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THE EVOLUTION OF ADVANCED LARGE SCALE INFORMATION INFRASTRUCTURE IN THE UNITED STATES

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ABSTRACT

Is private industry investing in backbone digital technology in a manner consistent with social policy? To address this question we assemble highly disaggregate data and compute indices for the geographic distribution of advanced backbone information technology in computing and telecommunications, focusing on recent changes in the indices. Our evidence suggests that the stock of advanced information technology capital, and access to it, became more equally distributed across the U.S. between the mid 1980s and early 1990s. In light of these findings there needs to be careful rethinking of the current policy concerns about the distribution of backbone technologies.

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"The traditional concept of universal service must be redefined to encompass a concept more in line with the information superhighway of the future."
-- U.S. Advisory Council on the National Information Infrastructure, 1996, p. 31 --

I. Introduction

Many recent information infrastructure policy debates have centered on redefining "universal access" to accommodate new information technologies. Analysts debate whether private industry is providing equal access to new technologies or meeting other national goals for wide dispersion of advanced information infrastructure.[1] Despite the prominence of this concern, not much is known about how the recent rapid growth in digital backbone technologies altered the distribution of information technology (IT) capital stock across the U.S., if at all.

To address this question, we examine the distribution of advanced large-scale backbone computing and digital telecommunications infrastructure between 1986 and 1992, a period of rapid growth in the backbone digital technology that makes up information capital. Our study emphasize two findings. First, like all infrastructure in the U.S., advanced information infrastructure is unevenly distributed. It follows population and locates in dense urban areas and regions with large amounts of white collar work. Second, over time it has become less concentrated in any specific region. Over these years advanced IT diffused across the geographic landscape of the U.S. and access to it increased.

We analyze changes over time in the geographic distribution of three key ingredients of the nation's digital infrastructure: a) fiber optic deployment by local telephone companies, b) the number of large-scale computer users, and c) the processing capacity of large-scale computers.

[1] For examples of recent studies, see National Academy of Engineering [1995], National Information Infrastructure Advisory Council [1995], NTIA [1995], the Information Infrastructure Task Force [1993, 1994], Kalil [1995], Kahin [1991], Moss and Townsend [1996], National Research Council [1996], Teske [1995].

Our goal in this paper is to understand how the distribution of IT capital stock changed as it grew in the late 1980s and early 1990s. We do not attempt to fully explain why the IT capital stock grew as rapidly as it did, which is an enormous research question partly addressed by other work.[2] Instead, we confine our attention to a measurement question that directly relates to an important policy discussion -- did the distribution of advanced IT capital become more or less geographically concentrated during a period of rapid growth? We document and analyze the changes that actually occurred.

Our indices are composed of very different parts of backbone technologies for regional digital IT networks. Both computing and telecommunications recently experienced rapid declines in price and rapid expansions in capital stocks. Each serves different functions, however. The growth in fiber optic cable at local telephone companies measures a region's ability to transmit data in digital form, while growth in large-scale computing capacity measures the ability of firms within the region to store and process large databases. In both cases, we interpret the level of capital stock as representing a variety of activities associated with building public and private digital IT networks in a region.

These two technologies have very different determinants. First, the firms making the investment decisions for fiber are regulated, while the investors in computers are largely unregulated. Second, large-scale computers began diffusing decades ago, although the recent competition to large-scale computing may have altered its distribution. In contrast, the diffusion of fiber as a market-oriented experience is a comparatively recent phenomenon. Yet, in spite of

[2] For attempts to analyze the determinants of advanced telecommunication infrastructure, see our companion papers using a similar set of data: Greenstein, McMaster and Spiller [1995], McMaster [1995], Greenstein and Spiller [1996], and Greenstein, Sosa and Spiller [1996] and their references therein. For work on the determinants of growth in the computing capital stock, see related analysis (on similar sets of data as in this paper) in Brown and Greenstein [1995], Bresnahan and Greenstein [1995, 1996], Brynjolfsson and Hitt [1995], Ito [1996], and references therein.

these differences, the customer bases for digital telecommunications and large-scale computing partially overlap. Administrative-intensive work, such as banking, finance, insurance, real estate, or business services, tends to make heavy use of advanced computing and digital communications. Of course, there are also plenty of non-overlapping industries. Because of these different investment processes and influences, it is not obvious whether these technologies should become more widely or less widely dispersed during rapid growth and whether the pattern of location of one of these technologies correlates with the pattern exhibited by the other.

