



AgEcon SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

Broadband Internet and Firm Entry: Evidence from Rural Iowa

Younjun Kim, Peter F. Orazem

Department of Economics, Iowa State University

ykim@iastate.edu, pfo@iastate.edu

*Poster prepared for presentation at the Agricultural & Applied Economics
Association's 2012 AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012*

*Copyright 2012 by Younjun kim and Peter Orazem. All rights reserved. Readers may make verbatim copies of
this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.*

Broadband Internet and Firm Entry: Evidence from Rural Iowa

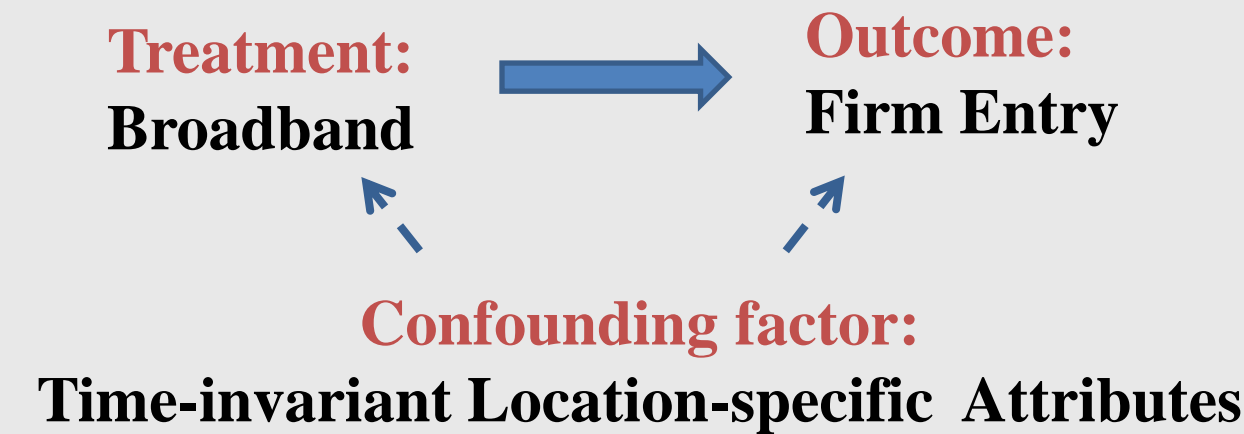
Younjun Kim*, Peter F. Orazem (*ykim@iastate.edu)

Research Questions

- Does broadband availability increase firm entry in rural areas?
- How is the answer confounded by local heterogeneity that could jointly raise local firm profitability and speed the introduction of broadband?

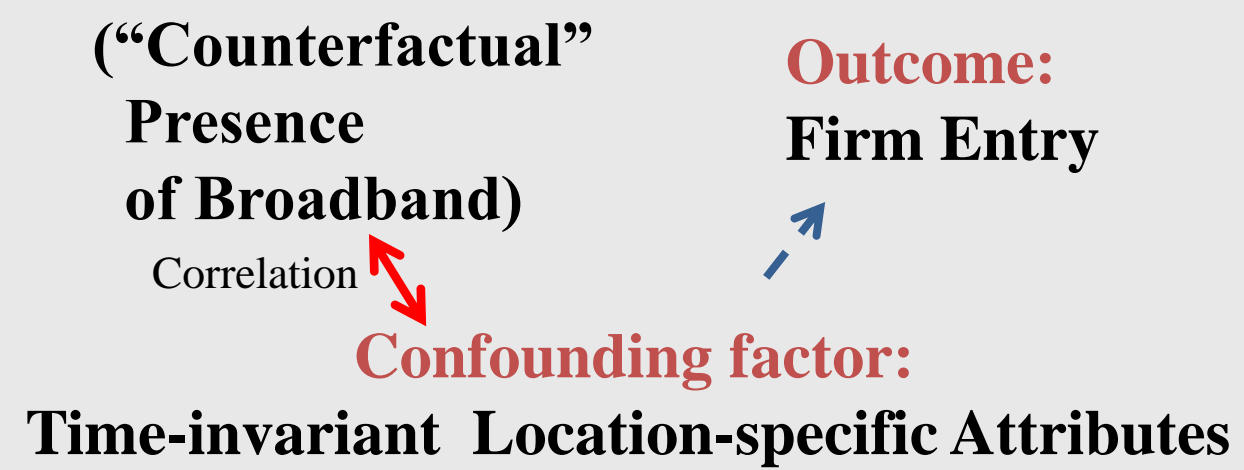
Introduction

- Correlation between Broadband Availability and Unobservable Time-invariant Location-specific Factors

