Rural internet connectivity

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Abstract

This research investigates Internet connectivity in rural regions, looking specifically at four states in the US. Access to the Internet has assumed new significance for commercial and political reasons, and remote and sparsely populated areas typically lack the telecommunications infrastructure for reliable and fast Internet connections. Even as government programs such as the federal E-rate provisions bring Internet connectivity for institutions such as schools and libraries under the government’s universal service umbrella, more general Internet access to a broader community constituency has not been addressed within policy circles. Even the deployment of so-called “national” Internet services favors urban regions.

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1. Introduction

Without adequate connections to advanced telecommunications infrastructure and services, rural communities may not be able to fully participate in the emerging information economy. Several studies from around the world have explored the link between economic development and the presence of different levels of telecommunications infrastructure, most concluding a positive relationship between access to telecommunications capabilities and improvement in certain economic indicators (Parker, Hudson, Dillman, Strover, & Williams, 1995). With the arrival of the Internet in the 1990s, access to this new tool has assumed huge importance, although empirical evidence specifically attesting to the efficacy of Internet access for rural economies at this point is scant. Several countries are grappling with telecommunications infrastructure policies that will

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extend Internet access to new communities, but many face substantial difficulties when phone service is itself either poor or nonexistent. Among developed countries where telephone penetration is high, national policies are seeking formulas to extend Internet connectivity on terms favorable to the sort of time durations characteristic of users of the World Wide Web. Policies in the US which recognize the importance of the Internet for education and information access have catapulted the ability to use the Internet to national significance, and other countries are doing likewise. Regional or local programs in various European countries, for example, also have sought to extend Internet connectivity to more communities, their goals often referencing community or economic development. However, any country with rural regions faces special problems.

In the US, in spite of efforts to extend Internet access to a broad population, the Falling through the Net series of studies by the Department of Commerce investigating the demographic correlates of access to the Internet has repeatedly concluded that some segments of the population are “falling through the net,” to their economic peril. With respect to rural areas, the 1999 report in the series notes:¹

- At almost every income level, those households in rural areas are less likely to own computers than households in urban or central city areas.
- At every income level, households in rural areas are significantly less likely—sometimes half as likely—to have home Internet access than those in urban or central city areas.
- Black households in rural areas are 1/3 less likely to own a computer than the average US Black household, and are 2/5 less likely to access the Internet than the average US Black household.
- For rural areas, the Kindergarten-12th grade school is a popular point of Internet access: 30.0% of rural persons use the school for Internet access outside the home, compared to a national average of 21.8%.

These findings echo a 1998 report’s conclusions that rural citizens are far less likely to use computers and digital networks, including the Internet, than average Americans (NTIA, 1998). This disadvantage is exacerbated by the lower income and education levels characterizing most rural regions, and in the US is most prevalent among non-white populations. Lower incomes and educational levels typify rural areas in many countries, and when these ingredients are added to infrastructure penalties characteristic of telecommunications in these regions, an international digital disadvantage is a predictable outcome.

The US telecommunications infrastructure supporting the information economy is unequally deployed in the US, and rural regions’ disadvantage—a situation duplicated in numerous countries’ telephone infrastructure environment—is well documented.² Although good data on the relationship between Internet access and local economies are difficult to obtain, many service vendors and other businesses claim that poor telecommunications infrastructure inhibits their

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abilities to do business in more rural regions. Competing telecommunications service providers are disproportionately clustered in metropolitan areas, suggesting that the forces of competition likewise are not reaching rural regions (FCC, 1998). When it comes to advanced or high speed connectivity, the growing availability of cable modem service is concentrated in urban markets where larger cable operators have made the necessary investment in hybrid fiber coax to offer Internet connections. Digital subscriber line (DSL) services cannot extend far enough from a central office to characterize them as truly rural although they may serve rural towns, but in any case low population density regions are not the first areas targeted by telephone companies deploying DSL (FCC, 2000).

Finally, one 1999 study is highly critical of the near-term results of US deregulation in both urban and rural areas. It concludes: “Instead of becoming vigorously competitive, the telecommunications and cable industries have become highly concentrated. Instead of significant declines in prices, we have sharp increases in cable and in-state long distance, and stagnation in local telephone and interstate long distance rates. Instead of rapid deployment of advanced technologies from increased private sector investment, we have a growing ‘Digital Divide’ between those who make intensive use of the telecommunications network and those who do not” (Consumers Union, 1999).

The current significance of Internet access and its associated costs highlight the importance of the industry and policy structures that affect both. Current US debates surrounding “open access” to cable modem services illustrate some of the stakes, although most of the local communities prompting the access claims are in urban areas, which is where cable modem services are and will continue to be offered in the near term. With respect to rural US areas, for the near term Internet access services are most likely to be provided by independent Internet service providers (ISPs), who in turn rely on telephone companies, particularly the incumbent local exchange companies, for their links to Internet networks and backbones. The end user’s connectivity to the Internet is defined by the quality of service an ISP can provide at a specific cost. Cost factors are related to state regulations and exchange boundaries relative to the user’s location, as well as the provider’s cost of getting to or leasing facilities from the local telephone company. Accessing the Internet through a dial-up ISP can mean a $20 or so monthly fee for unlimited access if an ISP is located nearby. If, however, reaching an ISP entails a toll call or joining a flat rate calling plan to reach a broader geographic region, the cost can be considerably higher.

