# Broadband: The Key Ingredient For Rural Economic Development

Cooking up an economic development plan for rural and near-rural counties? Be sure to stir in broadband if the area is underserved – but be aware that the existing economic base will influence broadband's impact.

By Steven S. Ross / *Broadband Communities*

In two major studies over the past two years (reported in the November-December 2014 and May-June 2015 issues of this magazine), I established that lack of broadband access accounts for at least 25 percent and as much as half of the rural population loss since 2010. In this article, I examine the effect of broadband access on different *types* of rural counties. Are counties in which the dominant economic activity is farming hurt more by lack of broadband than, say, counties that are retirement havens?

As in the previous studies, I used U.S. Census data for population shifts and the National Broadband Map to rank counties' broadband access within their states. The map's quality, never high, has deteriorated. The FCC now has responsibility for updating it but was given no funding to do so.

I turned to the Department of Agriculture (USDA) for its classification of all counties by dominant economic activity and for several poverty and employment measures. The latest classifications were released in December, 2015.

As before, I looked at all 3,144 counties and countylike municipalities in the United States.

## OVERALL FINDINGS

I first confirmed that population change is indeed a good surrogate for income and employment change. Using population data is preferable because more timely, accurate and precise data are available for rural population than for rural income and employment.

I also confirmed the conclusions of the two earlier articles: Rural counties in states that restrict municipal broadband have the biggest rural-urban divide in terms of population growth despite greater growth in top-ranked broadband counties; the "haves" in these states steal growth from the "have-nots."

This outcome would be unlikely if the overall national relationship between broadband access and population growth were spurious or if the population loss were causing most of the lack of broadband rather than vice versa. Determining *how* unlikely is tricky because not all restrictions are the same and the laws that restrict municipal broadband were enacted between 2004 and 2014. Conservatively, however, the chances are less than 1 in 100 that the results are spurious.

Previously, I found that states that restrict municipal broadband have grown faster since 2010 – 2.92 versus 1.93 percent. However, that growth was concentrated in urban counties that have good broadband access. The bottom half of counties in "restriction" states grew only 0.23 percent since 2010 versus 0.30 percent for the bottom half of counties in states that have no restrictions, even though the restriction states are growing faster overall. The difference widens for counties ranked in the lowest 10 percent of all

*In these summary tables, shaded categories show which types of counties are more likely to be helped by adding broadband.*

**OVERALL POPULATION GROWTH BY COUNTY TYPE**

| County Classification | Population Growth in States That Restrict Municipal Broadband | Population Growth in States That Do Not Restrict Municipal Broadband |
|---|---|---|
| Farming | -0.90% | -0.45% |
| Mining | 4.33% | 2.09% |
| Manufacturing | 0.92% | 1.03% |
| Government | 2.80% | 2.24% |
| Recreation | 3.62% | 1.76% |
| Retirement | 4.64% | 3.29% |
| Low Employment | -0.29% | 0.08% |
| Persistent Poverty | 1.50% | 1.36% |

**OVERALL POPULATION GROWTH, COUNTIES IN BOTTOM HALF OF STATE**

| County Classification | Population Growth in States That Restrict Municipal Broadband | Population Growth in States That Do Not Restrict Municipal Broadband |
|---|---|---|
| Farming | -1.40% | -0.69% |
| Mining | 1.49% | 0.25% |
| Manufacturing | -0.45% | -0.54% |
| Government | 0.39% | 0.11% |
| Recreation | 1.83% | 0.90% |
| Retirement | 2.20% | 1.99% |
| Low Employment | -0.50% | -0.25% |
| Persistent Poverty | -0.79% | -1.02% |

**OVERALL POPULATION GROWTH, COUNTIES IN BOTTOM 10% OF STATE**

| County Classification | Population Growth in States That Restrict Municipal Broadband | Population Growth in States That Do Not Restrict Municipal Broadband |
|---|---|---|
| Farming | -1.23% | -0.97% |
| Mining | -0.41% | -0.62% |
| Manufacturing | -0.86% | -0.54% |
| Government | -1.32% | 0.70% |
| Recreation | -1.03% | -0.29% |
| Retirement | -0.62% | 2.50% |
| Low Employment | -1.38% | -0.05% |
| Persistent Poverty | -2.35% | -1.12% |

counties in their states (-1.00 percent in restriction states versus -0.26 percent in no-restriction states).

## FINDINGS BY COUNTY TYPE

Segmenting the data by dominant type of economic activity in each county confirms the overall pattern and much of the causality – lack of broadband causes population loss more than low population discourages broadband investment. However, there are differences among counties with different types of economies.

The USDA classifies counties by their dominant economic activities in six categories:

- Farming
- Mining
- Recreation
- Retirement
- Manufacturing
- Government installations (everything from state capitals to military bases).

USDA also collects data about which counties have chronically low employment and high poverty. It takes note of employment, which is measured in rural areas by the Commerce Department roughly every two years, and poverty rates and childhood poverty every three or four years. Its most recent classifications of counties by employment and poverty, issued in December 2015, use data collected mainly from 2010 through 2012.

