

Averting expenditures and desirable goods: Consumer demand for bottled water in the presence of fracking

A. Justin Kirkpatrick
T. Robert Fetter

Duke University
justin.kirkpatrick@duke.edu

August 8, 2016

Policy Motivation

Fracking brings localized costs that are not fully priced.

- Groundwater impacts are a particularly salient subset.
 - Dimock, PA required water trucks for 3 years after groundwater became contaminated.
 - Muehlenbachs et al. [2015]: Hedonic price function affected more when fracking is in well-water areas.
- Groundwater impacts may be more actionable.

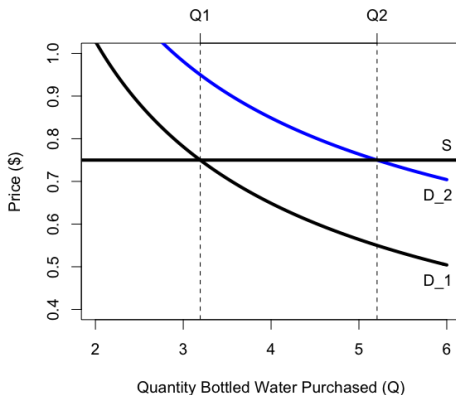
Policy Motivation

Fracking brings localized costs that are not fully priced.

- Groundwater impacts are a particularly salient subset.
 - Dimock, PA required water trucks for 3 years after groundwater became contaminated.
 - Muehlenbachs et al. [2015]: Hedonic price function affected more when fracking is in well-water areas.
- Groundwater impacts may be more actionable.
- *Research goal: disentangle the impacts on groundwater from overall fracking impacts.*

Averting Expenditures

- Claim: “Change in consumer expenditures provides lower bound on WTP to avoid contaminated tap water”
- Assumption: non-jointness in household production Bartik [1988]
- Wrenn et al. [2015], Abdalla et al. [1992]



Demand Estimation

Necessary to structurally model household demand for bottled water

- Heterogeneous demand functions over Hh

Demand Estimation

Necessary to structurally model household demand for bottled water

- Heterogeneous demand functions over Hh
- Consuming bottled water offsets tap water consumption - specify the “presence of fracking in tap water” as an *attribute* of bottled water.
- Other attributes: portability, taste, brand.

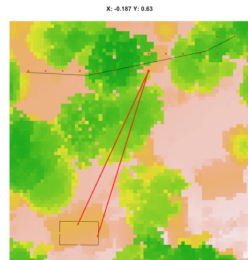
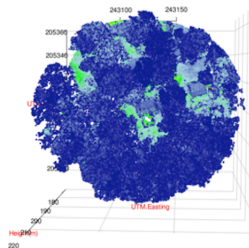
Demand Estimation

Necessary to structurally model household demand for bottled water

- Heterogeneous demand functions over Hh
- Consuming bottled water offsets tap water consumption - specify the “presence of fracking in tap water” as an *attribute* of bottled water.
- Other attributes: portability, taste, brand.
- \Rightarrow *Horizontal discrete choice model of consumer demand*
Nevo [2000]
 - Hendel and Nevo [2006] purchase of detergent conditional on quantity chosen. Allows for stockpiling and storage.

Data

1. Nielsen scanner data over PA and TX shale gas regions, pre- and post-boom
2. LiDAR (satellite) data to build potentially improved index of fracking presence



Questions

Model strategies?

Data problems or suggestions?

Other issues?

Thank You

- Charles W Abdalla, Brian A Roach, and Donald J Epp. Valuing environmental quality changes using averting expenditures: an application to groundwater contamination. *Land Economics*, 68:163+, 8 1992. ISSN 00237639.
- Timothy J Bartik. Evaluating the benefits of non-marginal reductions in pollution using information on defensive expenditures. *Journal of Environmental Economics and Management*, 15(1):111–127, 1988. ISSN 0095-0696.
- Igal Hendel and Aviv Nevo. Measuring the implications of sales and consumer inventory behavior. *Econometrica*, 74(6):1637–1673, 2006. ISSN 1468-0262.
- Lucija Muehlenbachs, Elisheba Spiller, and Christopher Timmins. The Housing Market Impacts of Shale Gas Development. *The American Economic Review*, 105(12):3633–3659, 2015. ISSN 0002-8282. doi: 10.3386/w19796. URL <http://www.nber.org/papers/w19796>.
- Aviv Nevo. A Practitioner's Guide to Estimation of RandomCoefficients Logit Models of Demand. *Journal of Economics & Management Strategy*, 9(4): 513–548, 2000. ISSN 1530-9134.
- Douglas H Wrenn, H Allen Klaiber, and Edward C Jaenicke. Unconventional Shale Gas Development, Risk Perceptions, and Averting Behavior: Evidence from Bottled Water Purchases. *Risk Perceptions, and Averting Behavior: Evidence from Bottled Water Purchases (March 20, 2015)*, 2015.