BEYOND RURAL WALLS:

IDENTIFYING IMPACTS AND INTERDEPENDENCIES AMONG RURAL AND URBAN SPACES

A Survey of Literature

October 2015

Joshua Seidemann
Vice President of Policy
NTCA–The Rural Broadband Association

NTCA THE RURAL BROADBAND ASSOCIATION®

4121 Wilson Blvd, Suite 1000
Arlington, VA 22203
703-351-2000
www.ntca.org

BEYOND RURAL WALLS:

IDENTIFYING IMPACTS AND INTERDEPENDENCIES AMONG RURAL AND URBAN SPACES

A Survey of Literature

October 2015

Joshua Seidemann
Vice President of Policy
NTCA–The Rural Broadband Association

ABSTRACT

This survey of literature explores (a) the economic benefits of broadband deployment and usage, and (b) rural and urban interdependencies. This paper proposes that those two factors, taken together, support the proposition that when rural broadband policy incorporates an analysis of the impact of rural broadband deployment on urban areas, rural broadband deployment is revealed as an issue of national concern, rather than solely rural concern.

CONTENTS

I. INTRODUCTION

Combined federal and state policies have enabled a 96.3% telephone penetration rate in the United States.[1] This accomplishment is particularly impressive because the data includes rural areas, in which the intensive capital costs of communications networks are compounded by the geographic distance over which facilities must be deployed; often challenging terrain characteristics; and the relatively small number of users (as compared with more densely populated urban areas) from whom related costs can be recovered. Accordingly, the provision of communications services in rural areas has inherent per-user costs that are higher than those encountered in urban areas. Rural areas comprise, depending upon various federal government definitions, 84% to 97.5% of the landmass of the United States.[2]

To compensate for higher costs, the deployment and ongoing operation of communications networks in rural areas rely, in many instances, upon a combination of user fees paid by subscribers, privately sourced capital and revenues derived from government-administered support programs. The latter may include (a) user-funded programs, including the federal Universal Service Fund (USF); (b) loan opportunities administered by the United States Department of Agriculture (USDA) under the aegis of the Rural Utilities Service (RUS); and (c) periodic grant programs administered by the RUS and the National Telecommunications Information Administration (an office within the U.S. Department of Commerce). Collectively, these and other federal administered programs (which are in many instances complemented by state-level programs) are consistent with long-standing national policy to ensure that everyone in the United States has access to communications services. The Communications Act of 1934, as amended (the Act), requires that users in rural and insular parts of the nation have access to services that are reasonably comparable to those that are available in urban areas, and at reasonably comparable rates.[3] In a comprehensive analysis, the Federal Communications Commission (FCC) estimated that various government programs could be relied upon to meet

[1] *Universal Service Monitoring Report*, Docket Nos. 96-45, 02-6, 02-60, 06-122, 10-90, 11-42, 13-184, 14-58, Federal Communications Commission (Data Received Through September 2014) at 47, Table 6.2 (https://apps.fcc.gov/edocs_public/attachmatch/DOC-330829A1.pdf) (last viewed Oct. 8, 2015, 09:13) (2014) (FCC Monitoring Report).

[2] Reynells, Louise, and John, Patricia LaCaillle. "What is Rural?," Rural Information Center, National Agricultural Library, U.S. Department of Agriculture, Beltsville, MD (2008) (http://www.nal.usda.gov/ric/ricpubs/what_is_rural.shtml#intro) (last viewed Oct. 13, 2015, 11:39).

[3] 47 U.S.C. § 151, *et seq*., 47 U.S.C. § 254(b)(3).

approximately $17 billion of a projected $24 billion cost to close a national broadband availability gap.[4]

These costs have driven debates concerning government policies relating to the deployment of broadband in rural areas, and have attracted studied attention from numerous interests. Many are captured in a long-running FCC examination of measures intended to enable broadband-capable network deployment and delivery of advanced voice and broadband services in rural areas.[5] This article will not focus on specific policies or proposals. Rather, this paper will present a survey of literature to propose that rural and urban economic interdependencies provide at least one context in which the issue may be considered. This article reports that the availability and ongoing use of rural communications networks generates quantifiable benefits to both rural and urban areas, as well as intangible benefits arising from the network effects of connected users. This article therefore proposes that rural broadband policy is, in fact, national broadband policy.

II. IMPACTS OF BROADBAND DEPLOYMENT AND USAGE

A. COMBINING NETWORK VALUE WITH DISTANCE-CONQUERING TECHNOLOGY

The FCC's 2009 opus "Connecting America: The National Broadband Plan" described positive economic impacts of broadband. Congress directed the FCC to develop the National Broadband Plan in order to ensure that every American has "access to broadband capability."[6] The Plan explored deployment and broadband use in urban and rural areas and addressed related issues such as education, health care, public safety and civic engagement; the Plan provided impetus for the FCC's active dockets re-examining rural broadband policy.[7] As the FCC commenced that docketed proceeding, it emphasized the benefits that broadband brings to rural areas:

> Ubiquitous broadband infrastructure has become crucial to our nation's economic development and civic life. Businesses need broadband to start and grow; adults need broadband to find jobs; children need broadband to learn. As important as these benefits are in America's cities—where more than two-thirds of residents

[4] *Connecting America: The National Broadband Plan*, Federal Communications Commission, at Section 8.2 (2010) (National Broadband Plan, or Plan).

[5] These efforts are captured chiefly in the Connect America Fund proceeding, FCC Docket No. 10-90.

[6] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5 § 6001(k)(2)(D), 123 Stat. 115, 516 (2009) (ARRA).

[7] *See*, note 5, *supra.*

> have come to rely on broadband—the distance-conquering benefits of broadband can be even more important in America's more remote small towns, rural and insular areas, and Tribal lands.[8]

The FCC's specific mention of the "distance conquering" aspect of broadband implicates a significant aspect of broadband, specifically, its "network value." Network value refers to the proposition that the value of a network tends to increase as more users are connected to it. Also known as "Metcalfe's law," the theorem states that the value of a telecommunications network grows with the square of the number of connected users.[9] This proposition can be illustrated by the historical development of interconnected computer networks:

> The first generation of computers consisted of expensive mainframes tended to by a specialized cadre of computer technicians. … Mass market computers only emerged in the 1980s with the spread of personal computers (PCs) for use by non-ICT [Information and Communications Technology] specialists and new business productivity applications like electronic spreadsheets.
>
> It quickly became apparent to users that PCs were more useful if networked so that they could share and access data located on other machines. Local area networks (LANs) and wider-area data communications services to tie these networks together were deployed widely across businesses in the latter half of the 1980s. As PC use spread, increasing numbers of professionals could take advantage of data communication services such as electronic mail over the "Internet"—the first mass market data communication network.[10]

Network value-oriented policies historically supported ubiquitous telephone deployment, and can be applied to support current increased national broadband deployment. Commercial network benefits of broadband can manifest in the ability of firms to access broader supplier networks, larger customer bases and rapid access to information; all should tend to increase a firm's activities and, consequently, revenues. In addition to commerce, benefits have been identified in the realms of education, health and social interactions.[11] An example of positive outcomes is

---

[8] *Connect America Fund; A National Broadband Plan for Our Future; Establishing Just and Reasonable Rates for Local Exchange Carriers; High-Cost Universal Service Support; Developing a Unified Intercarrier Compensation Regime; Federal-State Joint Board on Universal Service; Lifeline and Link-Up: Notice of Proposed Rulemaking and Further Notice of Proposed Rulemaking*, Docket Nos. 10-90, 09-51, 07-135, 05-337, 01-92, 03-109, Federal Communications Commission, 26 FCC Rcd 93, FCC 11-13, at para. 3 (2011) (Connect America Fund NPRM) (internal citations omitted).

