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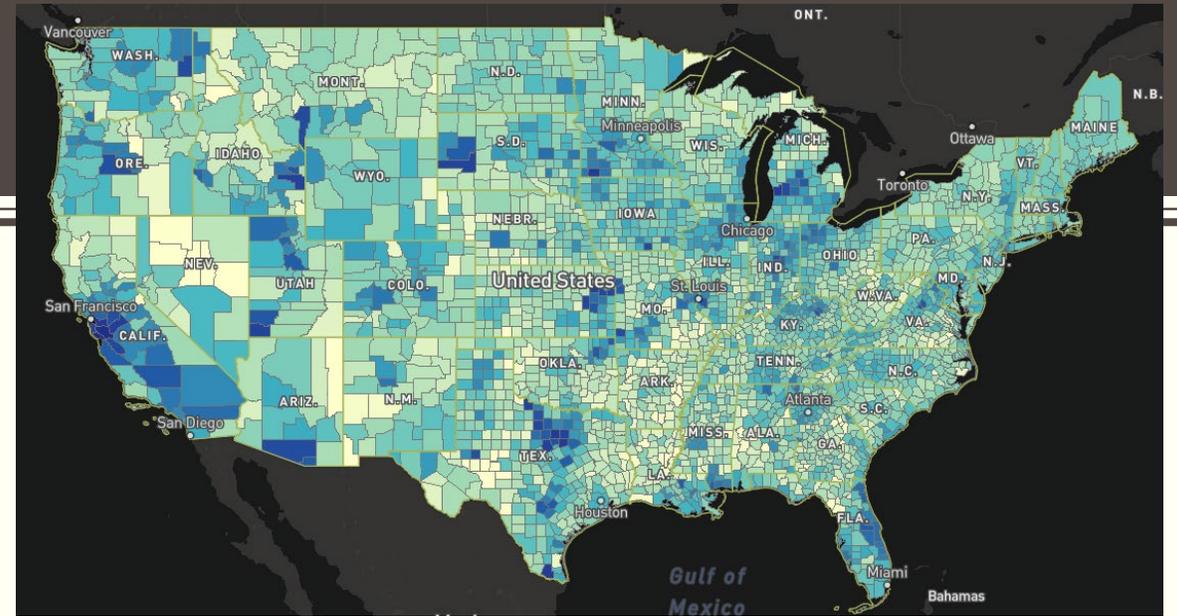
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State broadband policy: Impacts on availability

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STATE BROADBAND POLICY: WHAT IMPACTS AVAILABILITY?

Brian Whitacre



DEPARTMENT OF AGRICULTURAL ECONOMICS

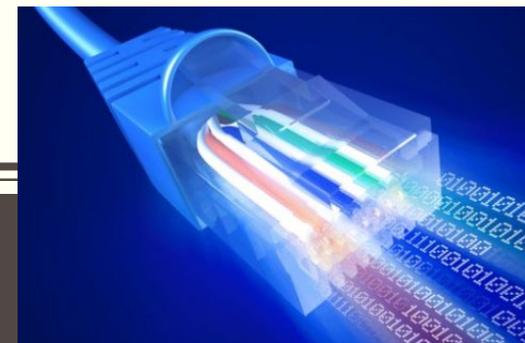
Roberto Gallardo



Center for Regional Development



State Broadband Policy Explorer



State Broadband Leaders Network



Presentation for WRDC Webinar
 Oct. 1, 2020

Background



- Provision of broadband Internet is an increasingly important topic
 - Highlighted by COVID-19 pandemic
- Rural areas have continued to lag behind in terms of broadband availability
- Broadband is important for a host of rural (and urban) economic outcomes (Kim and Orazem, 2017; Kandilov et al. 2017; Whitacre et al. 2014)
- States have taken different approaches to broadband policy
 - Some have state broadband offices with full-time employees
 - Others have state-level funding mechanisms
 - Some restrict cooperatives / municipalities from providing broadband
- Little to no empirical evidence regarding which policies work

California Broadband Council

[The California Broadband Council](#)
was established in 2010 by legislation

The NYS Broadband Program Office

In 2015 Governor Andrew M. Cuomo established the \$500 million New NY Broadband Program

UTAH

Legislation in 2013 added new obstacles to municipal broadband



Previous Research on Broadband Policy

**Broadband Penetration:
An Empirical Analysis of State and Federal Policies**
Scott Wallsten* June 2005

- Limited number of studies have examined U.S. broadband policy efforts
 - One early study concluded most state-level policies (tax incentives, universal service funds, municipal restrictions) were ineffective at promoting broadband penetration (Wallsten, 2005)
 - Another early study argued that policies focused on increasing demand were most effective (Falch, 2007)
 - Siefer (2015) lays out elements of “good” state broadband policy but stops short of empirically documenting their impacts.
 - Lack of research likely due to no clear source of information on state-level policies

Existing literature does not speak to effectiveness of state-level broadband policy in U.S.