The following discussions include rural and nonrural ("metro") counties, but even most of the nonrural counties are not huge population centers. Because nonrural counties tend to be more diverse than rural counties, not many meet the criteria for each USDA economic classification. For example, a large metro county with some agricultural activity is not likely to have a quarter of its population working in agriculture.

The data provide clear guidelines for economic development officials. The recipe goes like this:

1. Farming and low-employment counties clearly need more broadband access in almost all

cases, no matter where they rank in access in their own state.

2 Manufacturing counties that rank near the bottom of their states in terms of broadband access are in a danger zone, and adding broadband access is one tool to strongly consider. If a manufacturing county already has some broadband access, adding more broadband is likely to be one consideration among many.

3 With one exception – mining counties – counties that have little or no broadband (that is, counties in the bottom 10 percent of their state broadband access ratings) are in serious trouble; if private carriers can't make a business case for building broadband, county officials must explore other paths. Lack of broadband is at least half the problem and probably more.

4 For counties that depend on mining (mineral extraction, ground water production, oil and gas), the impact of broadband access is relatively small. For example, coal employment has declined because other forms of energy are cheaper, cleaner or both. Adding broadband in coal counties is likely to do little in the absence of other initiatives.

The detailed data and maps are presented and discussed in the online edition of this article.

## WHY THE DIFFERENCE?

**Why is there such a difference between restriction and nonrestriction states?** Municipalities don't really want to build their own broadband systems. Only about 200 muni fiber systems have been built, out of 40,000 U.S. communities, more than 15,000 of which are large enough to have their own school systems.

Municipalities in 31 states can *threaten* to build systems, which sometimes leads providers to upgrade their broadband networks. States that don't even allow threatening essentially doom these communities so that ISPs, usually nonlocal, can milk old outside plant.

Nationally, there are about 50 premises per road mile (130+ million premises, 2.7 million miles of paved road). Rural areas, of course, have far fewer. Wall Street won't finance fiber to fewer than 30 premises per mile (minimum 12–15 actual customers). However, a municipality can break even at eight to 10 customers per mile if it can achieve $40 to $50 a month gross profit (before overhead) per customer.

Rural communities tend to get higher take rates and lower churn, so the commercial business case can work at well under 20 premises per mile. Old outside plant can't generate the same revenues because the old plant can't support it.

Thus, the models are clear – the big, Wall Street-funded carriers would do better by having communities, or community-based providers, build new plant that the big guys can rent, to offer great services and gain revenue.

Wall Street hates uncertainty, so big firms have been spinning off rural or near-rural holdings as well as assets they would rather rent than own – cell towers and data centers, for example.

The result has been renewed interest in municipalities' partnering with small, local telecommunications companies that don't have to compete directly for funds on Wall Street.

The alternative, as our data show, is for communities to continue losing population and eventually die. ❖

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*Steve can be reached at steve@bbcmag.com. The two earlier articles in this series have won national awards for business reporting.*

Maps, detailed data and analyses are available in the digital edition of this article at www.bbcmag.com.

| Farming Counties | 2010 Population | 2013 Population | Population change | % Population change |
|---|---|---|---|---|
| In a restricted state (231) | 2,004,621 | 1,986,540 | (18,081) | -0.90% |
| In an open state (276) | 1,969,859 | 1,960,906 | (8,953) | -0.45% |
| | | | | |
| **Broadband access within-state rank** | | | | |
| Restricted, top half (60) | 638,728 | 639,714 | 986 | 0.15% |
| Restricted, bottom half (170) | 1,365,893 | 1,346,826 | (19,067) | -1.40% |
| Not restricted, top half (97) | 776,465 | 775,775 | (690) | -0.09% |
| Not restricted, bottom half (181) | 1,193,394 | 1,185,131 | (8,263) | -0.69% |
| | | | | |
| Restricted, top 10% (2) | 28,454 | 28,802 | 348 | 1.22% |
| Restricted, bottom 10% (45) | 199,975 | 197,521 | (2,454) | -1.23% |
| Not restricted, top 10% (9) | 35,812 | 35,766 | (46) | -0.13% |
| Not restricted, bottom 10% (52) | 258,878 | 256,361 | (2,517) | -0.97% |

## DETAILED FINDINGS

Now for the details. In these tables, the number of counties in each statistical break is given in parentheses.