[9] Newton, Harry. Newton's Telecom Dictionary, CMP Books (19th Edition, San Francisco 2003).

[10] Crandall, Robert, Lehr, William, Litan, Robert. "The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data," Issues in Economic Policy, Brookings Institution, at 3 (2007) (Crandall, et al.).

[11] National Broadband Plan, Part III.

evidenced in a report that "documented annual community-level savings of nearly $500,000 to rural communities who participated in telemedicine."[12] These types of benefits would remain unrealized, however, without a robust interconnected network upon which devices and users can communicate.

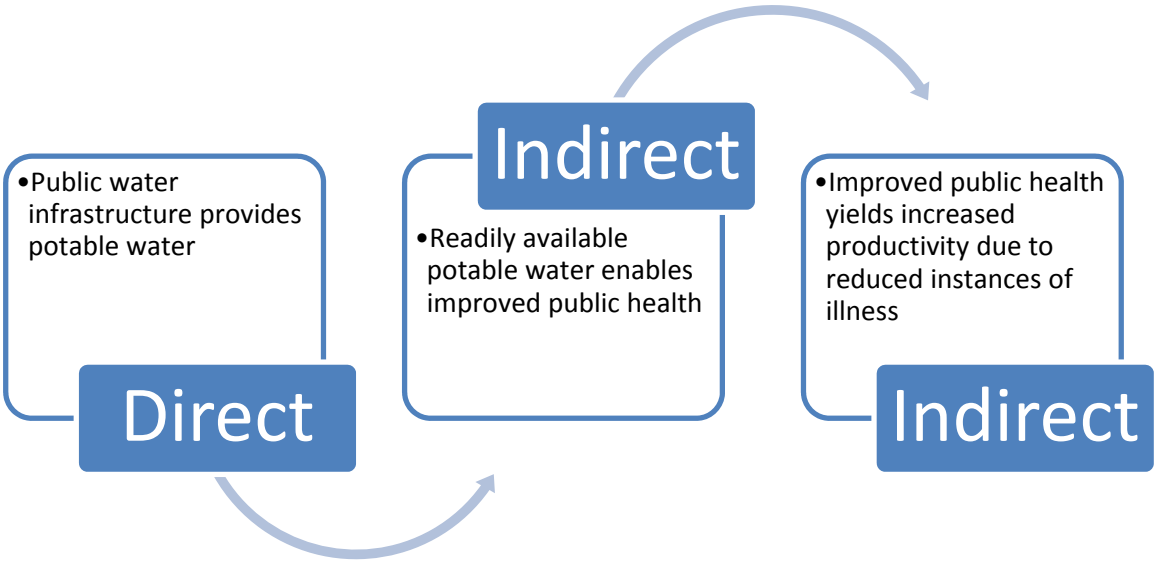
B. DIRECT AND INDIRECT BENEFITS OF INFRASTRUCTURE INVESTMENT

Benefits are not limited to broadband users. Rather, broadband deployment fosters both direct and indirect impacts. "Direct impacts" are enjoyed by those who use broadband, while the "indirect impacts" accrue to those who benefit tangentially from that usage. For example, the direct benefits of a municipal water system may include "potable water (necessary for life) and business (necessary as a factor in production)," while indirect benefits may be fire protection enabled by water delivery infrastructure close to populated areas.[13] Similarly, the direct benefit of a surface transportation system may be commercial opportunities that arise as access to routes become available, while an indirect impact may be the "spin-off" benefits that accrue when worker wages

[12] Dickes, Lori A., Lamie, R. David, Whitacre, Brian E. "The Struggle for Broadband in Rural America," Choices, Agricultural and Applied Economics Association (http://www.choicesmagazine.org/magazine/print.php?article=156 (last viewed Oct. 13, 2015, 11:38)) (2009) *citing* Whitacre, B. and Hartman, P., Boggs, S., and Schott, V. "A Community Perspective on Quantifying the Economic Impact of Teleradiology and Telepsychiatry," Journal of Rural Health, 25(2) at 194–197.

[13] Krop, Richard A., Hernick, Charles, and Frantz, Christopher. "Local Government Investment in Municipal Water and Sewer Infrastructure: Adding Value to the National Economy," U.S. Conference of Mayors, Mayors Water Council, at 11, 12 (Washington, DC, 2008).

generated by those commercial enterprises flow into local and regional economies. A view of direct and indirect benefits may be illustrated as follows:[14]



This analysis is corroborated by findings that "in the long-run, public infrastructure investment is positively correlated with input demands and output supply."[15] Discussions of "public infrastructure" tend to look at access to "roads, water, sewer, communications technologies and electricity," and as "essential to the economy."[16] Even if broadband is not a *per se* public utility, its increasing value for commerce, education, health care and public safety and convenience argue for policies to support widespread deployment.

The suggested benefits of public infrastructure investment, however, may be limited in some instances; this is relevant to the instant discussion because, as noted above, rural broadband networks typically cannot be supported solely by end-user revenues, and therefore require some support that is drawn, in part, from nonrural resources. Accordingly, when considering the use of nonrural resources to support rural broadband deployment, the distant impacts of local deployments should be considered.

---

[14] *See*, Krop, et al. at 12.

[15] Krop, et al. at 7, *citing* Demetriades, Pancios O. and Mamuneas, Theofanis P. "Intermodal Output and Employment Effects of Public Infrastructure Capital: Evidence from 12 OECD Economies," *The Economic Journal* 110 no. 465, 687-712 (July 2000).

[16] Krop, et al. at 5 (internal citations omitted).

When discussing utilities, generally, one view proposes that where benefits of the investment are "localized," no benefits to the national economy accrue.[17] For example, a water or power utility generally focuses on providing service within its region only. Although secondary benefits may accrue outside that region, the primary beneficiary is the local water or power user. This perspective, however, does not comport to the deployment and use of broadband facilities. Although the infrastructure may be local, its impact is far-reaching.

C. IMPACTS OF BROADBAND INVESTMENT AND USE

Broadband connectivity enables local users to import and export information. The beneficiaries are not only the local users who can *import* information, but also distant users who can direct information to the local user, and who can likewise *obtain* information from the local user. This "outward looking" nature of broadband comports to the FCC's observation that broadband is "distance-conquering."[18] The benefits of investment in local broadband infrastructure, therefore, are imported and exported when distantly placed users connect to local users. This is consistent with the observation that "for remote rural communities, isolation has been reduced by the Internet and attendant increased access to goods, services and markets."[19]

These outcomes are consistent with network value principles, or Metcalfe's law, and can be illustrated again by the history of information and communications technology (ICT) and the proliferation of networked PCs, noted above. ICT has been described as "a *general purpose technology* that is used by businesses in many ways to produce many different types of intermediate and final goods and services."[20] It has also been noted, "The emergence of ICT-powered enhanced health care, telecommuting and realization of economic growth benefits in

---

[17] Krop, et al. at 13 *citing* Young, Robert A. "Determining the Economic Value of Water: Concepts and Methods," Resources for the Future, Washington, DC (2005).