SEPTEMBER 2015
**STATE-LEVEL
BROADBAND POLICY**
A COMPENDIUM OF RESOURCES AND APPROACHES

ANGELA SIEFER
ADJUNCT FELLOW

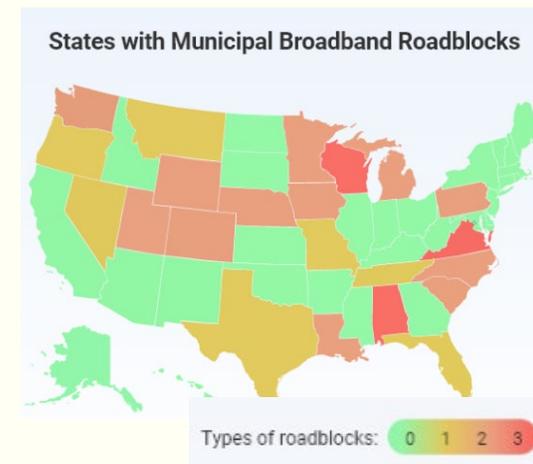


Research Questions

- Do state-level broadband policies impact overall availability?
 - What about rural availability?
- Which broadband policies are most effective – and what is the magnitude of their impact?
 - Existence of state-level broadband office with full-time employees
 - Existence of state-level funding mechanism
 - Existence of state-level restrictions on cooperative / municipal broadband provision



Broadband Expansion Grants



Source: Broadbandnow.com



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Data & Methods

Panel Dataset from
2012 – 2018
(3,140 counties)

- **Dependent Variable: County % of Population with Access to 25/3**
 - Aggregated from Census Block-level data
 - National Broadband Map (2010 – 2013)
 - Federal Communications Commission (2014 – 2018)
 - Other availability metrics of interest:
 - County % of Population with access to fiber
 - County % of Population with at least 2 providers offering 25/3 speeds
 - Also compiled “rural-only” metrics using Census Blocks classified as rural in 2010
 - **Primary Independent Variables of Interest: State Broadband Policies**
 - **Other county-level Control Variables**
 - Income
 - Education
 - Poverty Rates
 - Population Density
 - % Houses built after 2010
 - Topography
- Sources:
- US Census American Community Survey
 - US Census SAIPE
 - BLS - LAUS
 - USDA ERS Natural Amenities Scale



State Broadband

Initial Summary

- Compiled by Pew Char
- Initially available July 2
- Reviewed all state-level and governing directive dating to 1991
- First comprehensive cc

Ground-truthing

- Statutes may establish unclear if it provides full
- Several organizations k in dataset)
- Personalized emails se Leaders Network (SBLN assessment
- 31 of 50 states respons

fips	Geography	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	Alabama	0	0	0	0	0	0	0	0	1
2	Alaska	0	0	0	0	0	0	0	0	0
4	Arizona	0	0	0	0	0	0	0	0	0
5	Arkansas	0	0	0	0	0	0	0	0	0
6	California	1	1	1	1	1	1	1	1	1
8	Colorado	0	0	0	0	0	0	1	1	1
9	Connecticut	0	0	0	0	0	0	0	0	0
10	Delaware	0	0	0	1	1	1	1	1	1
11	District of Col	0	0	0	0	0	0	0	0	0
12	Florida	0	0	0	0	0	0	0	0	1
13	Georgia	0	0	0	0	0	0	0	0	0
15	Hawaii	0	0	0	0	0	0	0	0	0
16	Idaho	0	0	0	0	0	0	0	0	0
17	Illinois	1	0	1	1	1	0	0	0	0
18	Indiana	0	0	0	0	0	0	0	0	0
19	Iowa	0	0	0	0	0	1	1	1	1
20	Kansas	0	0	0	0	0	0	0	0	0
21	Kentucky	0	0	0	0	0	0	0	0	0
22	Louisiana	0	0	0	0	0	0	0	0	0
23	Maine	1	1	1	1	1	1	1	1	1
24	Maryland	0	0	0	0	0	0	0	0	0
25	Massachusetts	0	0	0	0	0	1	1	1	1
26	Michigan	0	0	0	0	0	0	0	0	0
27	Minnesota	0	0	0	0	1	1	1	1	0
28	Mississippi	0	0	0	0	0	0	0	0	0
29	Missouri	0	0	0	0	0	0	0	0	0
30	Montana	0	0	0	0	0	0	0	0	0
31	Nebraska	0	0	0	0	0	0	1	1	1
32	Nevada	0	0	0	0	0	1	1	1	1
33	New Hampshire	0	0	0	0	0	0	0	0	0
34	New Jersey	0	0	0	0	0	0	0	0	0
35	New Mexico	0	0	0	0	0	1	0	0	0
36	New York	0	0	0	0	0	1	1	1	1
37	North Carolina	0	0	0	0	0	0	1	1	0
38	North Dakota	0	0	0	0	0	0	0	0	0
39	Ohio	0	0	0	0	0	0	0	0	0
40	Oklahoma	0	0	0	0	0	0	0	0	0
41	Oregon	0	0	0	0	0	0	0	0	0
42	Pennsylvania	0	0	0	0	0	0	0	0	1
44	Rhode Island	0	0	0	0	0	0	0	0	0
45	South Carolina	0	0	0	0	0	0	0	0	0
46	South Dakota	0	0	0	0	0	0	0	0	0
47	Tennessee	0	0	0	0	0	0	0	1	1
48	Texas	0	0	0	0	0	0	0	0	0
49	Utah	0	0	0	0	0	0	0	0	0
50	Vermont	0	0	0	0	1	1	1	1	1
51	Virginia	1	1	1	0	1	1	1	1	1
53	Washington	0	0	0	0	0	1	1	1	1
54	West Virginia	0	0	0	0	0	0	0	0	1
55	Wisconsin	0	0	0	0	1	1	1	1	1
56	Wyoming	0	0	0	0	0	0	0	0	0
	Total	4	3	4	4	8	13	15	16	18