The US is in a privileged position because traditionally it has supported flat rate calling, and this in turn has allowed people to exploit the Internet environment at very low costs relative to what is paid in countries where flat rate calling is not the norm. However even in the US, certain populations and regions face penalties not borne by urban regions. This essay argues that rural areas’ costs are higher and services fewer and of lower quality, and that policy measures purporting to create a level playing field in fact have not been effective when it comes to Internet access services.

The Internet service provider industry in the US has undergone a great deal of consolidation in 1997–00 even as large companies such as Time-Warner, AT&T and the Bell Operating Companies

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3 Consumer’s Union issued a report in February 1999 that documents a digital divide based on consumer profiles. It is well known that rural communities conform to fairly modest income or socio-economic status profiles for the most part. The digital divide confronts the 1996 Telecommunications Act: economic reality vs. public policy. February, 1999.
(BOCs) have jumped into providing Internet connections.\textsuperscript{4} AOL and MSN have been among the largest ISPs, AOL dwarfing MSN’s operations. (In fact, MSN lost market share during 1999, and as of late 2000 ranks fourth in providing Internet access in the US, preceded by AOL with 26 million subscribers, Earthlink with 4.8 million, and Juno with 3.7 million (Katz, 2000).) Trade journals such as Boardwatch and The List estimate there are over 7000 ISP companies in the US, and the vast majority of them are local. ISP service is dependent on reaching telephone company points of presence (POPs), the large switches that connect long distance carriers to local traffic.\textsuperscript{5} The distribution of POPs around the country in turn is a determining factor in where ISPs focus their business.

Downes and Greenstein (1998) examined the geographic distribution of ISPs in the US using a database that listed the POPs used by different ISPs.\textsuperscript{6} They found that 92\% of the population had “easy access”, while 5\% had costly access. Their procedure located 247 counties that lacked an ISP, and another 141 counties that had only one ISP. They usefully point out that while establishing ISP service can be relatively easy, providing high quality and high speed connections can be rather expensive; the latter also can depend on the lines and switches at the local telephone provider. One problem with their study, however, is that they assumed county-wide coverage based on there being one access point in a county; a single point of access does not guarantee toll free access for the broader region.

NTIA found that 69\% of all households accessing the Internet use a national service provider, followed by 14\% using a local phone company (NTIA, 1999a,b). National service providers advertise “national” service scope, and many people assume this means one can dial into them from anywhere on a toll free basis. However, even though national service providers list broad areas of coverage, in fact, their local dialing numbers often must be reached by paying a long distance or toll fee. In both the NTIA and Downes and Greenstein studies, issues of service quality and the extent to which ISP services are available throughout the regions served by POPs and at what cost have not been addressed. In other words, to report that one city in a county supports an ISP can be quite misleading as to the connectivity available to all households in the county.

Internet connectivity still depends on the wireline telephone network. Telephone services in the US rural areas traditionally have been nurtured or protected through various federal and state policies, the early rationale for such policies focused on ensuring service parities between rural and urban areas. Consequently, for example, the Rural Utility Service (formerly the Rural Electrification Administration) made low or no cost loans to parties willing to establish phone services to remote regions. Cooperatives emerged as significant service providers in rural areas, their non-profit orientation leading them to provide telephone service in spite of limited prospects for profitability. Over the years, the development of the high cost fund ensured that service to higher cost areas—which typically include rural regions—would be supported. The early goals of building the telephone network through a definition of universal service that emphasized widespread availability evolved into a definition that emphasized equitable

\textsuperscript{4}AOL alone has 18 million Internet subscribers, although clearly it provides more than Internet access.

\textsuperscript{5}ISPs maintain at minimum modem banks that connect to telephone company facilities to reach backbone networks. At some point in their transmissions, access to the network via a POP or network access point is necessary.

\textsuperscript{6}Unfortunately, this source no longer makes POP information for ISPs available.
costs for basic telephone services. The high cost fund was supported through various implicit and explicit cross-subsidies—from business users to residential users, from metro service to rural service.7

In its reformist spirit, the 1996 Telecommunications Act mandated that the costs associated with universal service be made explicit so that subsidies could be directly addressed and so that accounting practices and transfer payments could be brought into the larger deregulation equation of moving prices toward cost; thus universal policies are in transition in the early 2000s. Beyond federal universal service policies, many states also support legislation or rules that exempt telephone companies serving rural areas from a variety of regulatory obligations (e.g., certain tariff schedules for services such as ISDN). While such exemptions protect rural telephone companies from what might be onerous requirements to them, the exemptions also may limit services available to their customers. The net effect of such policies has been the growth of a national telephone system that provides adequate connectivity to most rural areas, excepting certain geographic pockets (especially Indian reservations), but a system with highly uneven service terrain.

The demands of new communications capabilities ranging from accessing the Internet to linking institutions for video conferencing tax the infrastructure broadly available in rural areas, and deregulation will alter the circumstances under which the high cost fund operates. Already the formula for computing transfer payments to high cost urban regions has been revised, and the same formula for rural companies is under study.8 Consequently, how network connectivity unfolds in rural areas is a pressing policy issue. In particular, the ISPs’ dependence on telephone companies’ infrastructure highlights their vulnerability when a carrier is slow or unwilling to provision the lines an ISP requests, or when a carrier itself wishes to offer Internet connection services, thus presenting competition to extant ISPs. Whether deregulation can provide solutions for environments that are less competitive, and the effectiveness of regulatory agency actions in identifying competition problems and remedies are acutely significant to rural areas.