### Farming

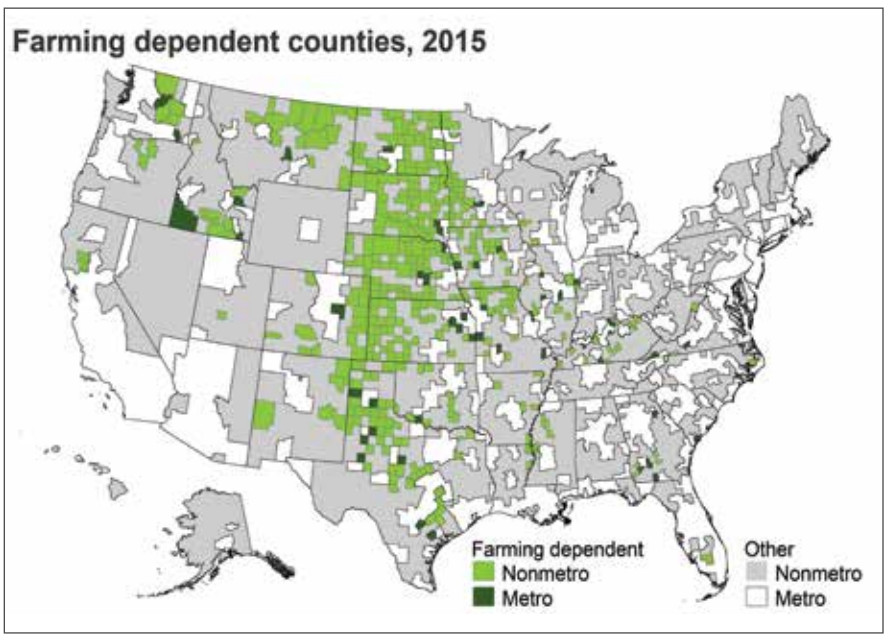
The USDA defines counties as "farming dependent" if 25 percent or more of the county's average annual labor and proprietors' earnings were derived from farming, or at least 16 percent of jobs were in farming, as measured by the Bureau of Economic Analysis for 2010 through 2012.

Note that farming counties are overwhelmingly in the Plains states, right in the middle of the country. Although California is the nation's largest producer of agricultural output, only one California county shows a clear dominance for agriculture.

The 231 agriculture-dependent counties in states that restrict municipal broadband or broadband provided by other quasi-public entities, such as electric co-ops, lost 0.9 percent of their population from 2010 to 2013. That was twice the 0.45 percent loss of the 276 agriculture-dependent counties in states that have no such restrictions.

The disparity is even more severe for counties whose broadband access is below average for their state. This is because agricultural counties that rank high in broadband access tend to be in metropolitan areas and have a population center as large as 50,000. These small but moderately dense communities are easy to wire for broadband. In fact, they are easier to wire than many very dense cities because the outside plant is aerial – on poles rather than in trenches.

Thus, in restricted states, 60 of the 231 agricultural counties are in the top half of their state in broadband access, and they gained 986 people in the study period – a small margin of 0.15 percent. In the nonrestriction states, 97 counties are in the top half, and they lost a similarly small number – 690 people, or 0.09 percent. This is in line with their average population, which is about 8,000 per county versus almost 11,000 for the restriction states. (A single business closing can easily have a greater impact on a very small county than on a larger one.)

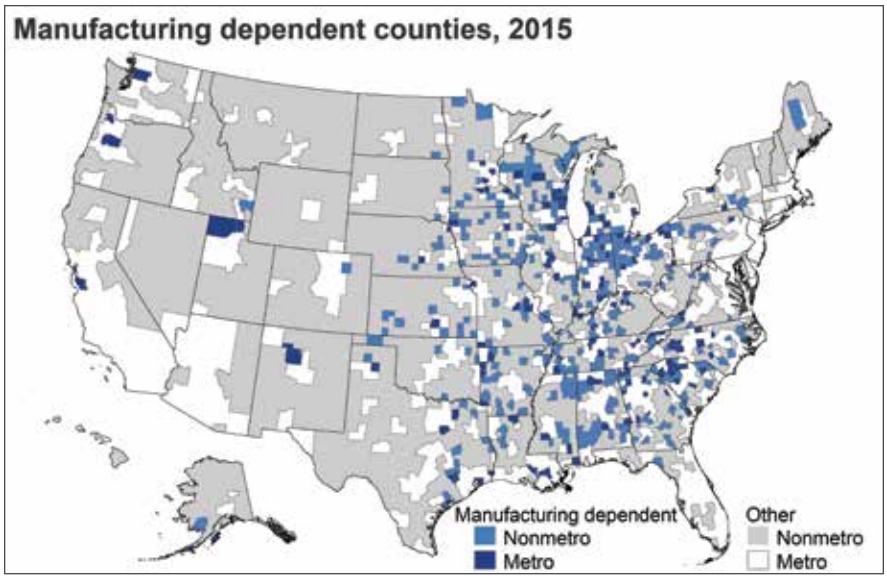


The greatest disparities are in the counties with below-average broadband access in their states. The 170 counties in the bottom half of the access rankings in restriction states lost 1.4 percent of their population. The similarly ranked 181 counties in nonrestriction states lost only 0.69 percent, despite the fact that they were smaller to begin with. In total population loss for these counties, the restriction states lost 19,067 and the nonrestriction states 8,263.

Comparisons for the bottom 10 percent of counties are not as statistically valid, as rankings are somewhat arbitrary at the bottom – the situation varies from no broadband at all to a small amount for a favored few. But even there, the nonrestriction states come out slightly better.

## Manufacturing

There is clear evidence that broadband helps manufacturing counties and that a lot of broadband helps more. But in these counties (which generally have higher population densities than agricultural counties), the private sector – often the manufacturers themselves, buying expensive custom services from carriers – makes up more of the broadband gaps. Still, rural manufacturing counties grow at considerably less than a third the rate of the national average for all counties.




In its latest (2015) categorization, USDA defined a rural county as "manufacturing dependent" if 23 percent or more of the county's average annual labor and proprietors' earnings were derived from manufacturing or if 16 percent of jobs were in manufacturing. Not all the jobs have to be on the shop floor; merely working for a company with within-county manufacturing activity qualifies.