Highlighted rows = response from SBLN state contact



DEPA
AGI

Broadband Policy Explorer

ing high-speed internet access

ing 851 of 851

Clear all

r results

- EGORIES
- broadband programs
- competition and regulation
- definitions
- unding and financing
- rastructure access
- ther



Broadband Leaders Network (SBLN)

gional Development

Data & Methods

Table 1. Descriptive Statistics for Broadband Outcomes, Policy Variables, and Demographics, 2012 & 2018.

Outcome Measures	2012				2018			
	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
25/3_all (%)	31.93	37.93	0	100	79.08	23.32	0	100
25/3_rural (%)	24.43	31.46	0	100	71.46	26.10	0	100
Fiber_all (%)	7.50	18.20	0	100	24.66	28.84	0	100
Fiber_rural (%)	6.48	15.83	0	100	21.58	27.33	0	100
2+comp_all (%)	4.48	14.46	0	99.8	35.49	31.97	0	100
2+comp_rural (%)	2.37	2.83	0	100	27.23	26.88	0	100
Broadband Policies								
State Funds (% with)	9.86	29.82	0	100	32.96	47.01	0	100
State Office (% with)	6.01	23.77	0	100	42.82	49.49	0	100
Muni Restrictions (% with)	56.66	49.56	0	100	51.60	49.98	0	100



The Elephant in the Room...