How do deregulation initiatives influence telecommunications infrastructure in rural areas? Are there improved choices and opportunities for services in these regions as a result of new competition policies? How do policies protecting smaller, more rurally-based telephone companies influence Internet availability in rural regions? How might they influence the structure of an ISP industry? We lack broadly available empirical evidence on most of these questions, and the focus of this paper is to provide some preliminary information in order to begin to address them. To date, the benefits of deregulation for rural areas are unclear. We attempt to provide a snapshot of Internet access in some rural areas in order to comment on the current problems such services face. How a competitive environment may influence those problems will be taken up in the conclusion of this paper.

7High-cost rural carriers receive 98.5% of current high-cost funding, which supports 31.4 million of the approximately 170 million total US access lines, according to the Universal Service Administrative Co. Carriers pay in about 2% of interstate and international revenues to support the fund (Engebretson, 1999).

8The Federal-State Joint Board on Universal Service released recommendations in December 2000 regarding reforms to rural high-cost Universal Service support mechanisms as a foundation for implementing a rural Universal Service plan. Federal-State Joint Board on Universal Service (CC Docket No 96-45, Recommended Decision, FCC 00J-4) (rel. Dec. 22, 2000).
2. Design of the study

This study assesses the status of dial-up Internet connectivity in selected rural counties. Over 1998–1999, rural areas of Texas, Iowa, West Virginia and Louisiana were examined with respect to Internet access options. The study of one region in west Texas was completed initially and provided baseline questions and a mode of inquiry for our work in Louisiana and West Virginia. Our investigation of Iowa relied entirely on secondary statistics provided by that state’s regulatory commission. These states were chosen because they include different dominant telephone companies and because each includes a high proportion of rural territory. The primary research questions were:

1. Who provides Internet service to our target regions?
2. How can we characterize the availability of Internet service in rural areas? What factors influence its presence?
3. What are some of the impediments to expanding Internet service in these regions?
4. How do state or federal policies influence Internet service to rural areas?

A combination of research tools provided data: secondary statistics and reports, original telephone-based surveys of ISPs for the relevant area codes of our target regions, and web-based investigation of ISP services. One important goal of the study was simply to document the conditions of access to ISPs in our target regions. In this we found methodological problems to be profound: trying to locate something that is not present is elusive.

2.1. Definitions

2.1.1. Internet service

Internet service amounts to access at various speeds and through different modes. For example, some ISPs offer only 28.8 Kbps rates, while others offer T-1 or T-3 lines and DSL. We requested information regarding the types of connections ISPs maintained with their telephone companies (T-1, type of switch, etc.) and the components of a “typical” service package (dial up access, web space, designing web pages, etc.) as well as the nature of service relationships between the ISP and the telephone company.

2.1.1.1. Service availability and impediments. We sought to determine the service territories of ISPs listed as serving our target counties. Because our interests focused on rural areas, service availability was defined in terms of whether or not a set of small towns within the area code could reach an identified ISP without a toll or special calling plan in place. For counties in Texas, West Virginia and Louisiana, we enumerated several small towns to use as “test cases” in order to ascertain the penetration of ISP service. We also queried the ISPs about the problems they face in providing service in their region. Those problems revolved around the responsiveness of the local telecommunications provider and local market conditions including the size of the customer group able to reach them on a toll-free basis.

2.1.1.2. State level policy. In the US, a distinction is made between long distance and local toll calling. The former crosses a boundary that entails handing a call off to a long distance company.
or service, while the latter can entail service by just one company but over distances that fall outside of normal local calling scopes and thus require users to pay per-minute rates. In some states, toll calling charges are relieved through extended local calling (ELC) policies (the names of such programs vary from state to state).\(^9\) Basically, ELC policies allow households to pay a flat rate for placing calls within a geographic region larger than that allowed by their normal monthly flat rate service. Subscribers can use ELC to connect from their rural telephone exchange to a nearby exchange without paying per-minute toll rates. In theory, people living in areas that lack services, including Internet access,\(^10\) or that run the risk of making numerous toll calls because their schools or businesses are located outside their local calling area, can potentially make such calls at reasonable rates under ELC. In other words, ELC policies may enhance the opportunity for low cost Internet access. We sought to examine how ELC policies might influence Internet access opportunities in our target regions.

ELC policies are different from state to state, reflecting regulators’ evaluation of the need to balance ELC against the lost toll revenue to rural telephone companies.\(^11\)

2.2. Sample and data-gathering

ISPs can provide a variety of services and often target specific constituencies such as businesses. In this study we were interested in ISPs that offer access to a broad range of customers, and consequently we eliminated services that worked only with businesses. Like most telecommunications service providers, ISPs tend to cluster in populated areas. We sought to ascertain which ISPs actually serve the targeted rural areas as per their public listing in two trade journals, Boardwatch and The List (http://boardwatch.internet.com and http://thelist.internet.com). In those journals, ISP companies are listed by the area codes they serve. One other source for listings in Texas was the Texas ISP Association, which provided us with a list of member ISPs for the state. We also contacted telephone companies in West Virginia and Louisiana and asked them about the ISPs to which they connect. A primary goal was to assess whether ISPs actually reach throughout the areas they claim to serve through their listing in publicly available sources, our concern being that providing service in a region actually meant that the service was available on a local call basis only to the larger cities of that region and that using it from elsewhere would necessitate more expensive toll calling.