Almost all these 516 counties are east of the Mississippi and outside the Northeast. Although their overall population (about 25 million) is more than six times the population in agricultural counties, a higher percentage of manufacturing counties are actually rural.

The USDA says that "rural manufacturers generally do not lag urban manufacturers in the adoption of new technologies or management practices, although there has been some

| Manufacturing Counties | 2010 Population | 2013 Population | Population change | % Population change |
|---|---|---|---|---|
| In a restricted state (259) | 13,880,061 | 14,008,301 | 128,240 | 0.92% |
| In an open state (257) | 12,503,396 | 12,632,139 | 128,743 | 1.03% |
| | | | | |
| **Broadband access within-state rank** | | | | |
| Restricted, top half (137) | 10,353,384 | 10,497,425 | 144,041 | 1.39% |
| Restricted, bottom half (122) | 3,526,677 | 3,510,876 | (15,801) | -0.45% |
| Not restricted, top half (124) | 9,112,360 | 9,259,263 | 146,903 | 1.61% |
| Not restricted, bottom half (133) | 3,391,036 | 3,372,876 | (18,160) | -0.54% |
| | | | | |
| Restricted, top 10% (26) | 3,754,956 | 3,828,167 | 73,211 | 1.95% |
| Restricted, bottom 10% (15) | 392,321 | 388,953 | (3,368) | -0.86% |
| Not restricted, top 10% (14) | 2,321,172 | 2,356,376 | 35,204 | 1.52% |
| Not restricted, bottom 10% (23) | 500,969 | 498,248 | (2,721) | -0.54% |

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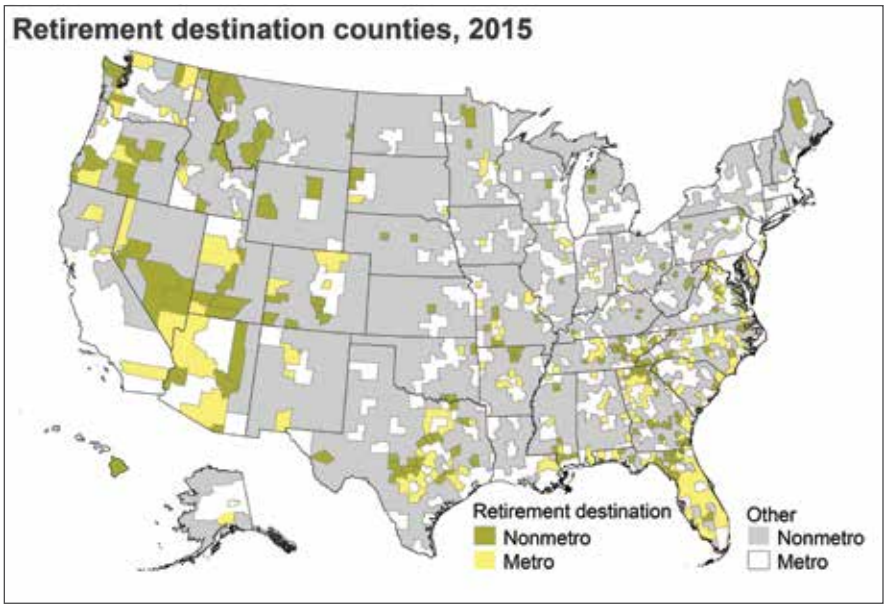
lag where local work force education levels are low. Smaller plants are more likely to adopt new methods and practices in industrially diverse rural counties where there are more people in creative occupations.

"The footloose nature of much of rural manufacturing made it especially vulnerable to overseas competition. This has been especially marked in the apparel and textile industries." Manufacturing is the only major activity that is not totally dependent to some extent on a county's geology or climate.

Unlike agricultural counties and contrary to popular expectation, the population of manufacturing counties continues to grow, Overall, as with agricultural counties, the growth rate in nonrestriction states (1.03 percent) outpaces growth in restriction states (0.92 percent) despite the fact that the restriction states' manufacturing counties have slightly greater populations. The difference is barely statistically significant, however, and may disappear entirely after taking into account premises density per road mile. Broadband Communities is slowly collecting density data, and our small sample so far suggests this may be the case.

One might expect rural manufacturing counties to support more metro areas, but this is not the case. Rural manufacturing is scattered both because it is not land-dependent and because manufacturing plants often do not make the best neighbors. These plants tend to have good interstate highway access, pipeline access (many are in the chemical industry, which is driven in the United States by oil and natural gas) or rail connections. But they may be too small to build their own broadband connections to the global internet.