Experts are furious over the FCC's rosy picture of broadband access

The data the agency uses has been criticized as flawed

BAD BROADBAND DATA —

FCC data fails to count 21 million people without broadband, study finds

Congress Tells FCC to Fix Broadband Maps Now

AT&T gave FCC false broadband-coverage data in parts of 20 states

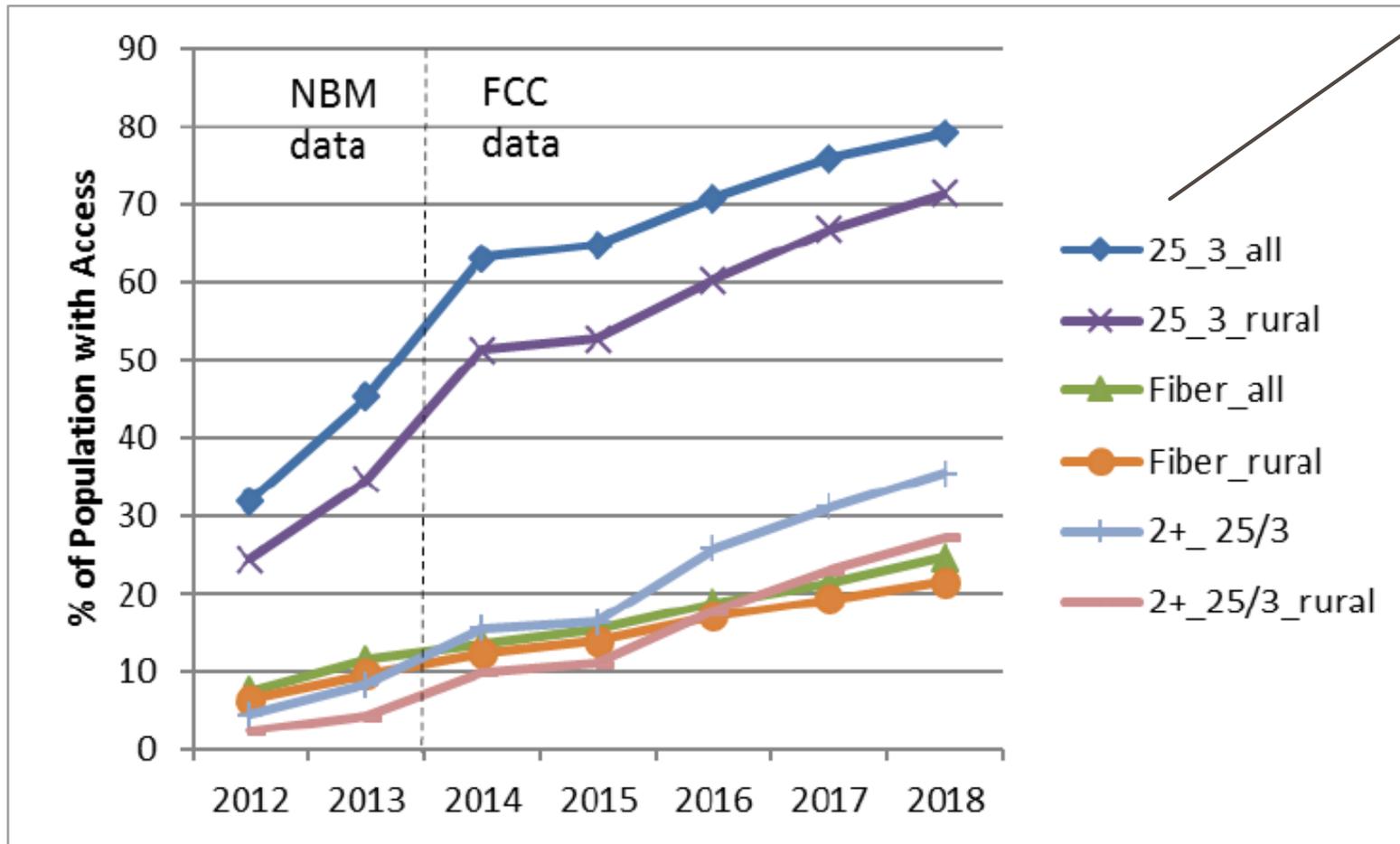
AT&T corrects mistake, admitting it offers no broadband in 3,600 census blocks.

- Major problems with FCC broadband data
- Coverage of any part of census block = service in entire block
- Max advertised speeds, not actual
- No cost data
- Incorrect submissions by providers

But, it remains the best / most complete data we have available

Broadband Availability, 2012-2018

Figure 1. Broadband Availability Averages for U.S. Counties, 2012-2108.



County averages

FCC Population-Based Availability Estimates

	2017	2018
All	93.5%	94.4%
Rural	73.7%	77.7%

Source: FCC Form 477 data, 2012-2018 (author's calculations)

State Broadband Policies, 2012 & 2018

Figure 2. State Broadband Offices, 2012 (left) and 2018 (right)

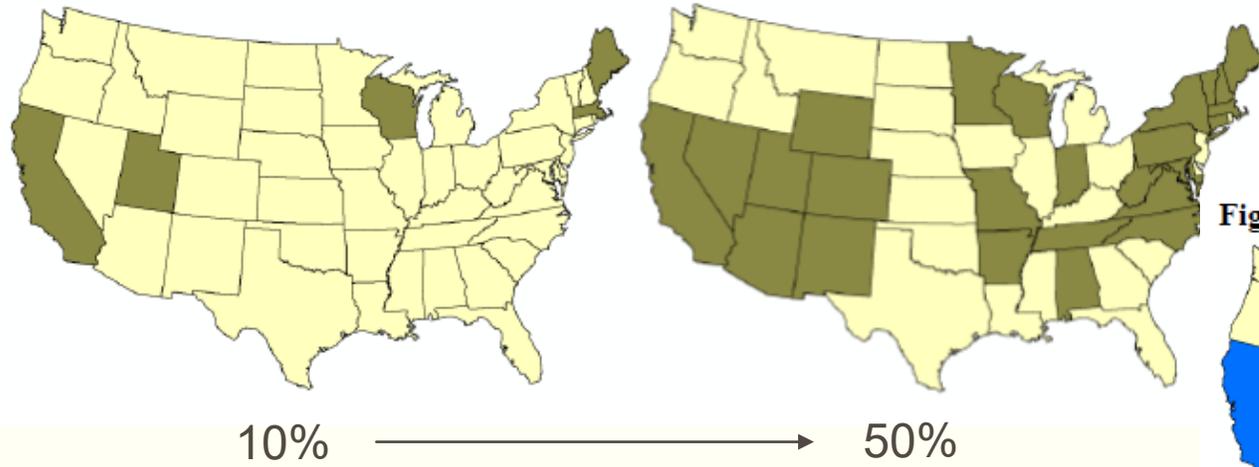


Figure 4. State Broadband Funding, 2012 (left) and 2018 (right)

