Problem Set #1
MACS 40200, Dr. Evans
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The case for structural estimation

In recent years, structural estimation has been faced with criticism that it relies on strong *a priori* assumptions based on economic theory. On the other hand, the reduced-form (or "experimentalist") approach is regarded as the method to estimate economic relationships simply and with fewer assumptions. However, I think that the criticism toward structural estimation is not rationalized.

First, as Keane(2010) argues, "all empirical work in economics, 'experimentalist' or 'structural,' relies critically on *a priori* theoretical assumptions" (Keane 2010, p.4). The major difference between structural estimation and reduced-form estimation is that the former puts the assumptions into its approach explicitly while the latter makes assumptions more implicit. Besides, reduced-form estimation mainly cares about statistical assumptions. If assumptions are left implicit and have merely statistical meaning, it is difficult to interpret the causal inference. Keane(2010) exemplifies this point presenting the experimentalist approach of Angrist(1990), who estimated the effect of military service on subsequent earnings by using the Vietnam era draft lottery numbers as instrument variables. Keane(2010) points out that such "ideal" instrument variables are not obviously exogenous, and "randomization alone does not guarantee exogeneity" (Keane 2010, p.5) even if a statistical hypothesis test seems to show the exogeneity of instrument. If there are no explicit assumptions, it leaves room for the possibilities that the effect of service are heterogeneous and the lottery number may make an influence on subsequent earnings indirectly, which invalidates the instrument variable.

Since a structural approach clearly makes assumptions based on the economic model in the estimation, the estimated parameters are easy to interpret their magnitude, economic meaning and causality. Also, as Keane(2010) claims, the purpose of structural estimation is to find key parameters of economic models. Thus, relying on assumptions from economic models should be a strength rather criticized. Moreover, this nature of structural estimation allows us to connect economic models with the real-world through inference from data like Rust(2010) points out that "Structural econometrics resulted from attempts to bridge theory and empirical work in economics." In this sense, we can estimate parameters based on the economic model and then give feedback the result to the theory in order to improve it.

One thing I cannot entirely agree with Keane(2010) is the attitude toward "incredible" assumptions. He claims that we should care about "how well the model performs in validation exercises"(Keane 2010, p.15) rather than whether each assumption seems plausible. Although it is difficult to find out false assumptions *a priori*, we should make sure the assumptions do not deviate from economic theory significantly because the advantage of structural estimation is to take assumptions from economic theory seriously.

As I argued so far, although both structural estimation and reduced-form estimation hinge on strong assumptions, the attitude toward the expression of the assumptions is different from each other. Also, the former builds a model based on assumptions from economic theory; the latter cares

about statistical assumptions. Those differences may cause controversy about the interpretation of results or the simplicity of the estimation procedure. It is difficult to conclude which approach is much better than the other in terms of those differences. Instead, by comparing the advantages and disadvantages of structural estimation and reduced-form estimation, researchers should consider which method is suitable for answering their research questions in practice.