We examine the post-divestiture years for both backbone technologies in 1986, 1989, and 1992, largely for pragmatic reasons. These are years of rapid investment and excellent documentation. Our study uses a variety of standard methods for analyzing the distribution of the capital stock across regions, as well as the distribution of access to capital.

We reach a stark conclusion. All indices we analyze show that these IT backbone technologies have become more widely distributed and less concentrated across the U.S. over time. This holds for the distribution of capital stock and for access to it. It is not possible to sustain any Cassandra-inspired argument that the distribution has become more unequal over time. We conclude that much of the current policy concerns about the distribution of backbone technologies need careful refinement to reflect these facts.

II. Data

Our data set consists of information about local exchange companies (LECs) and large-scale computer users in the U.S. in 1986, 1989, and 1992. It combines data first introduced in Greenstein, McMaster and Spiller [1995] (GMS), in Bresnahan and Greenstein [1995, 1996]

(BG), and in Hart, Nave, Raskob and Thomason [1982] (HNRT). Further documentation can be found in the appendices of these papers.

Our unit of observation is the territory covered by a local exchange company (LEC) at the substate level. This choice is made out of necessity, as no smaller geographic unit is reported to the FCC -- the source of our data on telecommunications infrastructure. The shape of these regions within a state depends on how the state divides up local telephone service franchises among different companies. Some states divide up their territory among many companies and some do not divide it at all. Most of these decisions were made years before. The appendix includes a list of all these territories, the division of different states, and the major cities within each LEC.

LECs' fiber optic deployment data, as well as demographic and economic data of the counties served by the carriers, come from GMS, while territorial extension data are from GMS and HNRT.[3] There are 101 LECs that annually report their fiber deployment to the FCC.[4] Demographic, economic, and territorial data of the counties served by each LEC are aggregated to the company level within each state.[5] While some small independent companies do not report to the FCC, the GMS data cover virtually all of the fiber optic cable used by local telephone companies.[6] Figure 1 shows the geographic area corresponding to the 101 LECs reporting to the

[3] The land areas from HNRT are for LEC square mileage in 1981. There may have been slight changes over time due to merges and other transactions.

[4] If a LEC generates more than 100 million dollars in revenue a year, it must report its infrastructure data to the FCC. Fiber deployment is reported using M and ARMIS 43-07 forms.

[5]The sources of the demographic data are the "Annual Estimates" of the U.S. Bureau of Economic Analysis, Department of Commerce, and "Regional Economic Information System Annual CD." The information is gathered for 48 states and the District of Columbia. Alaska and Hawaii are excluded.

[6] It includes virtually all the cable because very few of the small independent LECs have invested in fiber optics. However, this data does not include investment in fiber optics by competitive access providers such as Teleport

FCC, approximated at the county level. This area covers almost all the U.S. territory.

Information about large-scale computer users' locations and computing capacities overlaps with that found in BG. These data are collected by the Computer Intelligence Infocorp (CII), a market survey firm based in La Jolla, California, who regularly calls computer users in businesses to document their computer use patterns. We use the survey results from the end of each calendar year. The magnitude of the sample of large-scale systems users in each year is 13,788 sites in 1986, 13,553 sites in 1989, and 12,386 sites in 1992. These users contained at least one mainframe or large supermini computer at their site when they were surveyed. CII claims to cover 70% of all large-scale users in the U.S.. There seems to be no reason to expect the error in CII's sampling of large-scale users to correlate with the geographic location of users. Hence, we expect the joint distribution of LEC fiber and computing to indicate regional trends in infrastructure growth of computing facilities and capacity.