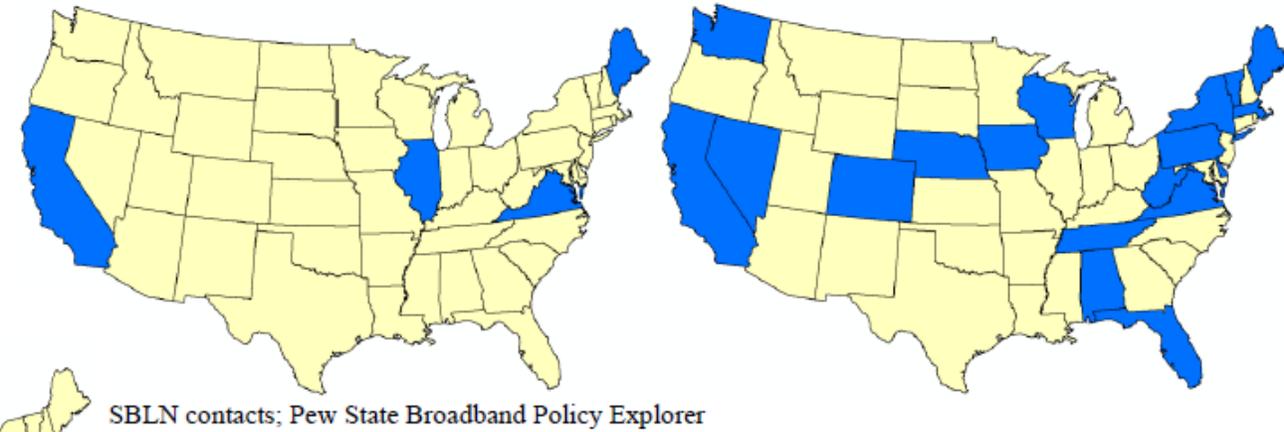
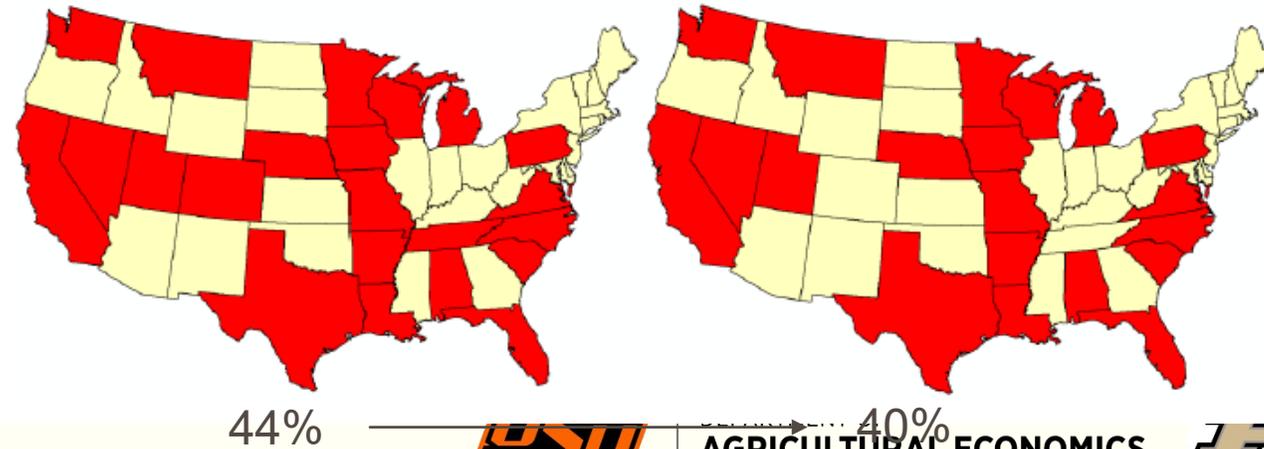


Figure 3. Municipal Broadband Restrictions, 2012 (left) and 2018 (right)



Data & Methods (cont'd)

Table 1. Descriptive Statistics for Broadband Outcomes, Policy Variables, and Demographics, 2012 & 2018.

