# "Non-Price Equilibria for Non-Marketed Goods"

Comments for Discussion

by

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This paper builds on a long line of research on the role of peer effects, social interactions, network effects, spillovers, etc… Congestion is just a very simple peer effect.

(1) Peer effects in education: Do the test scores of other students in class (or their attributes) have a direct effect on a student's test score?

- Coleman Report (1966)
- Mosteller and Moynihan (1972)
- Schofield (1995)
- Summers and Wolfe (1977)
- Henderson, Meiszkowski, and Savageau (1978)
- Gaviria and Raphael (1997)

What is the role of (i) correlated unobservables and (ii) non-random selection?

(2) Neighborhood Effects: Do neighbors' behaviors/attributes have a direct influence on a household's outcomes? Do households have a preference for neighbors' attributes in making residential decisions?

- Davis and Whinston (1961)
- Lewis (1966)
- Schelling (1971)
- Wilson (1987)
- Jencks and Mayer (1990)
- Crane (1991)
- Mayer (1991)
- Corcoran et al (1992)
- Brooks-Gunn et al (1993)
- Case and Katz (1991)
- Evans, Oates, and Schwab (1992)
- Cutler and Glaeser (1997)

(3) Papers defining the empirical problem of estimating social interactions:

- Manski (1993). "Identification of Endogenous Social Effects: The Reflection Problem." Review of Economic Studies. 60(3): 531-542.

- Moffitt, R. (2001). "Policy Interventions, Low-Level Equilibria, and Social Interactions." In *Social Dynamics*, Durlauf and Young (eds.). Brookings Institution Press. Washington, D.C.

- Manski (2000). "Economic Analysis of Social Interactions." *Journal of Economic Perspectives*. 14(3):115-36.

(4) Using non-linearity to break reflection problem: Binary decision (modeled as a simple logit) introduces non-linearity that solves identification problem.

- Brock and Durlauf (2001). "Discrete Choice With Social Interactions." *Review of Economic Studies*. 68:235-260.

(5) Sorting Models: Social interactions occur in geographic space (many choices and correlated unobservables).

Vertical Models: households agree on single public good index (allows for easy voting equilibrium)

- Epple and Romano (1998)
- Epple and Sieg (1999)
- Epple Romer, and Sieg (2001)
- Sieg, Smith, Banzhaf and Walsh (2006)
- Kuminoff (2005)
- Nechyba (1999)
- Ferreyra (2006)

Horizontal Models:

Draw heavily from two-stage models of discrete-choice differentiated product demand in industrial organization:

(i) use choice model similar to that in Brock and Durlauf (2001) (i.e., multinomial logit)
(ii) allow for correlated unobservables (important in spatial context)
(iii) allow for simple IV solutions to deal with endogenous attributes

Allow households to have different preferences for different dimensions of public good.

A few horizontal sorting papers:

- Bayer, MacMillan, and Rueben (2004)
- Bayer and Timmins (2005)
- Bayer and Timmins (2007)
- Timmins (2007)

Horizontal Models of Recreation Demand: Random Utility Models

- Smith and Phaneuf (2004). "Recreation Demand Models." *Handbook of Environmental Economics*, K. Maler and J. Vincent, eds.
- Hanemann (1978, 1984, 1999)
- Feather (1994)
- Peters, Adamowicz, and Boxall (1995)
- Kling and Thompson (1996)
- Parsons and Hauber (1998)
- Hicks and Strand (2000)
- Parsons, Plantinga, and Boyle (2000)

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- Murdock and Timmins (2007)

Problem: Simple RUM is a poor model of recreation demand (single discrete choices are inappropriate).

- Extensive margin – recreate or don't recreate?
- Intensive margin – how many recreation trips to a particular site?

Impact of Intensive / Extensive Margin on
General Equilibrium Welfare Effects

| Scenario | Totals Specification | | Shares Specification | |
|---|---|---|---|---|
| | PE | GE | PE | GE |
| Close 9 most heavily visited sites | -524.5 | -527.2 | -580.0 | -618.3 |
| Improve water quality throughout state | 153.6 | 106.7 | 161.9 | 172.2 |

Solving this problem will have benefits outside recreation demand – e.g., spatial models of entry in industrial organization. Replace congestion with competition (possibility of agglomeration?).

- Seim (2007)
- Watson (2004)
- Orhun (2004)
- Einav (2003)
- Lots of other work in marketing

Firms may enter multiple times in a single location, and will typically not enter at all in certain locations.

Expanding the model to control for intensive & extensive margins does not come easily:

(1) Equilibrium Properties:

- In a share-based model, existence is easily proven with Brouwer's Fixed Point Theorem.
- Existence may not be easy to prove in count model (especially in the case of an agglomeration effect).
- Feedback effects arise through both direct routes and virtual prices; complicates proof of uniqueness.

(2) How to remove an alternative from the choice set? Raising price to choke off demand, removed site's attributes still affect virtual prices of remaining choices.

(3) Computational Burden: Could this be relaxed with new techniques for GMM estimation of inequality constraint conditions?

- Chernozhukov, Hong, and Tamer (2003). "Parameter Set Inference in a Class of Econometric Models."

- Andrews, Berry, and Jia (2004). "Confidence Regions for Parameters in Discrete Games with Multiple Equilibria, With an Application to Discount Store Chain Locations."

- Pakes, Porter, Ho, and Ishii (2006). "Moment Inequalities and Their Application."

- Cilberto and Tamer (2004). "Market Structure and Multiple Equilibria in the Airline Market."

Ultimately, what can we learn from these models?

(1) What are the effects of non-marginal policies (i.e., with feedbacks)?

- w/ congestion, closing a large site will have big welfare effects (overstate costs by not allowing recreators to go less often or not at all)

- w/ congestion, benefits of a uniform improvement to all sites will not be as big

- to make this really meaningful, we need a model that allows for the possibility of agglomeration

(2) Accounting for endogenous attributes can have important implications for marginal policy evaluation:

| Parameter | $2^{nd}$ Stage OLS | | $2^{nd}$ Stage IV | |
|---|---|---|---|---|
| | Posterior Mean | Posterior Std Deviation | Posterior Mean | Posterior Std Deviation |
| $\gamma_0$ | -5.435 | 0.2015 | -4.081 | 0.2225 |
| $\gamma_{secchi}$ | 0.0391 | 0.0862 | 0.1122 | 0.0867 |
| $\gamma_{chlorophyll}$ | 0.0013 | 0.0017 | -0.0064 | 0.0019 |
| $\gamma_{congestion}$ | -13.34 | 2.14 | -55.91 | 4.29 |

(3) We need lots of variation in site attributes (IV strategy depends upon variation in attribute space; N in second-stage regression requires many sites).

- without variation, go back to Brock & Durlauf strategy (no correlated unobservables)

- keep correlated unobservables but –

    · ignore second stage
    · recover heterogeneity in preferences for endogenous attributes
    · focus on marginal effects

(4) How do we measure congestion (spatial, temporal)?