Our target areas for studying Texas, Louisiana and West Virginia were counties (or parishes) identified on the basis of their rural status. While we would have preferred to select study areas on

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\(^9\)Several states have slightly different names for suburban programs vs. rural programs that facilitate extended calling regions.

\(^10\)Internet access has been accepted as an ELC rationale by the PUC on some occasions. Frequent calling to proximate medical facilities, educational institutions and similar sites also can help build the case that justifies ELC.

\(^11\)In Texas, for example, eligibility is based on showing that a community of interest crosses exchange boundaries and on showing that a certain percentage of telephone subscribers elects for ELC. At least 100 verified signatures of customers residing in their exchange area (or 5% of total customers if the exchange has fewer than 2000 customers) must be submitted to the PUC along with a petition for ELC. If verified, the PUC requests that the local exchange company conduct an election. If more than 70% of those returning ballots elect for ELC, and all other conditions are met, the PUC will grant ELC between petitioned and petitioning exchanges. ELC is subject to Public Utility Regulatory Act (1997).
the basis of telephone exchanges, the availability of county-level data and the unavailability of
detailed maps of telephone exchanges made the county unit necessary.\footnote{Even state utility commissions lacked up-to-date maps of telephone exchanges and service providers. The dominant telephone companies provided all the maps we were able to obtain from regulatory bodies.} We used the urban influence continuum code to identify nonmetro counties and to select rural sites. This classification scheme describes the degree of urbanization and proximity to a metropolitan area, assigning codes of from one to nine with “one” referring to central counties of metro areas with one million or more people, and “nine” representing a completely rural county with no town exceeding 2500 in population. Seven counties in Texas (Pecos, Jeff Davis, Brewster, Terrell and Presidio in west Texas, and Blanco and Llano in central Texas), three in Louisiana (Red River, Tensas, and Cameron parishes), and four in West Virginia (Roane, Wirt, Ritchie and Calhoun) were selected, all in codes 8 or 9 in the classification scheme.

Within each county we identified both the larger and the smaller population clusters. As we contacted ISPs claiming to serve the area codes overlapping our target counties, we queried whether the ISP provided service throughout the area code. If they did not (and we found that most did not), the interview was terminated. Most ISPs provide service only in the largest cities. If they said they did provide service throughout the region, we recited the names of a few of the smaller towns in our target areas in order to learn precisely where their systems extended service.

For all of the ISPs claiming to provide services to our target regions, we also sought information about the types of connections they obtained from telephone companies as well as any difficulties they may have experienced with them. The types of customers served, typical service packages, rates, whether ELC figures in their company’s reach, and company size and revenue information also were sought from ISPs actually serving the most rural areas. Telephone-based surveys were conducted with the eligible ISPs, supplemented by web site-based information.

We also had numerous interviews with state utility commission personnel who helped to provide some information about local telephone companies and also interpreted their state’s calling plans. In the case of Iowa, the staff furnished us their own study of ISP access in the state, which is summarized below. In Texas, we filed a Freedom of Information Act request in order to obtain ELC information.\footnote{The Freedom of Information Act requires that most government information be available to the public, although researchers and journalists often must invoke it in order to compel the government to provide that information.} Information about each of the study areas is presented below.

3. Results

The environment for Internet connectivity for each of the four regions is summarized below. In each we note some of the responses of the policy community to the problem of Internet connectivity as well as data investigating the situation of the most rural regions of the states.

3.1. IOWA

In 1997 the Iowa legislature directed the Iowa Utilities Board to establish a consortium of telecommunications providers to “develop and establish a plan to provide non-toll dial-up
Internet access”. The group assembled by the Board took the first step of gathering data on toll free access to the Internet. Their data gathering used the exchange as the basic unit of analysis, and they sought to learn whether or not each of Iowa’s 811 exchanges had toll-free dial-up access to the Internet. Any exchange with at least one provider constituted an “exchange with access”. Their initial data from the end of 1997, reproduced in Tables 1 and 2, illustrate that 11% of the state’s exchanges lacked toll free access, representing about 3% of the population. The exchanges lacking toll free access are primarily rural, and most of them represented locations served by GTE Midwest, Inc. (79 of the 87). One year later (4th quarter 1998) the number of exchanges without access dropped from 87 to 64 even without any public policy remediation.

In their study the Board noted that ELC (or Extended area service (EAS) as it is known in Iowa) was an important factor in ISPs deciding to provide service: under the flat rate plan, more people could reach them from more distant places. One option the Iowa Utilities Board considered based on this observation was whether they might make it easier for exchanges to obtain EAS. Broader EAS services would translate into more customers being able to reach an ISP without placing a toll call, although the toll revenue local providers lost would have to be

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**Table 1**

Summary of data by exchange

<table>
<thead>
<tr>
<th>Exchanges with access</th>
<th>724</th>
<th>89</th>
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</thead>
<tbody>
<tr>
<td>Exchanges without access</td>
<td>87</td>
<td>11</td>
</tr>
<tr>
<td>Total Iowa-based exchange</td>
<td>811</td>
<td>100</td>
</tr>
</tbody>
</table>