Demographics	2012				2018			
	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
<i>All County</i>								
Population	98,447	313,839	66	9,840,024	102,769	329,907	75	10,152,600
Median HH Income	45,644	11,900	19,624	122,844	51,583	13,703	20,188	136,268
Population Density	259.35	1725.37	0.03	69,423	269.75	1783.49	0.037	70,977
% with Bach or more	19.50	8.75	3.72	72.81	21.57	9.43	0	78.58
% in Poverty	16.30	6.43	0	47.70	15.60	6.48	2.30	55.10
% Housing after 2010	0.31	0.44	0	5.60	3.59	2.64	0	36.00
Rural % of population	56.75	33.74	0	100.00	56.71	33.80	0	100.00
Topography	8.93	6.61	1	21.00	8.93	6.61	1	21.00
<i>Rural Portion of County Only</i>								
Population	17,358	15,512	0	123,887	17,579	15,993	0	128,275
Median HH Income	25,468	14,858	0	91,571	28,919	17,003	0	102,156
% with Bach or more	17.35	8.64	0	73.65	19.45	9.24	0	73.64
% in Poverty	13.92	7.42	0	86.00	13.25	7.17	0	76.40
% Housing after 2010	0.30	0.49	0	4.80	3.72	3.11	0	38.80
Instrumental Variables (State level)								
Conservative Adv.	20.56	7.93	-20.33	36.57	16.72	9.45	-30.34	38.24
% Repub. Legislators	58.99	12.21	0	84.28	62.53	12.82	0	87.20
# Obs	3,143				3,143			



Empirical Specification (Insert Glossy Eyes Here)

Dynamic Panel Regression

Dependent Variable:
 % of Population with 25/3
 access in county i at time t

Control Variables:

- Poverty Rates
- Education
- Population Density
- Rural % of Population
- Topography

$$(1) \quad Availability_{it} = \rho Availability_{it-1} + \beta X_{it-1} + \gamma BBPolicy_{it-1} + \delta_t + v_i + \epsilon_{it}$$

Lagged Dependent Variable

Variables of Interest

County Fixed Effects

Year Fixed Effects

**A Commonly-used Approach:
 Difference (or System) Generalized
 Method of Moments (GMM)**



Results

Table 2. System GMM Estimates for Broadband Availability

	25_3_All (1)			Fiber_All (2)			2_Competitors (3)		
Lag (availability)	0.433	0.013	***	0.755	0.023	***	0.574	0.027	***
% Bachelor's Degree or More	0.141	0.031	***	0.204	0.023	***	0.139	0.028	***
% Poverty	-0.351	0.065	***	-0.128	0.042	***	-0.068	0.039	*
% Housing after 2010	-0.320	0.106	***	0.496	0.092	***	0.358	0.124	***
ln(Median Household Income)	-0.008	0.020		-0.016	0.013		0.062	0.013	***
ln(Population Density)	0.032	0.002	***	0.000	0.001		0.020	0.002	***
Rural % of Population	-0.112	0.009	***	0.015	0.005	**	-0.093	0.008	***
Topography	0.000	0.001		-0.001	0.000		0.000	0.000	
Year F.E.	Yes			Yes			Yes		
Policy Variables									
State funds	0.012	0.006	*	0.020	0.005	***	0.001	0.005	
State office	-0.003	0.006		0.009	0.006		0.016	0.006	**
Municipal restrictions	-0.031	0.009	***	-0.022	0.008	***	-0.018	0.008	**
Constant	0.542	0.220	**	0.231	0.145		0.170	0.140	
Wald Chi Squared	14,568		***	5,705		***	18,455		***
# Instruments		54			55			61	
# Groups		3,140			3,140			3,140	
Hansen J-test		0.261			0.332			0.258	
AR(1)		0.000	***		0.000	***		0.000	***
AR(2)		0.336			0.231			0.150	
# Obs	18,833			18,833			18,833		

Intuitive results for controls

Some evidence of state office effectiveness

Municipal restrictions lower availability 2-3%

State funds increase availability 1-2%

Pass specification tests

*, **, and *** represent statistical significance at the p<.10, .05, and .01 levels, respectively

Hansen J-test represents p-values for the null hypothesis of valid instruments (overidentification)

AR(1) and AR(2) represent p-values for null hypotheses of no 1st and 2nd-order autocorrelation



Table 3. System GMM estimates for Rural Broadband Availability

Results - Rural

Intuitive results for controls

	25/3_All_Rural (1)			Fiber_All_Rural (2)			2+_Competitors_Rural (3)		
Lag (availability) - Rural	0.448	0.015	***	0.818	0.025	***	0.803	0.019	***
% Bachelor's Degree or More – Rural	0.264	0.029	***	0.095	0.022	***	0.104	0.018	***
% Poverty – Rural	-0.401	0.046	***	-0.091	0.028	***	-0.112	0.192	***
% Housing after 2010 - Rural	-0.152	0.096		0.382	0.065	***	0.059	0.075	
ln (Median Household Income – Rural)	-0.035	0.004	***	-0.009	0.330	***	-0.016	0.002	***
ln (Rural Population)	0.045	0.003	***	-0.010	0.168	***	0.015	0.001	***
Rural % of Population	0.019	0.014		0.050	0.009	***	-0.008	0.006	
Topography	-0.001	0.001		-0.000	0.000		0.000	0.001	
Year F.E.	Yes		***	Yes			Yes		
Policy Variables									
State funds	0.018	0.007	***	0.021	0.005	***	0.014	0.004	***
State office	-0.007	0.008		0.015	0.006	**	0.003	0.005	
Municipal restrictions	-0.037	0.011	***	-0.016	0.006	**	0.003	0.006	
Constant	0.175	0.042	***	0.208	0.032	***	0.037	0.024	
Wald Chi Squared		15,432	***		7,215	***		17,635	***
# Instruments		54			53			52	
# Groups		3,028			3,028			3,028	
Hansen J-test		0.251			0.304			0.275	
AR(1)		0.000	***		0.000	***		0.000	***
AR(2)		0.201			0.621			0.042	**
# Obs		18,159			18,159			18,159	