We matched the CII data against the FCC data through the use of zip codes, city codes, and county codes when available. We have found that virtually all the large-scale systems users are located in the geographic areas served by the 101 largest LECs that report fiber optic deployment to the FCC. In each year, less than 4.5% of sites included in the CII sample belong to territories that are served by LECs which do not file with the FCC. Further, the proportion of computer capacity, as defined below, in those territories is less than 2.7% of the total amount in each year. Thus, except in Table 5, all our analysis is based on information for those LECs that report annually to the FCC and for the computer users within those LECs. Figure 1 shows the geographic distribution of computer users relative to our coverage of LECs.

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or MFS, who are not required to report their capital stocks to the FCC.

III. Methodology

III.1. Indicators of Information Technology Infrastructure

We use two different groups of indicators of the diffusion of information technology capital in a region. In the first group we consider raw indicators of the stock of information technology infrastructure that are not scale free. The second group of indicators measures the level of access to the information infrastructure existing in a region.

We use three indicators of the stock of information technology infrastructure: the number of sites using large-scale computing, their associated computing capacity, and the miles of fiber optic cable used by the LEC within a region. The number of sites using large-scale computing is an indicator of the computing intensity of a region. Since we are only interested in backbone technology, we use the numbers of large-scale users as our measure. BG [1996] show that the vast majority of these sites are associated with white collar administrative work at central computing facilities. A smaller, and declining, fraction is associated with engineering or manufacturing work.[7]

The sum of Mips (millions of instructions per second) of all systems existing in a region's sites is an indicator of computing capacity existing within a region.[8] In the early years of our sample we are reasonably confident that it measures the bulk of large-scale computing

[7] BG [1996] found that for sites that contained identifiers approximately 15% of the observations came from Fortune 500 firms and that over 85% of the Fortune 500 have at least one representative in this sample.

[8] This includes all mainframe and non-mainframe computing hardware except PCS at all the sites operating within the region boundaries. We found in preliminary analysis that there was a strong correlation between aggregate mainframe MIPS and aggregate non-mainframe MIPS within an LEC in a year. Thus, for the purposes of this study, there was no benefit to distinguishing between the two different types of capacity or weighting them differently. We present the unweighted total. For further analysis of the determinants of the growth of this capacity and substitution between them, see BG [1996].

capacity in a region. As the networking revolution spread to large-scale computing in the 1990s, we can measure all the investment that occurred except the investment at sites which left the sample. BG [1996] show that this diffusion of networking up until 1992 primarily occurred at engineering oriented sites and that most exits were concentrated at these engineering sites. Hence, our measure of a region's computing capacity slightly emphasizes computing at administrative sites, especially in 1992, but this will be a small bias since we also measure non-mainframe computing capital.

Although the miles of fiber optic cable used by the LEC within a region includes neither fiber deployed by long distance telephone companies nor that deployed by private providers and users of local fiber optic cable, we are confident that our measure reflects the bulk of fiber devoted to local telephone networks and/or data transfer over the public network phone lines.[9] Fiber optic cable enables high-volume transmission of data and is widely considered to be an essential part of the modern digital telephone system. The limits on its capacity are determined by the available terminal and repeater technology.

To measure the level of access to information technologies we develop indices of access inequality. For that purpose, we borrow from the established methods for measuring the inequality of access to infrastructure in developing countries (Cowell [1995]), where researchers examine changes in the "density" of infrastructure. We propose a variety of methods for measuring "density," where the spirit of the exercise is to measure how common the infrastructure is in the local region. These indices are:

[9] The total revenue associated with the local telephone firms deploying the fiber in our index exceeds seventy billion dollars in 1992.

- *Number of Sites/Population*[10] measures the degree of diffusion of advanced computing technology inside the region. We can infer that a worker living in a geographic area with a high Number of Sites/Population ratio has more chances to be exposed to computer technology than a worker who lives in an area with a low ratio.

