Key issues in structural analysis

• What is structural research?
• Why do we use structural research?
• What assumptions are we making?
• What are top issues to worry about in structural research?

What is structural research?

• Structural research uses an assumed model of behavior to analyze data
  • Utility (or goal) maximization for consumers
  • Firm profit maximization (by setting price, quantity, advertising, ...?)
  • Anxiety, emotions, habit, limitation
    • Goldfarb and Xiao (2011)
    • Should be embedded in some theory

• Structural need not be complex, and complex does not mean structural

• Note that we never are fully structural
  • Deeper model: utility for cars vs. utility for all products
  • Games: model the entry of firms, but use reduced-form profits
  • Thus, there is extent of structure. Even reduced form has implicit structure. Otherwise you have a descriptive regression, not a reduced form regression.
Why use structural approach

• To clearly lay out assumptions
  • Is what I am estimating consistent with some theory?

• To consistently evaluate scenario
  • Estimate price responsiveness in geographic market?
  • Can easily sum up demands across locations (Thomadsen 2005; 2007)

• To supplement data
  • Thomadsen 2005 uses structure to estimate demand with price but no quantity
  • Having quantity data would be better
  • In general, how far can we go if assumption is correct

• To evaluate what happens after a policy shift (counterfactual)
  • Lucas critique
  • Theory guides us as what aspects of problem are steady
When might I not use a structural approach?

• You want to describe the scenario

• You don’t have an exhaustive set of theories
  • Hwang and Thomadsen: Does adding skus increase a brand’s sales? By how much?
  • Potential Causes
    • Better match of utility
    • Psychologically notice brand/appeals more. Can we model all of these?

• You want to forecast what will happen in scenarios where there is no structural shift in the problem
  • Fit is usually better because you include all equilibrium effects.
  • Just hope equilibrium doesn’t change!
What are assumptions of structural work?

• That model is right
• Without model, cannot make any interpretation beyond correlations
  • Traditional “reduced form” often believed to be agnostic, but really assumptions are not explicit
  • Some non-structural research tests between models – this is a version of using theory
The assumptions are not always clear even in structural work

• How to quantity change with price?
  • Regress $Q = X\beta + \alpha p + \varepsilon$
  • But is this demand or supply?

• Suppose you run a choice model: $U_{ij} = X_j\beta + \alpha p_j + \varepsilon_{ij}$
  • Logit: prob choice = $\exp(U_i)/\Sigma\exp(U_j)$
  • Am I estimating Demand or Supply?

• If supply is assumed, is the regression of $Q = X\beta + \alpha p + \varepsilon$ structural?
  • In what way might the logit be more structural
Key lessons

• What is structural depends on the context of what you are studying
• Making model structural can aid in the interpretation
• Wrong assumptions = wrong conclusions.
• There are often hidden assumptions
What issues to consider?

• Is the research question interesting and important?
• Is the model identified? Off of what variation?
• Are there implicit assumptions I am making?
• Am I consistent with the institutional details of the setting I study?
• Do I have endogeneity? How much? What fixes are available?
• How robust are my results? Can I find any other confirmatory evidence?
• What data do I need, and what data would I like to have?
• What are the best methods available to me?

• In other words, the same things we worry about in all empirical research