Municipal restrictions lower availability 2-4%

State funds increase availability 1-2%

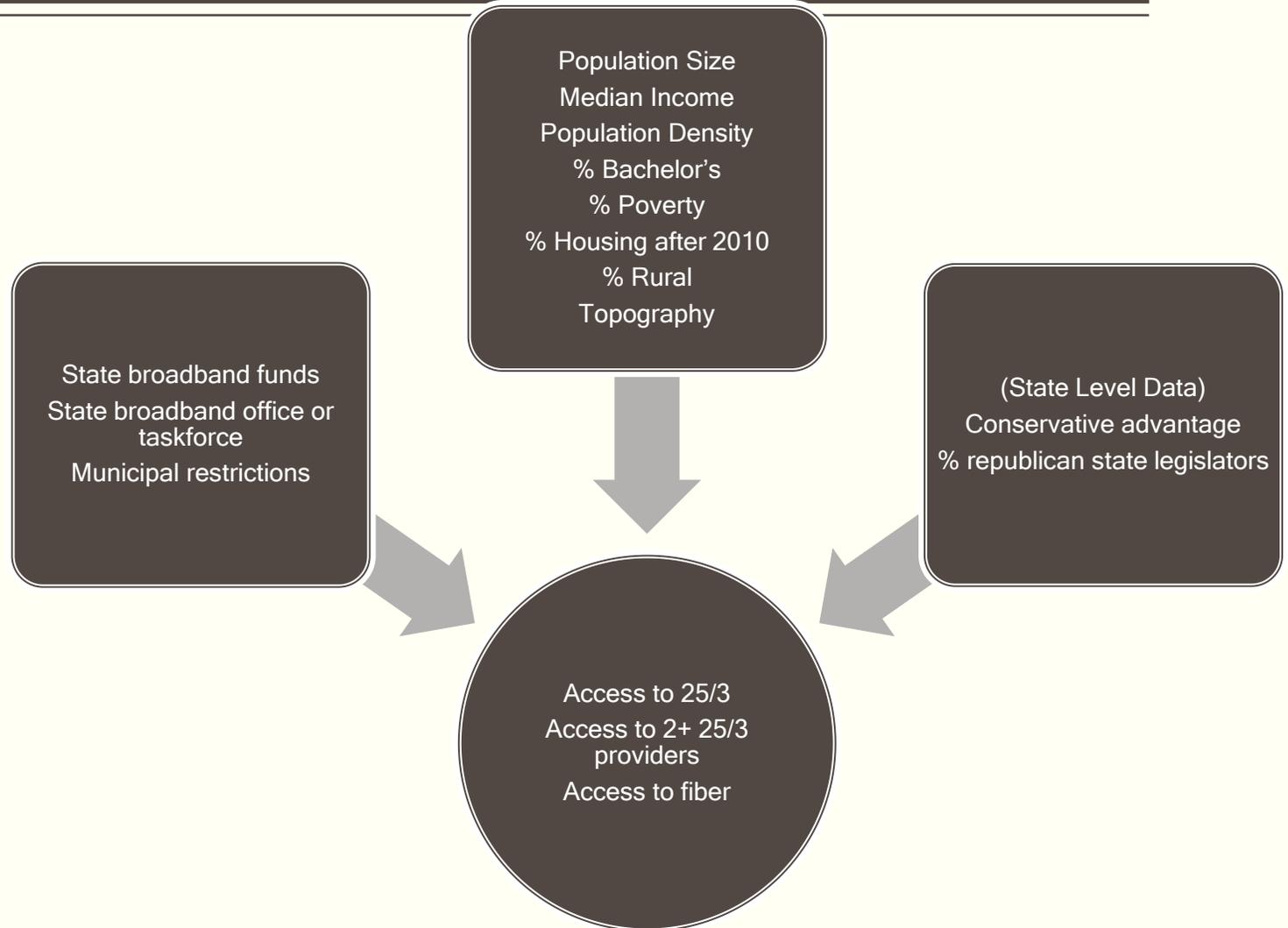


*, **, and *** represent statistical significance at the p<.10, .05, and .01 levels, respectively
 Hansen J-test represents p-values for the null hypothesis of valid instruments (overidentification)
 AR(1) and AR(2) represent p-values for null hypotheses of no 1st and 2nd-order autocorrelation