[18] Connect America NPRM at para 3.

[19] Dabson, Brian. "Rural-Urban Interdependence: Why Metropolitan and Rural America Need Each Other," Blueprint for American Prosperity, Metropolitan Policy Program at Brookings (Nov. 2007) (Dabson), *citing* Atkinson, Robert D, "Reversing Rural America's Economic Decline: The Case for a National Balanced Growth Strategy," Progressive Policy Institute (Washington) (2004).

[20] Crandall, et al. (emphasis in original), *citing* Bresnahan, Timothy, and Trajtenberg, Manuel, "General Purpose Technologies: Engines of Growth," *Journal of Econometrics*, 65 (Special Issue), 83–108 (Jan. 1995).

communities in rural areas (the 'death of distance') depend on the widespread deployment of broadband services."[21] As noted above, those benefits are not limited to the users, as the direct end-user benefits are complemented by indirect positive impacts that accrue to the broadband provider and then beyond, including employment gains both within and outside of the communications industry arising out of capital investments by communications firms.[22] Accordingly, the "network benefits" of broadband can also be defined to include positive economic impacts.

The positive economic impacts of investment in broadband deployment have been quantified in several studies. One study found "for every one percentage point increase in broadband penetration in a state, employment is projected to increase 0.2 to 0.3% per year."[23] The impact of broadband, however, may vary among different industry sectors: The study reported that broadband impact is expected to be more important for "finance, real estate and miscellaneous business services," and less important for mining, construction or manufacturing. Nevertheless, the same study acknowledged "surpris[e]" that "even manufacturing employment appears to be related to broadband deployment."[24] Consistent with the previous discussion of direct and indirect impacts, it is important to note that the benefit of broadband exists beyond commercial or industrial gains. Consumer-oriented benefits include health care, education and other activities that are made available or improved by broadband. A USDA report exploring telemedicine and telehealth,[25] distance education, service sectors and business usages found beneficial impacts in all categories. The study concluded that "[w]age and salary jobs, as well as the number of proprietors, grew faster in counties with early broadband Internet access."[26] Another study found that broadband adoption can be linked to increases in several factors of economic prosperity. In

[21] Crandall, et al. at 6.

[22] Beard, T. Randolph, Ford, George S., and Hyeongwoo, Kim. "Jobs, Jobs, Jobs: Communications Policy and Employment Effects in the Information Sector," Phoenix Center Policy Bulletin No. 25, at 4 (Washington) (2010).

[23] Crandall, et al. at 2.

[24] Crandall, et al. at 9, 12.

[25] "Telemedicine" refers to diagnoses and treatments made and conducted via communications networks; "telehealth" refers to health maintenance enabled over distance by communications networks.

[26] Sternberg, Peter, Moreheart, Mitchell, Vogel, Stephen, Cromartie, John, Breneman, Vince, and Brown, Dennis. "Broadband Internet's Value for Rural America," United States Department of Agriculture, Economic Research Institute, Economic Research Report No. 78, at 21 (Aug. 2009).

that study, counties with similar characteristics in education, income, age and race were compared with similar counties whose defining difference a decade later (late 1990s to 2010) was successful broadband adoption. The latter group "experienced higher growth in median household income levels, number of firms and total employment."[27]

Against this backdrop of generally determined economic benefits, we return to the questions of whether broadband investment in rural America, specifically, yields beneficial results, and to whom those benefits accrue. In an April 2011 report, the Center for Rural Strategies concluded that "while broadband will not bring immediate transformation to rural America, regions that lack broadband will be crippled."[28] In that discussion, a panelist observed, "Businesses that depend on information technology largely avoid being in areas where they cannot get what they need."[29] A second participant concurred: "As broadband becomes essential infrastructure, it will be taken for granted as a baseline service. Its absence may be associated with a loss of jobs, but its presence may not create jobs."[30] These observations could be read to suggest that the spinoff economic benefits of broadband deployment are more easily linked to the preservation and support of rural economies than igniting economic growth in a vacuum of inactivity. If, however, broadband is viewed as *growth-enabling* (*e.g.,* "a *general purpose technology* that is used by businesses in many ways to produce many different types of intermediate and final goods and services"), then the debate is not about (a) decline vs. *status quo,* but rather (b) whether rural broadband deployment offers a foundation for growth as the alternative to the *status quo*, which may (as discussed more fully below) waver between static and decline. In this respect, positive impacts that correlate to rural broadband deployment can be viewed as enabling increased benefits, while impacts arising from foregone deployment may be viewed as negative where there is an expectation for decline. Finally, as noted above, qualitative societal benefits, including more capable public safety communications resources for security and emergency response

---

[27] Whitacre, Brian, Gallardo, Roberto, Strover, Sharon, "Broadband's Contribution to Economic Health in Rural Areas: A Causal Analysis and an Assessment of the Connected Nation Program," *selected paper prepared for presentation at the Telecommunications Policy Research Conference, Arlington, VA, Sep. 27-29, 2013,* at 11 (http://agecon.okstate.edu/faculty/publications/4578.pdf) (last viewed Oct. 7, 2015, 18:41) (2013).

[28] Scholars Roundtable: The Effects of Expanding Broadband to Rural Areas," Center for Rural Strategies, at 3 (Apr. 2011) (http://www.ruralstrategies.org/sites/all/files/Broadband_Investment.pdf) (last viewed Oct. 13, 2015, 11:36) (Center for Rural Strategies).

[29] Center for Rural Strategies at 8.

[30] Center for Rural Strategies at 11.

capabilities; civic engagement; and enhanced communications capabilities that can benefit regional coordination and development, exist beyond the quantifiable benefits.[31] These, too, should be considered in the discussion.

III. RURAL AND URBAN INTERDEPENDENCIES

The preceding section describes the direct and indirect positive impacts of broadband availability. However, can those impacts be understood to discern whether rural broadband deployment locally generates positive impacts in distant areas? By way of example, the deployment of a rural broadband network generally accrues quantifiable economic benefits to outside urban regions because rural areas often do not produce many of the inputs necessary for broadband infrastructure development. Accordingly, a firm's initial deployment and even ongoing operation of broadband infrastructure requires purchasing and other economic activity outside of the rural provider's service area, introducing economic benefits to regional and national economies.[32] Consideration of these sorts of rural/urban economic interdependencies becomes part of rural broadband policy formation, since a decision on rural investment can be informed more fully by identifying "feedback effects" on urban economies.[33]

Evaluation of anticipated positive impacts begins with the assumption that investment decisions are premised on anticipated returns. Those returns either can be measurable (monetary or production) or intangible (societal benefits). These sort of evaluations rely on understanding the markets in which the relevant factors are generated. Where interdependent economies are implicated, consideration would arguably extend to all implicated markets. Therefore, when considering capital-intensive broadband deployment, the review should not be confined to anticipated impacts in the rural areas that are geographically proximate to the deployment, but rather should contemplate the broader relationships between rural and urban areas.