When we look at the bottom half of counties within their state ranking, restriction states have a smaller loss (-0.54 percent versus -0.45 percent) but again, their overall average population sizes are a bit lower, accounting for the difference. The bottom 10 percent of all counties in the restriction states lost 0.86 percent of their population, versus -0.54 percent in the nonrestriction states. But there are only 38 manufacturing counties in the bottom

| Retirement Counties | 2010 Population | 2013 Population | Population change | % Population change |
|---|---|---|---|---|
| In a restricted state (280) | 31,050,745 | 32,492,039 | 1,441,294 | 4.64% |
| In an open state (162) | 14,468,260 | 14,943,636 | 475,376 | 3.29% |
| | | | | |
| **Broadband access within-state rank** | | | | |
| Restricted, top half (158) | 25,939,320 | 27,267,991 | 1,328,671 | 5.12% |
| Restricted, bottom half (122) | 5,111,425 | 5,224,048 | 112,623 | 2.20% |
| Not restricted, top half (86) | 11,111,846 | 11,520,355 | 408,509 | 3.68% |
| Not restricted, bottom half (76) | 3,356,414 | 3,423,281 | 66,867 | 1.99% |
| | | | | |
| Restricted, top 10% (31) | 10,780,060 | 11,422,443 | 642,383 | 5.96% |
| Restricted, bottom 10% (24) | 568,350 | 564,842 | (3,508) | -0.62% |
| Not restricted, top 10% (16) | 3,560,651 | 3,698,003 | 137,352 | 3.86% |
| Not restricted, bottom 10% (9) | 252,186 | 258,485 | 6,299 | 2.50% |

10 percent in broadband access and a total of just over 6,000 people lost.

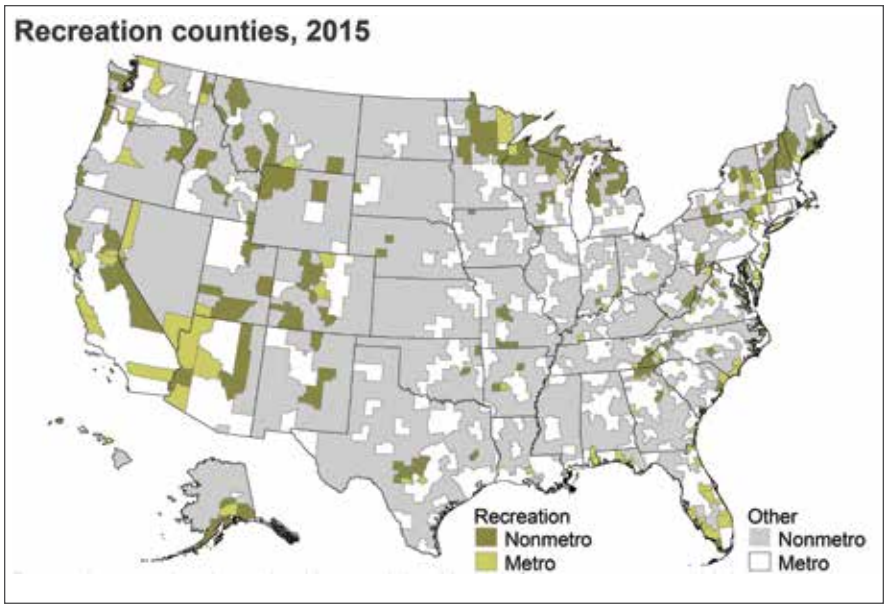
### Retirement

USDA defines the 442 "retirement destination counties" as those in which the number of residents age 60 and older grew by 15 percent or more between the 2000 and 2010 censuses due to net migration. Retirement communities are overwhelmingly in winter-warm states that restrict public broadband. The only retirement counties that are *not* growing are in restriction states and have particularly poorly ranked broadband access (-0.62 percent from 2010 through 2013 for restriction state counties versus 2.5 percent growth for nonrestriction). But there are only 23 retirement counties nationwide in the bottom 10 percent of state broadband access rankings, with a total population of just over 800,000.

Where private carriers can make a good economic case, great broadband leads to extraordinary growth rates. These counties are, by definition, fast growing and house about 45 million Americans – about one of every seven.

### Recreation

Counties that draw tourists are about evenly split between restriction and nonrestriction states. On average, these counties tend to have pretty good broadband. But those that don't (counties ranking in the lowest 10 percent) suffer far more if they are in states that restrict municipal broadband.




Recreation counties are classified based on a weighted average of jobs and earnings in entertainment, recreation, accommodations, eating and drinking establishments, and real estate as well as the share of all homes dedicated to seasonal or occasional use. There are 428 such counties with a total population greater than 30 million.

The three variables (employment, earnings, seasonal housing) were weighted, with 0.3 assigned to income and employment and 0.4 to seasonal housing. USDA says the reason for assigning a higher weight to seasonal housing is that employment and income may not reflect recreational activity because of the seasonality.

| Recreation Counties | 2010 Population | 2013 Population | Population change | % Population change |
|---|---|---|---|---|
| In a restricted state (231) | 14,917,089 | 15,457,630 | 540,541 | 3.62% |
| In an open state (197) | 15,840,824 | 16,120,221 | 279,397 | 1.76% |
| | | | | |
| **Broadband access within-state rank** | | | | |
| Restricted, top half (112) | 12,108,402 | 12,597,613 | 489,211 | 4.04% |
| Restricted, bottom half (119) | 2,808,687 | 2,860,017 | 51,330 | 1.83% |
| Not restricted, top half (67) | 9,304,658 | 9,525,512 | 220,854 | 2.37% |
| Not restricted, bottom half (130) | 6,536,166 | 6,594,709 | 58,543 | 0.90% |
| | | | | |
| Restricted, top 10% (7) | 5,054,809 | 5,297,011 | 242,202 | 4.79% |
| Restricted, bottom 10% (28) | 430,245 | 425,800 | (4,445) | -1.03% |
| Not restricted, top 10% (8) | 1,872,049 | 1,918,242 | 46,193 | 2.47% |
| Not restricted, bottom 10% (33) | 1,058,591 | 1,055,526 | (3,065) | -0.29% |