Study Summary in 2 slides:

- 2012-2018
- County-level data
- 18,833 observations
- Dynamic panel regression

- FCC Form 477
- ACS 5-year
- Pew Charitable Trusts



Study Summary in 2 slides (cont'd):

Do these state broadband policies matter?	State broadband office	State broadband funding	Municipal network restrictions
Overall			
25/3 availability		Yes (higher)	Yes (lower)
Fiber availability		Yes (higher)	Yes (lower)
Two or more 25/3 providers	Yes (higher)		Yes (lower)
Rural			
25/3 availability		Yes (higher)	Yes (lower)
Fiber availability	Yes (higher)	Yes (higher)	Yes (lower)
Two or more 25/3 providers		Yes (higher)	



Conclusions

- Strong argument that state broadband policies are having an impact
 - Existence of restrictions on municipal / cooperative broadband hinders overall availability
 - Broadband funding programs / offices have positive impact
- Magnitude of impacts:
 - Typical county in 2018: 71.5% rural broadband availability
 - Including state-level funding program: (+1.8%) → 73.3%
 - Removing municipal restrictions: (+3.7%) → 75.2%
 - Additive in nature: Do both → 77.0%



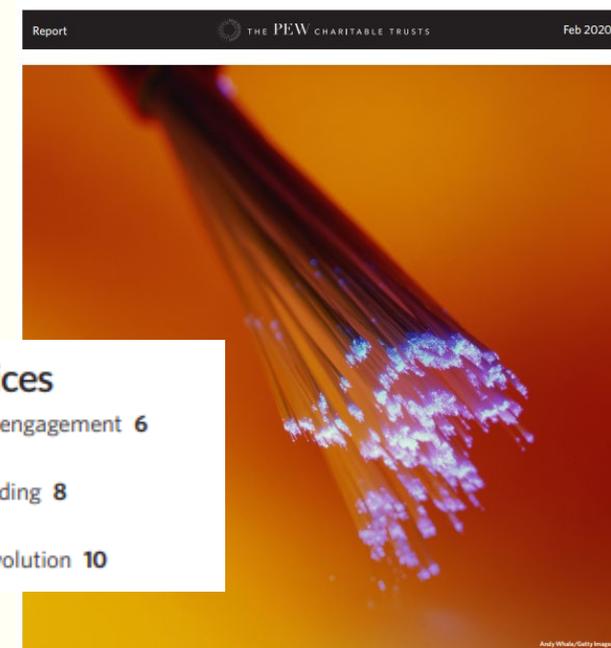
Conclusions (and recent progress)

■ State Broadband Offices

- Positive impact shown for only 2 outcomes: % of residents with 2+ providers; rural-only fiber
- But, many states only began investing in these relatively recently
 - 8 in 2014
 - 25 by 2018
- Benefits of these offices may take time to accrue
 - Stakeholder outreach
 - Planning / capacity building
- Interplay between state offices / other policies?

■ Recent Momentum

- Pew's update for 2019 legislative session:
 - 4 additional states set up broadband task forces
 - 7 states set up their own broadband funding structures
 - 5 states reduced restrictions for cooperative broadband provision



How States Are Expanding Broadband Access



Implications for Extension Educators

- Be aware that state policies CAN impact overall broadband availability
- Find out what broadband policies have been enacted / are ongoing in your state
 - Use the Pew Trust's State Broadband Policy Explorer!
- Share research findings with local contacts / organizations interested in broadband
 - Popular press versions of this study are available
- Reach out to state agencies working in broadband – let them know how extension can help!

[Pew's State Broadband Policy Explorer](#)

[Daily Yonder Link](#)

Research Report: States with Broadband Funding Program Have Better Access

State broadband policies make a difference, a new report says. In particular, residents of states that have their own broadband funding programs did better. And in states that restrict municipal broadband, residents fared worse.



That's all, folks!

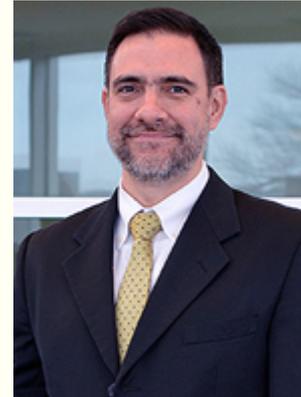
- Thanks to WRDC for having us!
- Questions?
- Comments?



State Broadband Leaders Network



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AGRICULTURAL ECONOMICS



Center for Regional Development