-*All Systems Mips/Population* measures the computing power of large-scale systems existing in the region. This index compares computing power among regions.[11]

-*Fiber/Land,* which equals Miles of Fiber Optic Cable Deployed/Miles of Land Extension, measures the deployment of fiber optic across geographic regions. An LEC with a high Fiber/Land ratio has a greater capacity to supply advanced telecommunication services than one with a low ratio.[12]

- *Networking Capacity Index*, which equals (Fiber/Land)*(Mips/Population), is a composite index that measures the potential capacity of a geographic area for storing information and transmitting it among computers using the public telecommunication infrastructure provided by the local exchange company.[13] It is analogous to many transportation infrastructure indices of roadway/vehicle carrying capacity.

-*Relative Information Infrastructure Index* is another composite index similar to those used by economic geographers to measure differences between the amenities associated with

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[10]The numerator in the indices Number of Sites/Population and All Systems Mips/Population corresponds to 1,000 people.

[11] Note that this does not allow us to make any inference of the distribution of computing power within the region.

[12] For this calculation we use the square miles of the LEC within the state relative to its fiber.

[13] A region without fiber optic deployed, but with a high storing capacity of information, has a Networking Capacity Index of zero.

different locations. It combines the information provided by the first three aforementioned indices, Number of Sites/Population, All Systems Mips/Population, and Fiber/Land in order to get a unique measure of the degree of access to information infrastructure in a region. The index is constructed as follows. We let

$$z_{ij} = \frac{y_{ij} - \bar{y}_i}{s_{y_i}}$$

where z_i is the normalized access index, $\bar{y}$ is the mean of the access index, and s_{y_i} is the standard deviation of the access index. The normalization converts the three sub-indices to the same unit of measurement. The relative information infrastructure index is defined as:

$$= \frac{1}{\sqrt{\sum_{i=1}^{3} \lambda_i (z_{ij} - \max_j z_{ij})^2}}$$

where

$$\lambda_i = \begin{cases} 0.25 & \text{for i = All Systems Mips / Population, No of Sites / Population} \\ 0.50 & \text{for i = Fiber / Land} \end{cases}$$

This is a weighted index that measures the distance of the value of the three sub-indices in a region from a 'desirable' degree of access to information infrastructure. The larger the distance from the 'desirable level,' the smaller the index. The 'desirable' values of the access indices are the maximum values of each of the access sub-index in the particular year. As a result, this index is quite sensitive to the skewness of the distribution of infrastructure, which, as we will see, makes it a somewhat flawed index for our purposes. Nonetheless, since it is widely used by economic geographers, we show it for comparative purposes.

-Index of Geographic Specialization in Computer Intensive Economic Activities: Because computer capacity inside each region may be widely used across all economic activities, or may be concentrated in just a few, we construct an index that measures the degree of specialization of the computing capacity existing in a region in a particular economic activity. For each group of economic activities we construct the index as follows:

$$\text{Regional Specialization Index of Computing Capacity} = \frac{\text{Mips in Region i used in Activity j / Mips in Region i}}{\text{National Mips used in Activity j / National Mips}}$$

If, for a given economic activity j, a region shows a ratio greater than one, we say that the computing capacity existing in this region is more specialized in the generation of activity j than is the computing capacity existing in the rest of the regions that present a ratio less or equal to one.

IV.2 Measures of Inequality in the Distribution of Infrastructure

We analyze changes in the inequality of the geographic distribution of computer and telecommunication infrastructure using a standard set of measures used in the study of income inequality: quantile ratios, the Gini coefficient, and the decile distribution ratio.

The analysis of quantile ratios allows us to compare the proportionate movement of the different quantiles of the distribution of the variable of interest. The quantile ratio is defined as the ratio Qth-quantile/Median. The comparison over time of these ratios illustrates whether the quantiles are moving closer to each other or if they are moving apart over time.

We also used the Gini coefficient for assessing changes in inequality of the geographic distribution of advanced computer and telecommunication infrastructure over time. The Gini coefficient is defined as:

$$G = \frac{1}{2n^2 \bar{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} | y_i - y_j |$$

where $\bar{y}$ is the mean of the variable, n is the total number of regions, and y_i and y_j are the values taken by the variable in region i and j, respectively. The definition corresponds to the average difference between all possible pairs of the variable among the regions, expressed as a proportion of the total sum of the variable. The Gini coefficient takes values in the interval [0,1], 0 representing total equality, and 1 representing the maximal inequality.