---

[31] An exposition of these benefits (as well as the opportunity costs of unavailability) relating to household life, including health and telecommuting; businesses and institutions; agriculture; and the service sector is offered in, Kuttner, Hanns, "Broadband for Rural America: Economic Impacts and Economic Opportunities," Hudson Institute (Washington) (2012).

[32] Kuttner, Hanns. "The Economic Impact of Rural Telecommunications: The Greater Gains," Hudson Institute, at 9 (Washington) (2011).

[33] *See*, Holland, David, Lewin, Paul, Sorte, Bruce, and Weber, Bruce, "How Economically Interdependent Is the Portland Metro Core With Its Rural Periphery? A Comparison Across Two Decades," Rural Studies Working Paper Series, Oregon State University, at 3 (Feb. 2009).

A. DEFINING RURAL

At the outset of this discussion, it is useful to define, if even only generally, "rural." Notably, "rural" is not a consistently defined term, and even various offices of the U.S. government rely upon different definitions. The U.S. Census Bureau defines "rural" as any area that is not "urban:" an urban area is one with (a) an "urbanized area" with at least 50,000 people, or (b) an "urban cluster of at least 2,500 and fewer than 50,000 people.[34] In comparison, the Economic Research Service (ERS) of the USDA invokes population thresholds, but also considers whether "outlying counties" are "economically tied to the core counties as measured by labor-force commuting," among other criteria.[35] In contrast, the U.S. Office of Management and Budget (OMB) utilizes a separate set of definitions for urbanized areas that revolve around Metropolitan Statistical Areas and Micropolitan Statistical Areas. Like the USDA approach, OMB considers economic ties, such as those evidenced by commuting workers, between places. OMB notes, however, that its classifications "do not equate to an urban-rural classification."[36] Nevertheless, the trends defined by OMB classifications are observed, and may be reported out in a manner that invites even rough comparisons to the rural/urban issue. The Housing Assistance Council suggests that OMB classifications may be a less useful "proxy for rural territory" than they were when first introduced. Housing Assistance Council proposes, "[w]hile there is no perfect definition of 'rural,' policy makers, practitioners, and data consumers should be aware of important factors and complexities of determining residences to better describe and assist rural

[34] United States Census Bureau website, "Urban and Rural Classification" (https://www.census.gov/geo/reference/urban-rural.html) (last viewed Oct. 7, 2015, 17:41) (Census Bureau).

[35] United States Department of Agriculture, Economic Research Services website, "What Is Rural?" (http://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural.aspx) (last viewed Oct. 13, 2015, 11:41) (ERS 2015).

[36] United States Office of Management and Budget, Bulletin No. 13-01, "Revised Delineations of Metropolitan Statistical Areas, Micropolitan Statistical Areas, and Combined Statistical Areas, and Guidance on Uses of the Delineations of These Areas," at 3 (Feb. 28, 2013) (https://www.whitehouse.gov/sites/default/files/omb/bulletins/2013/b-13-01.pdf) (last viewed Oct. 7, 2015, 17:18) (OMB Bulletin).

people."[37] ERS captures this sentiment concisely: "[T]he existence of multiple rural definitions reflects the reality that rural and urban are multidimensional concepts."[38]

In sum, a universally applicable definition of "rural" is not available. And, while any office's definition may affect the contours of programs beneath the aegis of that agency, the ultimate outcomes of rural broadband policy as formulated by elected officials and appointees may likely rely less on formal *definitions* of rural than on *perceptions* of rural. In that regard, an understanding of "rural" would contemplate not only the size, but also the dynamic nature of rural areas.

B. RURAL/URBAN RELATIONSHIPS

1. Historic Relationships

A report on a 2005 Aspen Institute gathering cited by Dabson (*supra* note 19) notes that rural and urban areas are

> . . . changing rapidly and are increasingly differentiated. Most insidious of all, the old assumptions imply there are no similarities between rural and urban communities around which common cause can be built. They imply that there are no interdependencies when, in fact, the fate of each place depends largely on what is happening outside its boundaries.[39]

This viewpoint is corroborated in an examination of rural/urban interdependencies in Ohio:

> Much of our discussion will focus on the dependence of remote rural, exurban, and suburban communities on urban areas, including the core principal cities. Yet, our description would be incomplete without recognizing that the interdependence also goes the other way. Urban communities depend upon exurban and rural areas for a host of needs including a rural labor force, food, natural resources, environmental quality, recreation, tourism, markets for their products, and, in some cases, urban residents' employment in rural and exurban

[37] "OMB Reclassification Reduces Outside Metropolitan Area Population by 1.5%," Rural Policy Brief, Housing Assistance Council, at 2 (May 2013) (http://www.ruralhome.org/storage/documents/rrbriefs/rpb_omb_outside_metro.pdf) (last viewed Oct. 7, 2015, 17:36) (Housing Assistance Council 2013).

[38] United States Department of Agriculture, Economic Research Services website, "What Is Rural," (http://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural.aspx) (last viewed Oct. 7, 2015, 17:07).

[39] Kubisch, Anne C., Topolsky, Janet, Gray, Jason, Pennekamp, Peter, Guitierrez, Mario. "Our Shared Fate – Bridging the Rural-Urban Divide Creates New Opportunities for Prosperity and Equity," at 7, Aspen Institute (Washington) (2008).

> communities. Indeed, the point of our assessment is that separating urban from rural is often pointless as healthy and prosperous rural and urban communities rely on the strength of their neighbors to succeed.[40]

The interdependency and ensuing benefits accruing from rural network availability to urban areas extend beyond the economic activity associated with deployment of such networks in the first instance. As rural and urban relationships are explored, it is useful to notice historic trends that provide context to current interactions. The relationship between rural and urban America has been characterized by one scholar as reflective of evolving "social contracts." Within this viewpoint, a "Frontier" social contract prevailed from the end of the American Revolution until the end of the 19th century; this social contract encouraged government-sponsored exploration and settlement of new lands. Toward the end of the 19th century, the Industrial Revolution consolidated workers in urban areas, transforming rural areas into commodity producers and heralding the dawn of the "Storehouse" contract. During that era, funding for transportation, telephone and electric systems were combined with programs designed to exploit agricultural and natural resources for national benefit.[41]

The positive impacts of rural America on the rest of the nation, including rural America's contributions of food, energy, workforce, stewardship of natural resources and "experiences" (the latter referring generally to recreational or educational activities), have been noted in consistent manner when addressing rural and urban interdependencies.[42] And, broadband itself is gaining a progressively larger role in agriculture through the use of "smart ag" technologies, which utilize broadband-enabled devices and applications to increase efficiencies in planting, fertilization, irrigation and harvests; these include reductions in the use (and consequently, the cost of) seed,

[40] Partridge, Mark D., Clark, Jill. "Our Joint Future: Rural-Urban Interdependence in 21st Century Ohio," DRAFT prepared for the Brookings Institution, at 5 (2008) (http://www.greaterohio.org/files/policy-research/partridge-report.pdf (last viewed Oct. 13, 2015, 11:35)) (Partridge, et al.).

[41] Stauber, Karl. "Why Invest in Rural America—and How? A Critical Public Policy Question for the 21st Century," Economic Review, Second Quarter 2001, Federal Reserve Bank of Kansas City, at 39, 40 (2001).