**Local telephone service provider**

<table>
<thead>
<tr>
<th>Provider</th>
<th>Exchanges without access</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTE Midwest, Inc.</td>
<td>79</td>
<td>91</td>
</tr>
<tr>
<td>US west communications</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Frontier communications of Iowa, Inc.</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Independent telephone companies</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
<td>100</td>
</tr>
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</table>


**Table 2**

Summary of data by access lines

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<tr>
<th>Number of access lines</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without nontoll access</td>
<td>38,324</td>
</tr>
<tr>
<td>With nontoll access</td>
<td>1,449,079</td>
</tr>
<tr>
<td>Total access lines in Iowa</td>
<td>1,487,396</td>
</tr>
</tbody>
</table>


14 The specific language is found in the Iowa Utilities Board report (1998).
15 Statistics were provided to the author from the Iowa Utilities Board.
factored into an equation that attempted to remedy the situation. Fundamentally, however, the low rate of toll-based access suggested to the Board-assembled group that Internet accessibility was not in dire straits in Iowa.

In seeking explanations for the difficulties that faced the exchanges lacking toll-free access, the Board noted that the costs of establishing Internet service warrant a subscriber base of at least about 200 households, and some exchanges in the state are too small to yield an ISP penetration base of that size. Another important factor they identified included the limitations of telephone company facilities, including the need for additional phone lines, the need to upgrade to digital switches and the inability of some ELC trunk lines to handle Internet traffic volumes.

The policy solutions Iowa enumerated in making its assessment included expanding ELC routes, designing optional calling plans that would expand callers’ ability to reach larger geographic areas for an incremental flat rate, investing in the costs of actually providing the ISP facilities for exchanges that lack access, and using the state-owned network, Iowa Network Communications, to offer access. It is worth noting that Iowa has a rural population that is evenly spaced across the state, with more small telephone companies than any other state in the US. Such distribution patterns of both supply and demand may be more favorable to developing Internet services than more remote regions sustain.

3.2. Texas

The Western five-county region (Pecos, Jeff Davis, Brewster, Terrell and Presidio) examined in Texas is extremely remote, as evident from the population per square mile figure in Table 3. In contrast, the two counties in Central Texas are closer to the state capital, Austin, as well as several other small regional towns with lively trade functions; their population density is considerably higher. While both regions have numerous farms, the central Texas region is characterized by more manufacturing and service occupations.

These regions are served by several different telephone companies, including large dominant companies such as Southwestern Bell and GTE as well as private independents (Big Bend Telephone Company) and cooperatives (Dell Cooperative and the Central Texas Telephone Cooperative). The regions represent 19 exchanges. Texas has fewer telephone companies overall than Iowa but has 1300 exchanges, many of them very large. The counties we examined comprise about 54,000 square kilometers, and fall into two area codes, 830 and 915.

The total “universe” of ISPs claiming to serve the 915 and 830 area codes in Texas numbered 180 as of fall, 1998. However, we found that even the largest towns in the counties had fewer than four potential providers; many small towns had none. In all, only a handful of providers operate in our seven counties. The process of finding these absent services illustrates some of the data problems faced in gauging telecommunications infrastructure.

We gathered data from all the 180 ISPs in our counties. Based on that information, we determined that 114 ISPs actually serve some portion of the area codes and meet our criteria for offering commercial dial-up service to any customer. Of those, 106 serve only the major cities or those customers who can dial-up a major city with a local call.\(^{16}\) For populations beyond the major cities, currently only six companies serve the five county area of west Texas and two offer

\(^{16}\)Abilene, El Paso, Lubbock, Midland, Odessa and San Angelo.
service in central Texas. In other words, broad reports indicating “coverage” from providers generally means coverage only in the major cities.

Following the typical pattern, ISPs are concentrated in more populated areas. For example, currently six towns in the west Texas counties examined here have no ISP who claims to serve them. Those towns—Lajitas, Study Butte, Bakersfield, Girvin, Sheffield, and Shafter—cannot connect to the Internet via dial-up, dedicated access or any other traditional connection without a toll call. A single ISP reaches most other towns in the area. However, even these ISPs have questionable financial health and service quality. One ISP in Ft. Stockton is managed by a ham radio club; an Alpine ISP operates out of a radio supply store. In all our target areas, the ISPs are side businesses or one of multiple income streams for a rural businessperson, making the long-term viability of these operations an open question.

The ISPs’ dependence on local telecommunications infrastructure illustrated some problems endemic to rural regions. First, their prices were generally modest, but so were their services; all ISPs offer flat rate pricing for basic services of between $15.95/month with a student discount in Ft. Stockton to $31.39/month in Terlingua and Presidio. Those prices generally include dial-up access and an email account; some include 1MB of Web server space. All but one ISP claimed to offer 56 Kbps bandwidth to dial-up customers. Some reported difficulties obtaining certain sorts of services (ISDN-based for example) from local telephone companies, and one reported that