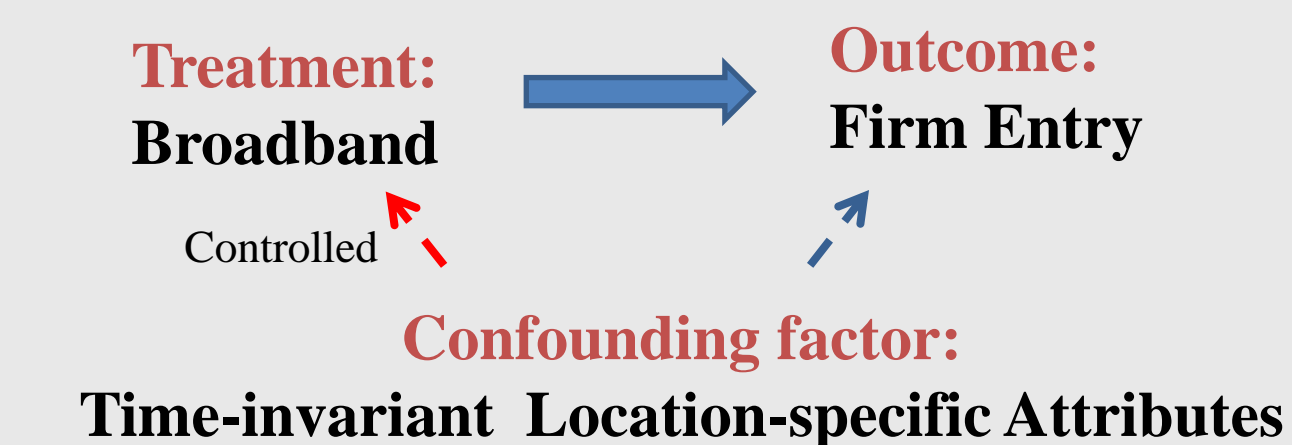


- Solution:** consider two time periods, At t=0 before broadband Internet is available anywhere, and t=1 after broadband deployment has begun. Longitudinal data on firm entry allows us to identify the location-specific effect of fixed factors that jointly influence firm entry and broadband availability.