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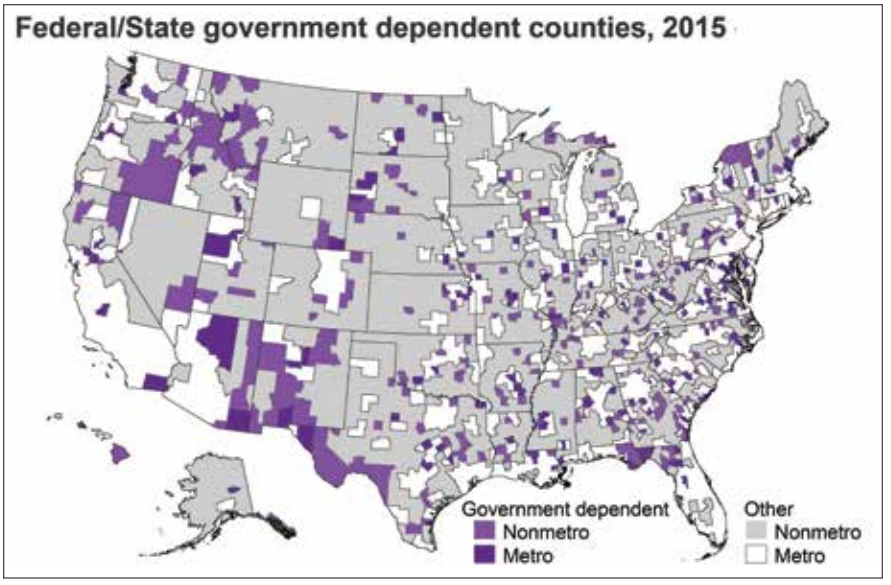
That judgment is, of course, somewhat arbitrary, but it has been baked into USDA studies since 2002.

Though they are rural, recreational counties are far more likely than other rural counties to have a small urban area of 50,000 or less. Those small towns, as already noted, are prime targets for broadband carriers. Recreation is often cited as a source of low-paying jobs, but the USDA notes that "counties specializing in recreation fare well on many measures of well-being, including wage levels and income. A central problem facing residents in these counties is the high cost of housing."

In general, these counties are growing well. They are growing faster in warm-weather states, and those states also happen to lean toward restricting public broadband. Lack of snow, in contrast, has closed more than half the ski areas in New England in the past two decades as the climate has warmed. Tourist attractions tend to be located in geographically restricted areas and historically have had fairly good broadband anyway.

I am exploring the hypothesis that areas with more seasonal employment have a worse business case for broadband. There is some anecdotal evidence to support this, but I hope to confirm it with a more rigorous statistical analysis.




## Government

To be considered government-dependent, 14 percent or more of the county's average annual labor and proprietors' earnings or 9 percent or more of the jobs must be derived from federal or state government, as measured by the Bureau of Economic Analysis in its local area and personnel income data from 2010 to 2012.

Rural counties (461 of them) dominated by government-supported activities follow the overall national pattern – counties with really bad broadband in restriction states experience population loss. But here, cause and effect may be muddled because restriction states were more likely to cut public employment and salaries during the recession. Another confounder is that there is a concentration of government-dominated counties around the Washington, D.C., area, and they tend

| Government Counties | 2010 Population | 2013 Population | Population change | % Population change |
|---|---|---|---|---|
| In a restricted state (225) | 15,180,226 | 15,604,517 | 424,291 | 2.80% |
| In an open state (236) | 22,418,610 | 22,920,293 | 501,683 | 2.24% |
| | | | | |
| **Broadband access within-state rank** | | | | |
| Restricted, top half (99) | 11,642,087 | 12,052,545 | 410,458 | 3.53% |
| Restricted, bottom half (126) | 3,538,139 | 3,551,972 | 13,833 | 0.39% |
| Not restricted, top half (122) | 17,562,001 | 18,014,372 | 452,371 | 2.58% |
| Not restricted, bottom half (113) | 4,254,886 | 4,259,472 | 4,586 | 0.11% |
| | | | | |
| Restricted, top 10% (20) | 3,128,608 | 3,228,023 | 99,415 | 3.18% |
| Restricted, bottom 10% (24) | 354,188 | 349,526 | (4,662) | -1.32% |
| Not restricted, top 10% (30) | 7,411,604 | 7,649,954 | 238,350 | 3.22% |
| Not restricted, bottom 10% (27) | 524,520 | 528,179 | 3,659 | 0.70% |