Table 3
Texas, Louisiana and West Virginia county data

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<tbody>
<tr>
<td>Pecos</td>
<td>16,549</td>
<td>3</td>
<td>$24,078</td>
<td>58</td>
</tr>
<tr>
<td>Jeff Davis</td>
<td>2185</td>
<td>1</td>
<td>$24,306</td>
<td>69.5</td>
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<tr>
<td>Brewster</td>
<td>9318</td>
<td>1</td>
<td>$21,338</td>
<td>73.2</td>
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<tr>
<td>Terrell</td>
<td>1215</td>
<td>1</td>
<td>$22,969</td>
<td>66.3</td>
</tr>
<tr>
<td>Presidio</td>
<td>8123</td>
<td>2</td>
<td>$13,920</td>
<td>43.9</td>
</tr>
<tr>
<td>Blanco</td>
<td>8004</td>
<td>8</td>
<td>$24,533</td>
<td>68.9</td>
</tr>
<tr>
<td>Llano</td>
<td>13,013</td>
<td>12</td>
<td>$21,627</td>
<td>71.6</td>
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<tr>
<td>Calhoun</td>
<td>7885</td>
<td>28.3</td>
<td>$14,496</td>
<td>27.7</td>
</tr>
<tr>
<td>Ritchie</td>
<td>10,233</td>
<td>22.3</td>
<td>$17,333</td>
<td>29.8</td>
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<tr>
<td>Wirt</td>
<td>5192</td>
<td>22.7</td>
<td>$16,951</td>
<td>33</td>
</tr>
<tr>
<td>Roane</td>
<td>15,120</td>
<td>33.3</td>
<td>$15,375</td>
<td>29.6</td>
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</thead>
<tbody>
<tr>
<td>Cameron</td>
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<td>6.9</td>
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<tr>
<td>Red River</td>
<td>9387</td>
<td>23.8</td>
<td>$14,831</td>
<td>24.7</td>
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<td>7103</td>
<td>11.2</td>
<td>$11,931</td>
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GTE’s T-1 lines were multiplexed into several lines that supported less than 28.8 Kbps, meeting the tariff for voice but “inadequate” (according to the respondent) for data traffic. Contrary to anecdotal evidence and the experience in Louisiana and West Virginia, we heard no reports of systematic problems with the local telephone providers. However one ISP noted that a portion of their geographic region is served by a type of radio telephone that is not able to support Internet service.

3.2.1. ELC in Texas

We found some evidence that extended calling plans worked to expand Internet access in Texas, although when we asked ISPs if they were aware of ELC only one of the eight answered affirmatively. In fact, the owner of one ISP located in central Texas said that without extended calling his costs would rise considerably. In Texas, petitioners in a single exchange may request ELC for up to five neighboring exchanges in a single ballot. Customers may elect up to five of adjacent exchanges for a single flat rate, generally $3.50 per month for residential customers and $7 per month for businesses per exchange. The advantage to electing all five is to create a local calling region, but the costs to the total customer base rise incrementally. Eligible costs to the telephone company (including lost toll revenues, lost access charges, switching costs) not recovered through the flat monthly rate are distributed among all customers.

Our review of ELC data in Texas shows that across the state as of fall 1998, petitions had been filed for a total of 5478 ELC elections, with 3029 (55%) successful elections. About 19% (1023) of the elections failed to garner 70% of the electorate. The remaining 26% (1426) election petitions were dismissed, sometimes the result of something as simple as failing to provide required documents, sometimes because the required number of customers (100, or 5% in smaller exchanges) had not signed the petition, or because a “community of interest” had not been demonstrated.

ELC clearly affects Internet access in west Texas. Consider that Coyanosa, which is served by two ISPs, can dial-in to Ft. Stockton, which has four ISPs. Imperial, served by a single ISP, can dial-in to Ft. Stockton and Odessa, much larger cities served by several national and regional ISPs. Valentine, in Jeff Davis County, posted the most disappointing petition results: the state regulatory commission dismissed all five of Valentine’s petitions because they failed to articulate a community of interest in three cases; one exchange was too far away to qualify for ELC in the fourth case, and Big Bend Telephone exercised its exemption as a rural telephone company (fewer

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17 His service operates in three area LATAs and has avoided inter-LATA problems by employing remote call forwarding (RCF) devices. ELC will replace the need for some RCFs in that network since it was approved early in 1999. This will save this ISP costs associated with purchasing, operating and maintaining RCFs. Many ISPs consider the time and costs associated with maintaining equipment to be a significant growth inhibitor and a drain on cash flow.

18 For the purposes of analysis, each electable exchange is counted as a separate election. Therefore, petitioners may hold up to five “elections” on a single ballot.

19 The costs passed on to the customer base vary according to the total customer base of the petitioned exchange. Currently, Southwestern Bell charges about 26 cents per customer, however, Sprint complained to the PUC that they would have to charge more than $6 per customer to create similar discounts.

20 Recall that each exchange may conduct up to five “elections” on each ballot; exchanges often file more than one petition, and thus hold more than one ballot.

21 Because COI is distance sensitive (only those petitioning exchanges separated by more than 22 miles are required to demonstrate it) the burden of proving COI falls disproportionately on rural exchange customers.
than 10,000 lines) in the fifth case, avoiding the requirement to provide extended calling. In the 
central Texas counties, only one exchange successfully petitioned for ELC, the net result being 
that its customers are connected to three other exchanges, all of which are outside the target 
counties examined here but which provide better ISP services.

These examples illustrate some of the advantages and disadvantages of ELC in the state. 
Clearly the extended calling plan can make an ISP’s services available to a larger population. 
However, as was the case with Big Bend Telephone, the smallest and most rural telephone 
companies are exempt from ELC obligations, evacuating this public policy mechanism’s utility for 
the most rural communities.