[42] Dabson at 11, 12.

fertilizer and pesticides.[43] (Representative information about the role of agriculture in the national and state economies is provided in Appendix A.)

At the same time, metropolitan areas provide benefits to rural areas through markets, jobs, specialized services and technology-oriented resources that are developed in urban areas.[44] Others note, "[i]t is very difficult to disentangle the causal forces of growth *within* an economic region or metropolitan area. The economic forces that affect a metropolitan area could originate across the entire metropolitan region, or from the principal city, or from the surrounding suburbs (or some combination of the three)."[45] Despite the potential difficulties involved in identifying sources and impacts, quantification of the impacts can be achieved. One study concludes, "[t]he economic dependence of urban Minnesota on rural Minnesota is real, measurable, and significant;" the study also notes that it explored only the impact of rural to urban flows, and that urban-originating outputs should be examined, as well, in order to better understand urban/rural codependence.[46] And, as described in Section IV below, several studies quantifying impacts of the rural communications industry on distant economies have been completed. There exists, therefore, sound basis to quantify positive urban impacts arising out of rural broadband investment.

2. Demographic Trends and Effects

These relationships and impacts can moreover be considered within the context of dynamic forces that continually reform urban and rural relationships across the decades. As borne out by the evolution of social contracts, the relationship remains somewhat constant, though the contours of the interactions change with time. One report warns,

> . . . it has been a long time since rural America was the low-cost producer of food, fiber, raw materials, or cheap labor. As the last few decades have

[43] *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act: Comments of Deere & Company*, Docket No. 15-191 (2015). *See, also,* "Smart Agriculture and the Role of Broadband," Foundation for Rural Service, Washington (2012).

[44] Dabson at 12, 13.

[45] Partridge, et al. at 18, 19 (emphasis in original).

[46] Searls, Kate. "Pilot Study: Estimating Rural and Urban Minnesota's Interdependencies," Minnesota Rural Partners, Inc., at 48 (2011).

> demonstrated, leaving rural America to a low-cost strategy means, for most people and communities, leaving rural America.[47]

As rural/urban relationships inform rural broadband policy, understanding "rural" should derive from more than the population-based thresholds and instead incorporate a more expansive view, similar to the broader view taken by ERS, which considers the economic relationships between discrete rural and urban areas. Likewise, other defining characteristics should be considered. One study compiles two sets of qualitative approaches.[48] One set proposes that "there is no one rural America; there are several," and categorizes them as "urban periphery" ("within a 90-minute commute" of urban employment and services); "sparsely populated" ("low and often declining" population with diminished demand for services and employment); "high amenity" (rural areas with significant natural and cultural attractions for wealthy and retired people); "high poverty" (areas with "persistent poverty or rapid declines in income").[49] The other set identifies three types of rural areas: "amenity rich" (populated by retiring Baby Boomers and "footloose professionals"); "declining resource-dependent" areas that can no longer depend on natural resources or manufacturing to support a blue collar middle class; and "chronically poor" communities.[50] A separate inquiry offers a third approach, dividing counties into 12 "community types," including "Tractor Counties" and "Evangelical Epicenters" (which fare differently than "Empty Nest" and "Immigration Nation" counties).[51] Reliance on even the first two approaches can increase rural populations from, when comparing two values, 60 million to 90 million, creating "obvious implications for the political power of rural versus urban regions. . . ."[52]

The respective (and potentially competing) political powers among rural and urban regions have an impact on policies that affect rural America, including those that leave their imprint on programs designed to facilitate broadband deployment in high-cost regions. As noted above, the

---

[47] Stauber at 42.

[48] Dabson at 4.

[49] Dabson at 4, *citing* Stauber at 48.

[50] Dabson at 4, *citing* "Rural America in the 21st Century: Perspectives From the Field," Carsey Institute, University of New Hampshire, at 3 (Jun. 2007).

[51] Chinni, D. "Rural Counties are Aging and Losing Population, But Are They Really 'Dying'?," Patchwork Nation (Mar. 4, 2011) (http://www.pbs.org/newshour/rundown/2001/03/-as-the-2010-census.html) (last viewed May 3, 2012 15:57).

[52] *See*, Dabson at 4.

"Storehouse" era saw investments in roads, electricity and other facilities that improved opportunities to distribute the wealth of rural America to urban areas and beyond; the notion of the United States as the "breadbasket of the world" reflected the production abilities of rural areas. While the weight of rural or urban political power is ultimately measured in actual policy outcomes, rather than competing academic approaches to defining rural America, certain trends arise when considering the role of rural and urban relationships in national policy.

As a threshold matter, economic activity tends to follow population shifts. Data reveal

> . . . the geographic center of U.S. population and economic activity has been moving steadily westward and slightly southward for decades. During the Civil War, the center of U.S. population was located in southern Ohio; today [2007], it is in south-central Missouri (U.S. Bureau of the Census). As the population moves, so does economic activity.[53]

Concurrent with the shift in the *mass* of population are apparent changes in the *types* of areas to which people are moving. From 1990 to 2001, the following evolution is reported:

- "1990 - the first time more than 50% of Americans lived in metropolitan areas larger than 1 million people;
- "1992 - the first time the majority of votes cast for president were cast in suburban districts;
- "1994 - the first time that suburban representatives occupied all the top five positions in the U.S. House;
- "1996 - only 76 of the 435 Congressional districts were predominantly rural;
- "2001 - the 2000 Census shows that America is a suburban nation. The majority of Americans live in suburbs, and the majority of political power is there."[54]

(These shifting influences are also seen on the local level, as some state legislatures experience the impacts of increased urban representations.)[55]

---

[53] Crandall, et al. at 7. In 2010, the population center was Texas County, Missouri. *See*, "Centers of Population," United States Census Bureau Website, (https://www.census.gov/geo/reference/centersofpop.html) (last viewed Oct. 7, 2015, 18:06).

[54] Stauber at 41.

[55] Sulzberger, A. G. "Rural Legislators' Power Ebbs as Populations Shift," *The New York Times* (Jun. 2, 2011) (http://www.nytimes.com/2011/06/03/us/03rural.html?_r=0) (last viewed Oct. 20, 2015, 16:35).

Finally, the population shifts also warrant examination within the context of other demographic developments in rural areas. In early 2011, the proposition that rural counties are "dying" achieved attention among the press and academics. This label arises out of data that compares birth rates to mortality rates: data demonstrate that 90% of counties experiencing such "natural decrease" are in rural areas, and counties further from metropolitan areas are subject to this phenomenon more than those that are closer to metropolitan areas. "Natural decrease" reflects "a local age structure that that has few young adults of child-bearing age and a large surplus of older adults at high risk of mortality." The trend exists, though in lesser magnitude, in nonmetropolitan areas, where youth migration is coupled with retention of older adults (it is only that in natural decrease areas, the magnitude is greater).[56] In 2012, for the first time, deaths exceeded births in two states, when Maine recorded 103 more deaths than births (West Virginia experienced natural decrease in multiple preceding years).[57] The ERS found that 2010-14 "mark[ed] the first time with an estimated population loss for nonmetro America as a whole."[58] In some areas, however, trends reflect "baby boom" migration into rural areas. This migration has been found to spark a secondary wave into rural areas of workers who are needed to meet the needs of the Baby Boomers.[59] Accordingly, where some rural areas experience the consequences of diminished demand for youth-oriented services such as schools or pediatric services,[60] others could benefit from offering "personal consumption amenities," including health or recreational services that could be attractive to in-migrating Baby Boomers.[61] Finally, some data indicate that population changes differ in various locations, and that population declines in some regions are counterbalanced by population gains in others. One report notes that "[s]tates such as Arizona,

[56] Johnson, K. M. "Natural Decrease in America: More Coffins Than Cradles," Issue Brief No, 30, Carsey Institute, University of New Hampshire, at 2, 3 (Spring 2011) (Johnson 2011).