| Low-Employment Counties | 2010 Population | 2013 Population | Population change | % Population change |
|---|---|---|---|---|
| In a restricted state (485) | 19,471,765 | 19,416,268 | (55,497) | -0.29% |
| In an open state (421) | 14,490,585 | 14,502,782 | 12,197 | 0.08% |
| | | | | |
| **Broadband access within-state rank** | | | | |
| Restricted, top half (145) | 10,597,072 | 10,585,689 | (11,383) | -0.11% |
| Restricted, bottom half (340) | 8,874,693 | 8,830,579 | (44,114) | -0.50% |
| Not restricted, top half (142) | 7,082,731 | 7,113,425 | 30,694 | 0.43% |
| Not restricted, bottom half (279) | 7,407,854 | 7,389,357 | (18,497) | -0.25% |
| | | | | |
| Restricted, top 10% (10) | 4,175,741 | 4,145,912 | (29,829) | -0.71% |
| Restricted, bottom 10% (68) | 1,234,213 | 1,217,241 | (16,972) | -1.38% |
| Not restricted, top 10% (5) | 494,287 | 494,912 | 625 | 0.13% |
| Not restricted, bottom 10% (56) | 1,002,083 | 1,001,582 | (501) | -0.05% |

to be metro or near-metro – outside the orbit of a major city but considered rural because they have a population center no larger than 50,000. State capitals are all too large to be considered hubs of rural counties, so they are not included.

Government facilities tend to have broadband connections, so fewer than half of government-dominated counties are below average for broadband access overall within their states. Those below-average counties have a total population of less than 8 million, compared with more than 29 million for the above-average counties.

While it is not odd that counties with many state or federal employees have good broadband – after all, government takes care of itself – it may be considered counterintuitive that this pattern of good broadband is actually stronger in states that have been saying they are trying to cut government employment. People may leave, but the broadband still gets better.

### Low Employment and Persistent Poverty

Low-employment counties are those in which fewer than 65 percent of county residents age 25 to 64 were employed, as determined by the Census Bureau's American Community Survey five-year average for 2008 through 2012. These counties are overwhelmingly clustered in the Southeast and Southwest. There are 906 of them (the most counties of any category detailed in this study) with

| Persistent-Poverty Counties | 2010 Population | 2013 Population | Population change | % Population change |
|---|---|---|---|---|
| In a restricted state (156) | 9,213,728 | 9,352,174 | 138,446 | 1.50% |
| In an open state (197) | 8,788,133 | 8,907,322 | 119,189 | 1.36% |
| | | | | |
| **Broadband access within-state rank** | | | | |
| Restricted, top half (44) | 6,729,621 | 6,887,690 | 158,069 | 2.35% |
| Restricted, bottom half (112) | 2,484,107 | 2,464,484 | (19,623) | -0.79% |
| Not restricted, top half (62) | 3,926,131 | 3,981,879 | 55,748 | 1.42% |
| Not restricted, bottom half (134) | 2,357,302 | 2,333,294 | (24,008) | -1.02% |
| | | | | |
| Restricted, top 10% (5) | 2,785,071 | 2,821,801 | 36,730 | 1.32% |
| Restricted, bottom 10% (22) | 261,838 | 255,675 | (6,163) | -2.35% |
| Not restricted, top 10% (6) | 3,569,405 | 3,679,474 | 110,069 | 3.08% |
| Not restricted, bottom 10% (34) | 389,115 | 384,743 | (4,372) | -1.12% |

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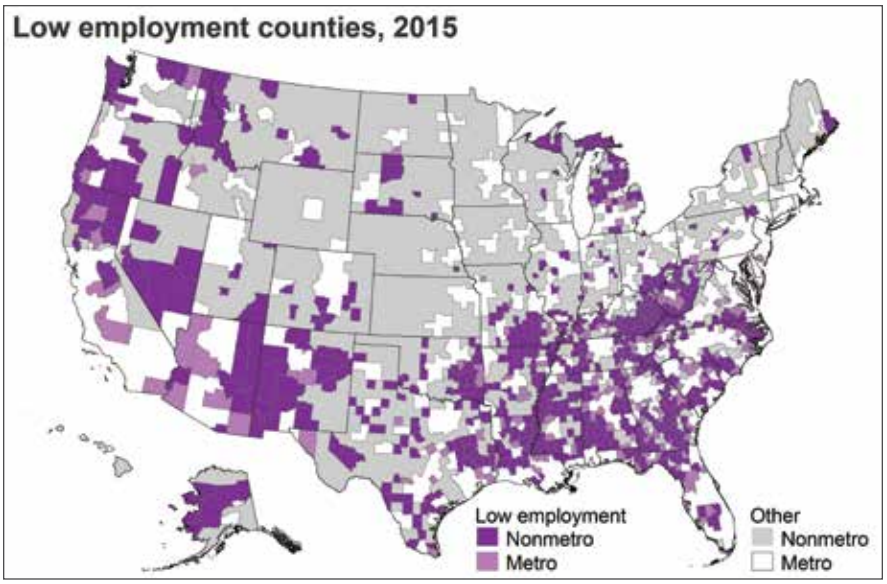



about 34 million people, one-tenth of the U.S. population.

Populations grew significantly faster or declined more slowly in states that did not restrict public or quasi-public broadband, all through the recession (0.29 percent loss among restriction states and 0.08 percent gain in nonrestriction states.)