3.3. Louisiana and West Virginia

As was the case for Texas, we located ISPs on the basis of the area codes serving our 
target counties. Area code 318 served all three target counties in Louisiana, and area codes 
225 and 504 serve other parts of the state. West Virginia has only area code 304. Both 
states support “banded calling” zones that enable people to pay an additional flat, monthly 
fee to call greater geographic areas. The banded calling plan offers a customer a “home” rate of 
$15.00 per month, plus access to Tiers 1 and 2 regions. Tier 1 includes exchanges in the adjacent 
local areas and Tier 2 includes all central offices within 22 air miles of the local central office, 
working out to a diameter of about 50 miles. The cost for Tier 2 service is $29.00 per month, 
and about 10% of all customers opt for this plan in the state. Roughly 50% opt for Tier 1 
service.\textsuperscript{22} Bell South also offers an Area Plus plan that allows callers to call anywhere within their 
LATA for a flat rate of $35 per month. Two of our parishes, Tensas and Red River, are in the 
same LATA as Shreveport, for example, and therefore subscribers to this plan would have access 
to up to 113 ISPs.

The banded calling program has an effect similar to ELC except that it makes it difficult for an 
ISP to know exactly where its customer base is. It could be considerably more expensive than ELC 
programs examined in Texas or Iowa, depending on a customer’s choice of Tier 1 or 2. It also 
meant that for this study’s purposes the idea of a “local” ISP was broadened considerably. 
Consequently, we examined ISPs in area codes other than 318 for Louisiana.

Across the four area codes for the two states, we located 502 ISPs that claimed to serve the 
areas. Of those 502, only 99 had phone numbers in the local area codes, suggesting the probability 
that they would serve more remote regions. Of those 99, again we found just a handful serving the 
most rural regions of the states that we had targeted. In our selected Louisiana counties, we found 
one locally-based ISP plus four others offering services to that area on a local basis even though 
their points of presence (“POPs”) are not in the area. In West Virginia, we found three ISPs with 
POPs in the locality and two additional ISPs with customers in the region even though their POPs 
are outside of the area.

While those numbers are quite low, the availability of the banded calling and 
intra-LATA calling plans means that access at an additional flat rate is available although 
it represents an additional monthly charge for households or businesses and therefore may be

\textsuperscript{22}Telephone conversation with Gregg (1999), Public Advocate West Virginia and member of the Federal Rural Task 
a disincentive. What was consistently cited as a problem among these ISPs, however, was their relationship with the local telephone companies. Telephone company charges were very high for some ISPs, higher than they believed was justifiable, and provisioning was slow. These cases highlight the significance of depending on the local telephone company for basic infrastructure.

In West Virginia, service from the telephone companies was almost uniformly reported to be a problem, particularly the length of time it took to get lines or other services from Bell Atlantic. Nevertheless, one West Virginia ISP commented that there seemed to be “enough business to go around”, at prices ranging from $12.95 to $29.95. However, the smallest local ISP—which was a combination ISP and retail Radioshack—offered only dial-up access and site hosting, whereas the others offered dedicated access, some web design services, and better connections with local phone companies (via digital switches, signaling system 7 (SS7), ISDN lines, frame relay, and so forth).

In Louisiana, the only local ISP was a division of the local telephone company, and predictably, it offered no critical comments concerning service or relationships with the local carrier, its parent. Most of the ISPs interviewed had extremely negative comments about Bell South, primarily having to do with the quality of their switches, their charges, and their service. One ISP doing business in both Texas and Louisiana commented that his ISDN line costs $585 in Texas but $1410 per month in Louisiana.

The strong finding in these states is that access to the Internet is available but at an additional cost. However, the prospect of a lively, competitive ISP industry expanding services and perhaps driving prices down does not appear to be on the horizon largely because the local telephone companies are not meeting the ISP’s needs.

4. Conclusion

Many scholars and policymakers believe rural communities can use advanced telecommunications services, particularly the Internet, to help them ease the distance penalty that accompanies a rural location. However, there is a mismatch between perceived demand and the supply of services. Several of the local ISPs studied here noted that there is demand for their services and expressed an interest in expanding if the cost structure were more favorable. However, commercial telecommunications infrastructure providers—on whom ISPs depend—are reluctant to invest in rural areas because of the high costs necessary to reach what can be relatively few rural customers and the consequent difficulties in achieving economies of scale in rural areas. As well, when they do have requisite equipment for ISP services, they appear to provision local ISPs more slowly, or at high prices, that discourage ISPs from reaching further into their rural areas. This means that ISPs wishing to serve rural areas also cannot do so without becoming telephone companies themselves and building their own facilities—a posture most are unprepared to assume. ISPs’ dependence on the local telephone infrastructure defines their pricing structure and their service offerings. The ISPs in the regions studied here had no choices in terms of which provider they could use.

The extent to which telephone or ISP competition may emerge in rural areas to redress access problems remains to be seen, but currently the conditions in rural areas do not appear to be
One problem is found in the very deregulation act that was supposed to create competition: the 1996 Communications Act defines an exemption for incumbent rural telephone companies from the requirement to unbundle their networks to would-be competitors. In essence, unless a new company—whether telephone or a facilities-based ISP—departs an entirely new infrastructure in the rural area, the exempt rural telephone companies maintain a virtual monopoly in their area. Companies that wish to offer services using that infrastructure therefore are limited by it, and have little bargaining power.