[57] Johnson, K.M. "Deaths Exceed Births in Record Number of U.S. Counties," Fact Sheet No. 25, Carsey Institute, University of New Hampshire, at 1 (2013) (Johnson 2013).

[58] United States Department of Agriculture, Economic Research Services website, "Recent Population Change," (http://www.ers.usda.gov/topics/rural-economy-population/population-migration/recent-population-change.aspx) (last viewed Oct. 7, 2015, 17:45) (ERS "Recent Population Change").

[59] Cromartie, John and Nelson, Peter. "Baby Boom Migration and Its Impact on Rural America," United States Department of Agriculture, Economic Research Service Report No. 79, at 4 (Aug. 2009).

[60] Johnson 2011 at 3.

[61] Henderson, Jason and Akers, Maria, "Coming Home to Rural America: Demographic Shifts in the Tenth District," Economic Review–Third Quarter 2009, Federal Reserve Bank of Kansas City, at 113 (2009).

Utah, Delaware, Hawaii and Florida all experienced rural and small town population growth at 20% or more," and described other states in which rural areas lost population.[62] Similarly, the ERS contrasts identifies population growth in "recreation areas" and losses in "areas of relatively high poverty."[63] The varying needs of rural areas based upon their respective populations also point discussions toward broadband-related issues. Whereas agricultural-oriented counties have experienced out-migration, amenity-rich areas are experiencing population growth; recreational, or amenity, counties are "among the fastest growing nonmetropolitan counties.[64]

In sum, the condition of rural America is dynamic and diverse, and the circumstances of some areas cannot necessarily be extrapolated to all areas. Nevertheless, shifts in population and political influence are accompanied by changing public perspectives that are informed by the increased clustering of more people in urban—rather than rural—areas. These conditions underscore the question of how rural and urban spaces relate to each other when considering investments in broadband technologies that link these spaces.

[62] Population Change in Rural America, Housing Assistance Council Rural Research Note, at 4 (Dec. 2011) (http://www.ruralhome.org/storage/research_notes/rural_research_note_population_change.pdf) (last viewed Oct. 13, 2015, 11:33).

[63] United States Department of Agriculture, Economic Research Services website, "Shifting Geography of Population Change," (http://www.ers.usda.gov/topics/rural-economy-population/population-migration/shifting-geography-of-population-change.aspx) (last viewed Oct. 7, 2015, 17:07) (ERS "What is Rural").

[64] Johnson, K. M. "Age and Lifecycle Patterns Driving U.S. Migration Shifts," Issue Brief No. 62, Carsey Institute, University of New Hampshire, at 2, 4 (Spring 2013).

IV. ECONOMIC IMPACTS OF RURAL BROADBAND

Within the context of changing demographics and public perspectives, the task of soliciting urban-based support for rural areas can become more difficult. If programs that draw from non-rural resources are necessary to support rural broadband deployment, then the benefit of rural broadband must be evidenced to accrue to both rural and urban areas. In that regard, several studies demonstrate that policies aimed at increasing rural broadband deployment (including industry-funded mechanisms, federal loans, and other policies that encourage sufficient private investment) inure to the benefit of statewide and regional urban areas as well. These studies examine the multiplied impacts of activity relating to the deployment and operation of rural telecommunications, including purchasing, employment figures and projected tax revenues.[65]

A Colorado State University study found,

> [R]ural wired telecommunications providers generated $63.7 million in output in 2010, $45.5 million directly and an additional $18.2 million in spinoff impacts. This translates into $60.1 million in total value added activity. In employment terms, the 165 jobs generate an additional 263 jobs through multiplier impacts. Together, these 428 jobs add more than $21.0 million to state payrolls.[66]

In North Dakota, rural telecommunications companies were found to contribute more than $18 million in federal tax revenues and $31 million in state tax revenues. These included impacts arising out of 1,100 direct jobs and 800 secondary jobs generated by rural telecommunications activity. The study described the sectors most affected by rural telephone and broadband company (rural local exchange carrier, or RLEC) spending. They included: food services and drinking places; real estate establishments; offices of physicians, dentists and other health practitioners; private hospitals; architectural, engineering and related services; nursing and residential care facilities; retail stores—food and beverage; motion picture and video industries; and, retail stores, general merchandise. The study explained,

---

[65] *See*, McKee, Gregory. "The Effect of Changes in Universal Service Funding on the Economic Contribution of Rural Local Exchange Carriers to the North Dakota State Economy," Department of Agribusiness and Applied Economics, Agricultural Experiment Station, North Dakota State University, at 6 (Dec. 2011) (McKee).

[66] Shields, Martin, Cutler, Harvey, and Marturana, Michael. "The Impacts of Colorado Telecommunications Association Members on the Colorado Economy," Regional Economics Institute, Colorado State University, at 9 (Oct. 26, 2011).

> Like other RLECs, North Dakota RLECs buy many specialized products and services not available in state economies. National and international markets typically provide these products and services. Nevertheless, the statewide economic effects of the RLECs are substantial, largely because of the buying power created by high RLEC employee compensation. In turn, RLEC employees buy goods and services provided locally. This spending supports many small businesses in the area.[67]

Other studies explore negative impacts of reduced communications investment. A report examining Kansas approached the issue from the perspective of potential cuts in federally-administered programs, and predicted that potential rural telecommunications job losses would result in $1.4 million in personal income tax losses for the state over five years and an additional $1.3 million in retail sales taxes.[68] A study analyzing similar impacts in New Mexico predicted that a loss of 99 jobs stemming from federal regulatory changes would generate an additional 261 nontelecommunications job losses and a reduction in New Mexico personal income of $14.1 million.[69]

National-scope data found rural telecommunications supported $14.4 billion of economic impact in 2009, with $4.9 billion occurring in rural areas and $9.5 billion occurring in urban areas; the industry also supported more than 70,000 jobs in 2009, 54% (38,427) of which were placed in rural areas, and 45% (32,385) of which were placed in urban areas.[70]

In sum, these studies demonstrate secondary economic impacts of rural broadband activity that affect regions beyond rural borders, thereby demonstrating that nonrural impacts of rural broadband deployment should be considered when contemplating rural broadband policies.

While the aforementioned studies quantify impacts of network deployment and operation, other ancillary impacts may be considered, as well. One example is telemedicine. As noted above,

---

[67] McKee at 16-19.

[68] "Kansas Rural Local Exchange Carriers: Assessing the Impact of the National Broadband Plan," W. Frank Barton School of Business, Center for Economic Development and Business Research, Wichita State University, at 11, 12 (2011) (Wichita State).