The bottom 10 percent of counties in their within-state rankings in nonrestriction states stayed even (0.05 percent loss) while similar counties in restriction states lost 1.38 percent of their population from 2010 through the end of 2013.

Counties that display persistent poverty show the same pattern, but the data collection is less robust. The poverty data lag the employment data by several years.

### Mining

Mining counties are the only segment in which the pattern did not hold. The enormous economic and technological forces at work in this sector dwarf any state policies. Canada, more reliant on mining than is the United States, has suffered even more as raw materials prices have fallen.

To be considered a mining area, 13 percent or more of the county's average annual labor and proprietors' earnings had to be derived from extractive industries – coal, oil, minerals. Counties also met the bar if 8 percent of more of the jobs were in or directly related to these fields, as measured from 2010 through 2012 in the Bureau of Economic Analysis local area personal income and employment survey. Few

## CONFOUNDERS

**Chicken-and-egg problem:** Does population decline in part because of poor broadband, or is poor broadband the result of lousy business cases due to population decline? Or do both result from some other influences, unknown or unexplored?

**States have very different ways of dividing themselves into counties.** Texas alone has almost 10 percent of all U.S. counties.

**States vary in other ways.** States have different population densities, distributions and temporary economic advantages (new oil discoveries, retiree attraction, and so forth). States that restrict municipal broadband have different kinds of restrictions enacted at different times. Later analyses will incorporate some of these differences.

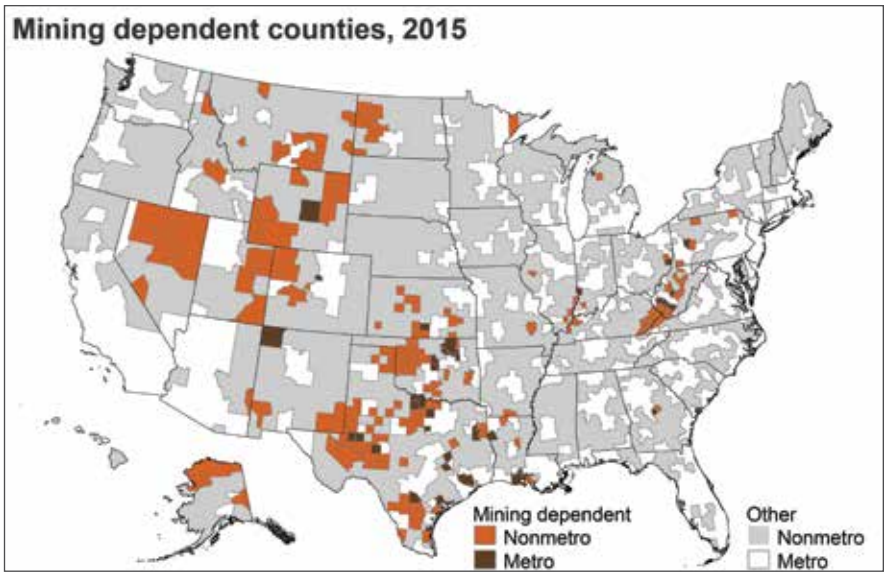
**Counties that have very small populations** can move the needle with just one new business or housing development.

**Moves are not always intrastate.** People tend to migrate for work as short a distance as possible, but they could move to a nearby state, softening the link between rural decline and urban growth within a given state.

**25 Mbps** is the FCC's new threshold for broadband, but that level is somewhat arbitrary.

**Variance on x-axis.** National Broadband Map data are flaky and tend to overestimate actual access.

**Take-rate variance.** Even in counties with great 25 Mbps access, only 22 percent of households with supposed access buy it. However, this is up from 17 percent six months earlier.




All Maps Courtesy USDA

have metro areas, and most of those metro counties are in Texas, which has more than 250 counties in total. Most rural mining counties are west of the Mississippi River. They account for about 11 million people.

There is significant mining (especially oil and gas extraction) in major cities as well, but few of these cities outside Texas and Oklahoma meet the percentage criteria.

| Mining Counties | 2010 Population | 2013 Population | Population change | % Population change |
|---|---|---|---|---|
| In a restricted state (124) | 7,094,357 | 7,401,512 | 307,155 | 4.33% |
| In an open state (132) | 3,826,302 | 3,906,269 | 79,967 | 2.09% |
| | | | | |
| **Broadband access within-state rank** | | | | |
| Restricted, top half (48) | 5,914,083 | 6,205,245 | 291,162 | 4.92% |
| Restricted, bottom half (61) | 1,103,752 | 1,120,240 | 16,488 | 1.49% |
| Not restricted, top half (50) | 2,021,801 | 2,076,633 | 54,832 | 2.71% |
| Not restricted, bottom half (65) | 931,410 | 933,772 | 2,362 | 0.25% |
| | | | | |
| Restricted, top 10% (9) | 4,695,883 | 4,971,328 | 275,445 | 5.87% |
| Restricted, bottom 10% (18) | 79,650 | 79,325 | (325) | -0.41% |
| Not restricted, top 10% (8) | 1,560,691 | 1,626,323 | 65,632 | 4.21% |
| Not restricted, bottom 10% (15) | 137,079 | 136,226 | (853) | -0.62% |