Broadband Internet and Firm Entry: Evidence from Rural Iowa
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Broadband Internet and Firm Entry: Evidence from Rural Iowa

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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
  - Treatment: Broadband
  - Outcome: Firm Entry
  - Confounding factor: Broadband

- Time-invariant Location-specific Attributes
  - Correlation: "Counterfactual" Presence of Broadband
  - Outcome: Firm Entry
  - Confounding factor: Time-invariant Location-specific Attributes

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
- "Counterfactual" Outcome: Firm Entry
- Correlation: Time-invariant Location-specific Attributes
- Confounding factor: Time-invariant Location-specific Attributes

(2) t=1: Internet is Available at Some of Markets
- Treatment: Broadband
- Outcome: Firm Entry
- Confounding factor: Time-invariant Location-specific Attributes

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
\[ \pi_{ij0} = \gamma_z z_{ij0} + \gamma_p p_{ij0} + \gamma_r r_{ij0} + \epsilon_{ij0} \] (1)
\[ \pi_{ij1} = \gamma_z z_{ij1} + \gamma_p p_{ij1} + \gamma_r r_{ij1} + \epsilon_{ij1} \] (2)
where \( z_{ij} \) indicates time-varying location-specific factors in market \( j \) in time period \( t \), \( \mu_j \) indicates time-varying location-specific factors in market \( j \), and \( I_{j1} \) is broadband availability in market \( j \) in time period \( 1 \).
- Projection of time-varying location-specific factor on availability of broadband and location factors
\[ \mu_j = \theta_z z_{ij1} + \theta_p p_{ij1} + \epsilon_{ij1} \] (3)
- Rewrite the two profit functions (1) and (2) with (3)
\[ \pi_{ij0} = \gamma_z z_{ij0} + \gamma_p p_{ij0} + \gamma_r r_{ij0} + \epsilon_{ij0} \]
\[ \pi_{ij1} = \gamma_z z_{ij1} + \gamma_p p_{ij1} + \gamma_r r_{ij1} + \epsilon_{ij1} \]
- Using the Different-in-Difference, merge the two profit functions into one
\[ \pi_{ij} = \pi_{ij0} - \pi_{ij1} = (\gamma_z z_{ij0} + \gamma_p p_{ij0} + \gamma_r r_{ij0} + \epsilon_{ij0} - \epsilon_{ij1}) \]
- Start-ups choose a location with the highest profitability. The decisions are estimated by the Conditional Logit.
\[ \pi_{ij} = \gamma z_i \geq 0 \forall i,j \]

Sources of Data
- 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

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

Estimates for Broadband Availability

Results for Broadband Availability
- RUC
- 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 (0.120) 2,027
- 9 0.0018 (0.099) 1,982

***: p-value<.001, S.E. in the parentheses

Marginal Effect and Elasticities of Broadband Availability

MARGINAL EFFECTS OF BROADBAND AVAILABILITY ON FIRM ENTRY

Linkages between broadband availability and firm entry are stronger with broadband's impact on large enterprises than smaller firms.

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