(1) t=0: Internet is not Commercially Available

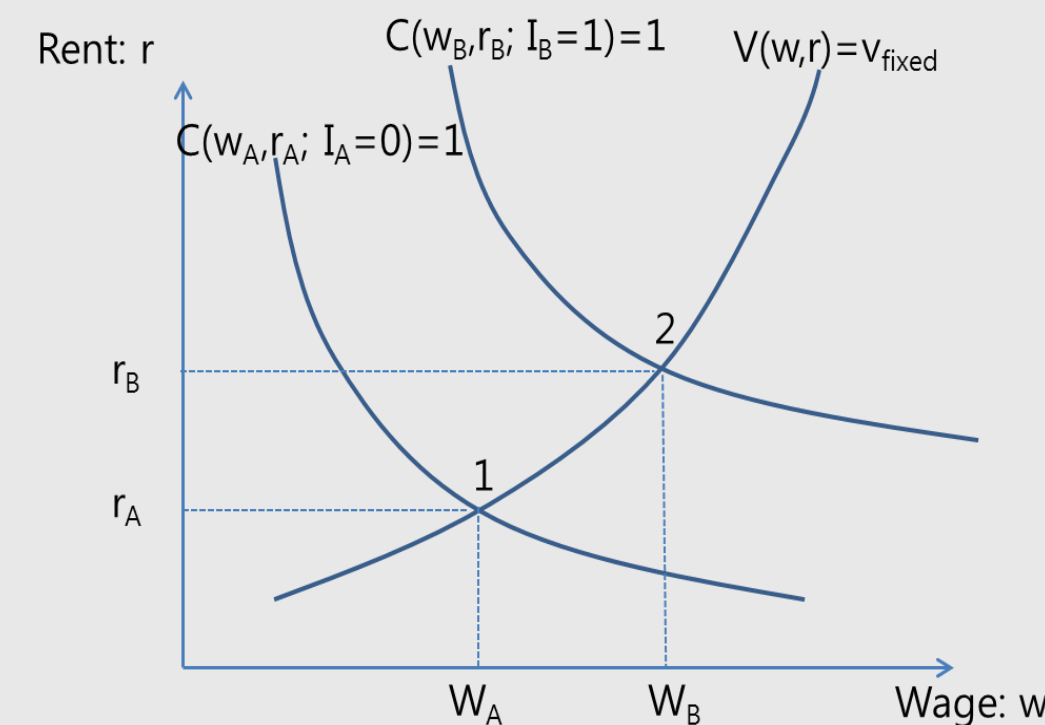


(2) t=1: Internet is Available at Some of Markets



Model

- Characterizing a Spatial Equilibrium with variation in local productivity (Moretti, 2004)
 - An area with higher local productivity attracts firms
 - Equilibrium wages and rents rise with local productivity



- Identification assuming the spatial equilibrium

- Reduced-form profit functions in time period 0 and 1

$$\pi_{ijt}^* \equiv \gamma_z^0 z_{j0} + \gamma_\mu^0 \mu_j + \varepsilon_{j0} \quad (1)$$

$$\pi_{ijt}^* \equiv \gamma_z^1 z_{j1} + \gamma_\mu^0 \mu_j + \gamma_I^1 I_{j1} + \varepsilon_{j1} \quad (2)$$

where z_{jt} indicates time-varying location-specific factors in market j in time period t , μ_j indicates time-invariant location-specific factors in market j , and I_{j1} is broadband availability in market j in time period 1.

- Projection of time-invariant location-specific factor on availability of broadband and location factors

$$\mu_j \equiv \theta_z^1 z_{j1} + \theta_I^1 I_{j1} + \omega_j \quad (3)$$

- Rewrite the two profit functions (1) and (2) with (3)

$$\pi_{ijt}^* = \gamma_z^0 z_{j0} + \gamma_\mu^0 (\theta_z^1 z_{j1} + \theta_I^1 I_{j1} + \omega_j) + \varepsilon_{j0} = \gamma_z^0 z_{j0} + \gamma_\mu^0 \theta_z^1 z_{j1} + \gamma_\mu^0 \theta_I^1 I_{j1} + \gamma_\mu^0 \omega_j + \varepsilon_{j0} \quad (1')$$

$$\pi_{ijt}^* = \gamma_z^1 z_{j1} + \gamma_\mu^0 \mu_j + \gamma_I^1 (\theta_z^1 z_{j1} + \theta_I^1 I_{j1} + \omega_j) + \varepsilon_{j1} = (\gamma_z^1 + \gamma_\mu^0 \theta_z^1) z_{j1} + (\gamma_\mu^0 \theta_I^1 + \gamma_I^1) I_{j1} + \gamma_\mu^0 \omega_j + \varepsilon_{j1} \quad (2')$$

- Using the Different-in-Difference, merge the two profit functions into one

$$\pi_{ijt}^* = D_{t=0} \gamma_\mu^0 z_{j0} + (\gamma_\mu^0 \theta_z^1 + D_{t=1} \gamma_z^1) z_{j1} + (\gamma_\mu^0 \theta_I^1 + D_{t=1} \gamma_I^1) I_{j1} + \gamma_\mu^0 \omega_j + \varepsilon_{jt}$$

- Start-ups choose a location with the highest profitability. The decisions are estimated by the Conditional Logit.