[69] Peach, James, Popp, Anthony V., and Delgado, Leo. "The Potential Economic Impact of the National Broadband Plan on the New Mexico Exchange Carriers Group," Office of Policy Analysis, Arrowhead Center, New Mexico State University, at 18 (Las Cruces, NM 2011).

[70] Kuttner (*supra* note 31) at 6, 8.

recreational counties are identified as enjoying population growth, attributable in part to in-migration of retirement age adults into these counties.[71] These trends warrant consideration as telemedicine opportunities may facilitate better health care, reduced costs, or both. Telemedicine offers benefits to both patients and health care providers. Patients who are located at great distance from hospitals or other health care facilities can undertake interactions without the need for travel; these benefits are also obtainable for those whose mobility may be compromised, as well. Physicians relying on telemedicine can lower recurring facilities and administrative costs as more patients are treated through online programs, and also treat more patients as time savings accrue. Patient compliance can also increase as regular physician interactions are easier and, therefore, accessed more. Collectively, these can result ultimately in lower health-care costs, particularly where chronic conditions can be addressed, at least in part, by telemedicine. Recent studies support both qualitative and quantitative benefits of telemedicine. By way of example, one program that focused on common acute care diagnoses among Medicare Advantage and Medicaid patients resulted in "hospital at home" costs that were 19% lower than costs for in-patients. Patient outcomes for "hospital at home" users in the groups were equal to or better than their in-patient counterparts.[72] Another study examined the role of telemedicine benefits from chronic care patients, whose treatment collectively constitutes nearly 80% of U.S. health care costs. In this study, costs for Medicare beneficiaries decreased approximately between 7.7% and 13.3%.[73] (Appendix B to this report features descriptions of telemedicine initiatives undertaken by locally operated independent communications providers.)

V. CONCLUSION

The relationships between broadband and economic development, and the interdependencies of rural and urban areas, reveal that the benefits of rural broadband deployment extend to urban areas as well, and should therefore concern both rural and urban interests. Although historic bases for these assumptions are changing as market and demographic shifts occur, the interlocking relationships of rural and urban areas should inform national broadband policies in order to

[71] *See, e.g.*, Henderson, et al. at 113.

[72] "Costs for 'Hospital at Home' Patients Were 19 Percent Lower, With Equal or Better Outcomes Compared to Similar Inpatients," Lesley Cryer, Scott B. Shannon, Melanie Van Amsterdam and Bruce Leff, *Health Affairs June 2012, 31:61237-1243; doi:10.1377/hlthaff.2011.1132.*

[73] "Integrated Telehealth and Care Management Program for Medicare Beneficiaries With Chronic Disease Linked to Savings," Laurence C. Baker, Scott J. Johnson, Dendy Maculay and Howard Birnbaum, *Health Affairs September 2011, 30:91689*1697; doi:10.1377/hlthaff.2011.0216.*

enable development of beneficial results for the entire nation. Broadband has been identified as generating positive economic and societal impacts, and the rural communications industry has been demonstrated to contribute positively to local, regional and national economies. A comprehensive examination reveals that “rural broadband” is effectively “national broadband,” and policy conversations should incorporate a holistic view that considers the interconnected beneficial impacts of broadband deployment across the United States.

APPENDIX A

Representative Data Concerning the Role of Agriculture in the National and State Economies

National Economic Data

The U.S. agriculture sector extends beyond the farm to include farm-related industries. Agriculture and related industries contributed $789.3billion to the U.S. GDP in 2013, a 4.7% share. Farms contributed $166.9 billion of this amount (about 1%). Related industries include: forestry, fishing, food, beverages, tobacco, textiles, apparel and leather. [*]

Agriculture sector contribution to U.S. GDP has increased over time in absolute terms but has decreased as a share of total as the U.S. economy has expanded.[**] Agriculture's share of U.S. GDP has fallen from 37.5% in 1869 to 0.8% in 2006. From 1929–2006, U.S. farm value-added increased sixfold, from $17 billion to $98 billion (2000 prices), while the U.S. GDP increased thirteenfold.[***]

State Data

California is the largest contributor to the agricultural component of U.S. GDP, but this domination is consistent with the state's large economy as compared with other states. In summary:

California: $17.9 billion agricultural output (2005 – 2009 average); this was 16.4% of U.S. agricultural output.[****] Since 2000, California agricultural sector has grown 4.61% annually. It is the state's 17th largest economic sector.[*****]

Texas: The state's $6.13 billion output (2005 to 2009 average) represented 5.6% of the U.S. agricultural output.[*****] Since 2000, Texas's agricultural sector has grown 5.3% annually.[*****]

Iowa: Iowa enjoys an annual agricultural output of $5.93 (2005 to 2009 average) billion, representing 5.4% of U.S. agricultural output.[****] Iowa's agricultural output represents 6.4% of the state's economy and is the sixth largest sector of the state.[*****]

---

[*] United States Department of Agriculture, Economic Research Service, "Ag and Food Sectors and the Economy" (www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy.aspx) (last viewed Oct. 22, 2015, 12:38).

[**] "Environmental and Socioeconomic Indicators for Measuring Outcomes of On-Farm Agricultural Production in the United States," Field to Market, Second Report (Version 2.0), Revised December 2012, at 121 (2012) (Field to Market).

[***] Alston, Julian M., James, Jennifer S., Andersen, Matthew A., Pardey, Phillip G., "A Brief History of U.S. Agriculture," at 9, 10 (2009).

[****] Field to Market at 144, Table 2.4.

[*****] "Agriculture Sector Top 10 States by GDP," EconPost (Jan. 9, 2010) (http://econpost.com/industry/agriculture-sector-top-10-states-gdp) (last viewed Oct. 8, 2015, 16:46).

The top five states that contributed the largest agricultural (crop and livestock) share to their respective state economies are: North Dakota; South Dakota; Nebraska; Iowa; and, Idaho.[****]

State	2005–2009 Average (Billio	Share of State Economy	Share of U.S. Agriculture GDP	National Ranking
North Dako	$2.19	7.7%	2.0%	21st
South Dako	$2.46	7.0%	2.3%	17th
Nebraska	$4.34	5.4%	4.0%	6th
Iowa	$5.93	4.6%	5.4%	4th
Idaho	$2.13	4.1%	2.0%	22nd

Consumer Monetary Data

In 2013, U.S. consumers, businesses and government spent $1.4 trillion on food and beverages in groceries, other retailers, and away-from-home meals and snacks.[******]

Between 1960 and 2007, the share of disposable income spent on food has dropped from 17.5% to 9.6%. In 2013, Americans spent 5.6% of their disposable income on food at home, and 4.3% on food away from home. *Id.*

Food-away-from-home expenditures have nearly doubled since 1960, climbing from 26.3% of total food expenses to 49.6 in 2013. This reflects the growing number of two-income families. *Id*.

Between 2006 and 2013, price inflation for food was outpaced only by medical care prices. *Id.*

Farm-level commodity prices are only partly reflected in retail food pricing; packaging, processing, transportation and other marketing costs have a greater role in determining retail food pricing. *Id.*

[******] United States Department of Agriculture, Economic Research Service, "Food Prices and Spending" (www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/food-prices-and-spending.aspx) (last viewed Oct. 22, 2015, 13:03).

