156, no. 1 (2010): 3-20.

Rust, John. "Comments on:"Structural vs. atheoretic approaches to econometrics" by Michael Keane." Journal of Econometrics 156, no. 1 (2010): 21-24.