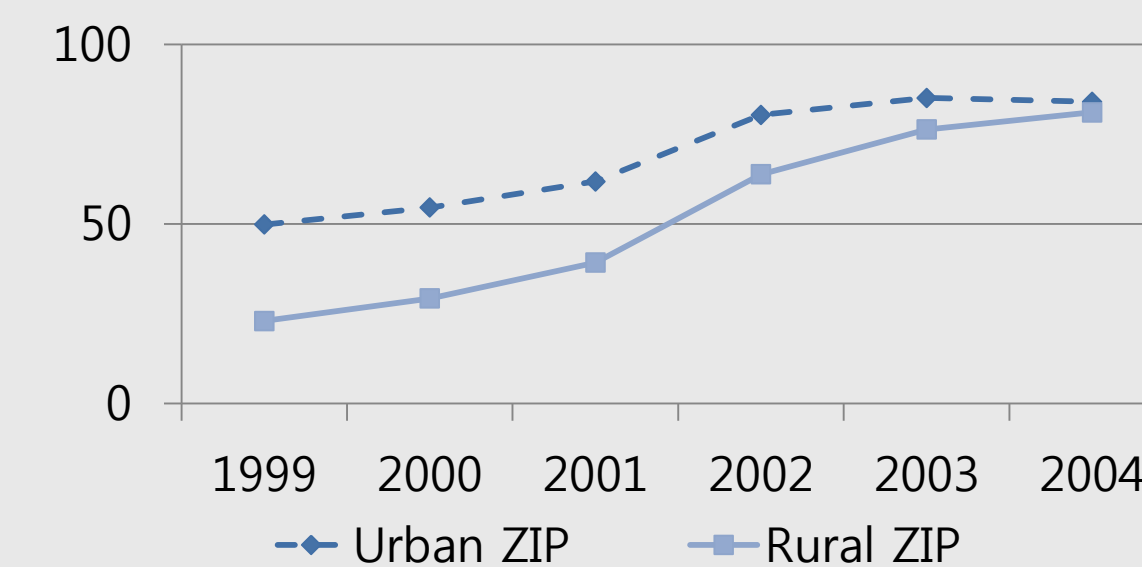
$$\pi_{ijt}^* - \pi_{ijt'}^* \geq 0 \quad \forall j \neq j'$$

Data and Results

- Sources of Data

Variables	Definition
ZIP code areas of start-ups in 1990-1992 and 2000-2002	National Establishment Time Series (NETS) by Walls & Associates
Broadband availability for ZIP code areas	Form 477, Federal Communications Commission
Education and Household Income in ZIP code areas in 1990 and 2000	Summary file 3, 1990 and 2000 Decennial Census, U.S. Census Bureau
RUCC for ZIP code areas	1993 Rural-Urban Continuum Code (RUCC), Economic Research Service, U.S. Department of Agriculture,

- Deployment of broadband in rural Iowa was slower and more uneven than in urban Iowa. By 2004, differences were negligible.



- Estimates for Broadband Availability

RUCC	Broadband Availability	Obs.
6 to 9	0.2088 (0.034)***	24,277
6	0.3854 (0.058)***	8,897
7	0.0852 (0.054)	11,371
8	0.0117 (0.102)	2,027
9	0.0018 (0.099)	1,982

***: p-value < 0.01, S.E. in the parentheses

- Marginal Effect and Elasticities of Broadband Availability

RUCC	Marginal Effect: (P _{t=1} - P _{t=0})	Elasticity: (P _{t=1} - P _{t=0}) / P _{t=0} × (% of ZIP code areas with broadband)
6 to 9	0.00059	0.0756
6	0.00290	0.1684
7	0.00012	0.0307
8	0.00011	0.0037
9	0.00001	0.0004

Discussion

- Our finding is consistent with Lehr et al. (2005) that areas with broadband have higher market rental rate.
- Possible correlation between broadband availability and time-varying location-specific factors
 - If time-invariant location specific factors are correlated with time-varying factors, and start-ups can predict future change in time-varying factors, then an estimate for broadband availability may be biased.
 - Effect is not driven by firm entry rates in 1990 - 1992.

Conclusions

- We have suggested an estimation strategy controlling for correlation between broadband availability and time-invariant location-specific factors.
- Our model is based on spatial equilibrium where wages and rents adjust to local productivity.
- We find that broadband availability increases firm entry significantly in rural Iowa.
- The broadband effect is only significant in more populated rural areas (RUCC 6 and 7).
- Broadband effect on firm entry is similar across all industries.

References

- Lehr, W.H., C.A. Osorio, S.E. Gillett, and M.A. Sirbu, 2005, Measuring broadband's economic impact, (US Department of Commerce, Economic Development Administration).
- Moretti, E., 2004, Workers education, spillovers, and productivity: Evidence from plant-level production functions, *American Economic Review* 94, 656-690.