APPENDIX B

Telemedicine Initiatives Undertaken by Rural Communications Providers

ComSouth Telecommunications (Hawkinsville, Ga.)—ComSouth serves an area of more than 275 square miles with a population of 11,542. ComSouth provides service in an area where the median income is $15,000 below the national average. The broadband provider partnered with the county school system to deploy telehealth equipment in school nurses' offices. These are connected to physicians in a regional health center that itself enjoys fiber connectivity.

Dickey Rural Networks (DRN; Ellendale, N.D.) —DRN provides service across 5,444 square miles with a population of approximately 19,000. DRN provides its local hospitals, clinics and nursing homes with fiber to the premises (FTTP). This high-speed connection enables high-definition video and instant data transfers, whereby patients can consult with doctors in urban areas and receive diagnoses equivalent to in-person consultations. DRN worked with a local hospital to implement a telehealth service that enables emergency room physicians in rural areas to connect instantly with peers in urban hospitals, ensuring that the rural practitioner has immediate access to a colleague who might have more experience with a certain condition or set of presenting symptoms.

Gardonville Telephone Cooperative (Brandon, Minn.)—Gardonville serves an area of approximately 1,350 square miles with a population of 54,000. Gardonville offers an in-home technology pilot that connects hospice patients with their loved ones, caregivers and medical team. Gardonville partnered with a nonprofit organization that specializes in senior care to enable in-home hospice patients to view pictures, receive incoming messages, watch medical videos, video chat with family and friends, and listen to music. The system also connects to a variety of wireless activity sensors placed in the patient's home that can alert designated caregivers by phone, email or text message if necessary, and offers the capability for real-time biometric feedback from the system.

Nex-Tech (Lenora, Kan.) —Nex-Tech serves an area of 9,300 square miles with a population of approximately 98,000. Nex-Tech provides broadband services to 11 hospitals, 14 rural health clinics and many small physician practices. Of the 11 hospitals in its service territory, 10 have already adopted telemedicine and all plan to use it more extensively in the future. These facilities use the broadband connection for a number of applications that are critical to patient care, including teleradiology and teleconsultations, while also facilitating continuing education for practitioners. A physician stationed at another, large facility is able to virtually consult with a patient at a rural health clinic. Patients who visit the clinic are able to interact with the doctor through a robot, which is equipped to conduct diagnostic testing. The broadband connection also enables access to patient electronic health records stored in the cloud. Data storage and backup is also an area of increasing demand. For example, Hays Medical Center, a regional state-of-the-art hospital center, provides software and data hosting services for six critical access facilities in western Kansas. Additionally, HaysMed is in the process of upgrading its telemedicine equipment

for the Cardiac Rehab unit from analog to digital. This rehab equipment enables a cardiac rehab nurse at HaysMed to monitor a patient (via EKG, blood pressure, oxygen levels, etc.) in one of the 12 hospitals they contract with in western Kansas.

Premier Communications (Sioux Center, Iowa)—Premiere serves 96 square miles with a population of 9,000. With the population growing rapidly, the Sioux Center Community hospital was outgrowing its facilities and built a new, state-of-the-art building. This new hospital building is interconnected with the Avera hospital system in Sioux Falls, S.D., 60 miles away. Premier worked closely with Sioux Center Health and Avera Hospital, to establish a connection that allows Sioux Center Health to send diagnostic images to radiologists in Sioux Falls, and utilize e-emergency video technology, enabling Emergency Room doctors in Sioux Falls to remotely monitor patients in Sioux Center through live feeds. The hospital also features live information boards and a patient tracking system that permit family members in the waiting room to see the status of a patient's procedure. Nurses use customized computer and projection tools to update the boards, passing on important information while still maintaining patient privacy. These new features require excellent bandwidth, sophisticated wiring and complex machine installations.

Vernon Telephone Cooperative (VTC; Westby, Wis.) – VTC serves a 3.8-square-mile area with a population of 4,362. Vernon Memorial Healthcare (VMH) employees more than 500 employees at the hospital in Viroqua, four outreach clinics, two pharmacies in outlying communities and the Bland Bekkedal Center for Hospice Care. VMH is located 40 miles from the nearest critical access hospital and provides essential medical services, including emergency care for area residents. VMH utilizes private metro Ethernet connections provided by VTC for all network connectivity between its outreach facilities and its hosted cloud-based services in Madison, Wis. Medical providers at VMH utilize the broadband network to access and maintain electronic medical records. The View My Health patient Web portal facilitates patient information, scheduling and prescription filling. The broadband network creates more reliable, efficient and faster patient services. The radiology department can transfer CT or CAT images to any clinic in the network in less than 10 minutes using a 3-D Picture Archiving and Communication System. Patients can be treated locally because the image processing time is shortened dramatically. Community outreach and education are a constant challenge for VMH, and conversations have begun in partnership with VTC to create a dedicated VMH community television channel for video content created and uploaded from the hospital.

About NTCA–The Rural Broadband Association: *NTCA–The Rural Broadband Association is the premier association representing nearly 900 independent, community-based telecommunications companies that are leading innovation in rural and small-town America. NTCA advocates on behalf of its members in the legislative and regulatory arenas, and it provides training and development; publications and industry events; and an array of employee benefit programs. In an era of exploding technology, deregulation and marketplace competition, NTCA's members are leading the IP evolution for rural consumers, delivering technologies that make rural communities vibrant places in which to live and do business. Because of their efforts, rural America is fertile ground for innovation in economic development and commerce, education, health care, government services, security and smart energy use. Visit us at www.ntca.org.*

About Smart Rural Community: *Smart Rural Community*[SM] *is an initiative of NTCA–The Rural Broadband Association. Smart Rural Community comprises programming relating to and promoting rural broadband networks and their broadband-enabled applications that communities can leverage to foster innovative economic development, commerce, education, health care, government services, public safety and security and more efficient energy distribution and use. Smart Rural Community hosts educational events for communications and non-communications professionals, including government policy-makers; administers an award program that invites and reviews applications of rural broadband providers for certification and recognition; and provides resources to rural broadband providers to assist their achievement of goals promoted by Smart Rural Community. Smart Rural Community also publishes original research and white papers that investigate issues relating to rural broadband deployment, adoption and use. For information please visit www.ntca.org/smart.*

About the Author: *Joshua Seidemann is Vice President of Policy of NTCA–The Rural Broadband Association. Mr. Seidemann focuses on Federal regulatory issues as well as technology and economic factors affecting the rural telecom industry. He is a regular contributor to the NTCA tech blog, the New Edge, and other media. Mr. Seidemann holds a B.A. degree in Economics and Speech/Drama and a law degree, both from Yeshiva University. He is admitted to practice in New Jersey, New York, and the District of Columbia.*

Additional Smart Rural Community White Papers:

Schadelbauer, Rick, "Conquering the Challenges of Broadband Adoption," NTCA–The Rural Broadband Association (https://www.ntca.org/images/stories/Documents/Advocacy/CCBA_Whitepaper.pdf) (2014).

Ward, Jesse, "The Smart Rural Community," NTCA–The Rural Broadband Association (https://www.ntca.org/images/stories/Documents/Advocacy/Issues/Broadband/TheSmartRuralCommunity.pdf) (2012).

4121 Wilson Boulevard, Suite 1000 • Arlington, VA 22203-1801
Phone/703-351-2000 • Fax/703-351-2001 • www.ntca.org