In the US exemptions apply to virtually all rural exchange areas served by small independent companies and cooperatives. On the state level too, the public policy measures designed to enlarge local (toll free) telephone calling areas and possibly aid in Internet access present contradictions when it comes to rural areas. In Texas, for example, telephone companies that serve fewer than 10,000 total lines in Texas, that are cooperatives, that lack a digital switch (necessary for ELC billing), or where local calling already is available, are exempt from the requirement to provide ELC. Since it is cooperatives and small carriers that cover large parts of rural Texas, the most rural communities cannot petition for the distance calling provision. These exemptions include many exchanges that might potentially benefit from ELC. Moreover, companies that did not opt for competition under the state’s own 1995 deregulation act—all cooperatives and most small independent companies—are not required to schedule digital upgrades to their infrastructure. As a result, rural communities fall into the divide where advanced services have difficulties getting into or out of the last service mile.

Even well intentioned programs sometimes lack appropriate implementation to be effective. For example, there is no formal or commonly accepted method of publicizing ELC. Sometimes local telephone companies lead the way. Local economic development coordinators may get wind of the policy and discuss it with local officials and community leaders. In Texas, the PUC has conducted one single ELC workshop, at the request of a local legislator, in the entire time since ELC was enacted. Even after a community member has discovered ELC and initiated the process of electing for it, the burden of communicating the election rests mainly on the community. The local phone carrier is required to publish a legal notice in the local paper. But unless the election captures the attention of the editorial staff, it is unlikely to receive much mass media attention or community awareness.

Combined with the small company exemption to ELC, federal policy creates rural telephone monopolies wherein no competitor can interconnect and no customer can dial out at a toll-free rate. Additionally, national deregulation of the telecommunications sector at the moment

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23 The Federal Communications Commission has interpreted this exemption as based on four criteria, and two of them are that (1) the exchange area includes no incorporated place with more than 10,000 inhabitants, and (2) the company provides exchange service to fewer than 50,000 access lines. See Section 3(37) of the Federal act. For a full discussion of the exemptions, see Part 51.5 of FCC Rules.

24 “Metropolitan” areas are defined in the ELC handbook as Austin, Corpus Christi, Dallas, Ft. Worth, Houston, San Antonio and Waco.

25 Also known as PURA95, this deregulation act which was passed in 1995 established a schedule for rural upgrades for the larger LECs in exchange for various pricing advantages.

26 Many rural telcos and coops have implemented digital technologies in their backbone. However, “last mile” technologies in many cases are so crude that customers cannot acquire even the most basic computerized services, e.g., call forwarding. The FCC (1999) reported on the issue in early February.
advanced telecommunications has become so important creates an era of uncertainty. Competition has been advanced as the mechanism to improve services, lower prices and extend infrastructure. However, regulators and industry continue to joust over the dismantling of old regulatory regimes, while new technologies seek to enter the fray. Meanwhile, deregulatory rulings may erode traditional universal service supports while new financing and distribution schemes’ effectiveness for a reconfigured universal service is unclear. Policies that seek to protect companies that are smaller, cooperatively owned, and that have traditionally provided telecommunications services in less lucrative markets end up imperiling timely provision of affordable Internet connectivity. To the extent that many countries are seeking methods to extend telecommunications infrastructure and related services to rural areas, the lesson of these cases is at least twofold: that well intentioned vendor support programs initiated through state or national policy actually can lead to reduced investment in infrastructure or actual impediments to investment; and that market forces alone do not appear to yield timely service provision to rural markets.

In the US what many people agree on is that most residential consumers have seen little local telephone company competition to date, although in urban areas there is lively competition for long distance, wireless telephone, and Internet access. In rural areas lacking low cost connectivity, even basic phone service may become difficult or impossible to maintain for many rural citizens, while wireless companies bypass those regions and Internet access providers cannot suitably use existing telecom infrastructure to provide the services they wish to offer. In rural regions competition has not operated suitably in rural regions. Moreover, the data here suggest that upgraded infrastructure will not be as plentiful from the larger incumbents in their rural exchanges as advanced service providers such as ISPs would like it to be. Although coops and small independents often invest in their infrastructure regularly—indeed, they led the BOCs in moving to digital switches in the 1980s—and might even accept ELC if their local subscribers want it, the larger telephone companies tend to prioritize metropolitan areas, leaving their rural customers waiting for digital switches and appropriate software, and disadvantaging ISPs interested in offering Internet services.

How then will rural regions acquire access to advanced services, such as the Internet, that require industry investment in infrastructure upgrades? Current policies may not be sufficient to encourage conditions guaranteeing that all citizens enjoy access to advanced infrastructure. Even where infrastructure exists, ISPs may not enter a rural market because it is uneconomical, or because they do not accurately perceive the market, or because there are no mechanisms such as ELC available to help aggregate demand. Rural citizens often lack the skills or knowledge to realize the importance of digital information and communication to their lives and to navigate the public agencies and negotiate with private entities to assure digital infrastructure in their areas through such means as ELC, for example. They also may be less aggressive in shaping new public policies and taking advantage of existing rules to enhance their prospects for connection. Public policies and patterns of investment influence the digital capacity of rural areas, and currently those patterns generally do not favor investment in rural regions. It may be time to assess the near term outcomes of competition policy for rural regions not just in the US but in any nation facing

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27 Economic support for poor and rural citizens has not disappeared, however, new proxy models adopted by the FCC have uncertain implications for many rural areas.
similar difficulties and to explicitly acknowledge that strategies must be implemented that step outside of normal marketplace mechanisms if we are to maintain the viability of rural regions.

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