Finally, we also use the Decile Distribution Ratio (DDR) which is the ratio of the share of the bottom 40% in relation to the share of the top 20%. When this ratio increases, the inequality of the distribution decreases.

V. Results

V.1 Geographic Distribution of Information Infrastructure

In the analysis below we find strong evidence of a decreasing concentration of advanced backbone information technology across different regions of the U.S.. This pattern is evident in virtually all of our measures. It shows up both as a tendency for the poor regions to get richer and as a (weaker) tendency for the rich to get comparatively less rich.

The geographic distribution of advanced large-scale computer and fiber optic infrastructures in the U.S. is deceptively skewed. Many small geographic areas contain few large-scale computer users, low computing capacity, and low deployment of fiber optic cable in relation to geographic areas in the top of the distribution. However, most of the U.S. population lives within the territories that are most advanced. Table 1 contains the basic descriptive statistics documenting the changes in the distribution of backbone information technology infrastructure in the late 1980s and early 1990s.

In Table 1 we see that our three indicators of the stock of information infrastructure experienced changes in the distribution during the period 1986-1992. The number of sites that used large-scale computers decreased during the period, while the computer processing capacity and the deployment of fiber optic grew remarkably. The total number of millions of instructions per second (All Systems Mips) was almost five times larger in 1992 than in 1986. The miles of fiber optic deployed by the 101 largest LECs was nearly 24 times larger in 1992 than in 1986. The situation in 1986, when around 28% of the 101 LECs did not have fiber optic deployed in their operating areas, contrasts dramatically with the situation in 1992, when just around 4% did not. This advanced IT capital has diffused virtually everywhere.

The percentage of population living in regions with relatively low stock of information infrastructure is relatively small. Less than 15% of the population of the 101 largest LECs are served by LECs that have less than the median Number of Sites, All Systems Mips and Fiber Optic. In the case of fiber, the fraction of population that is served by the LECs that belong to the top ten percentile has increased from 15.4% in 1986 to 44.25% in 1992.

The dispersion of the distributions of the three variables decreased during 1986-1992. The coefficient of variation of the geographic distribution of large-scale computer users, Mips and Fiber Optic is consistently lower across the years. In particular, the largest changes in the coefficient of variation of the geographic distributions of Mips and Fiber Optic occurred during the period 1986-1989.

The quantile ratios (Table 2) show that the information infrastructure rich do not seem to be getting richer, but the poor are certainly improving their relative position. The bottom halves of the geographic distributions of MIPs, Sites and Fiber are getting closer to their medians. In the case of MIPs and Sites, there is no clear tendency in the movement of the quantile in the upper half of the distribution. In the case of Fiber, there is a tendency toward equalization of the amount of fiber deployed by the upper half of the distribution in relation to the median.

Table 3 shows that the ranking patterns of geographic areas according to the number of sites and total amount of MIPs seems to be quite stable over time. This is easy to understand since the unit of observation is not scale free. That is, despite rapid rates of growth overall, the bigger areas are still bigger and the smaller areas still smaller.

Fiber optics, however, does not show an identical pattern. The ranking pattern of geographic areas has changed between 1986 and 1989. Closer examination, not shown in the tables but revealed by the raw numbers in appendix 2, shows that the changes in the ranking pattern are due to changes in the deployment of fiber in the geographic areas that occupy the mid-size positions, and not in the areas that occupy the extreme positions of the ranking pattern. That is, areas that had a very small or a very large deployment of fiber optic in 1986 continue holding their position in the 1992 ranking pattern, but there was much growth among LECs with middle size fiber deployments.

The Gini coefficient and the Decile Distribution Ratio, shown in Table 4, reveal that the level of the two computer infrastructure variables show a slight reduction in inequality among regions.[14] The Decile Distribution Ratio corresponding to Number of Sites is almost twice the

[14] The Gini coefficient of the geographic distribution of number of sites decreased from 0.678 in 1986 to 0.662 in 1992, while the Gini coefficient of the distribution of All Systems MIPs decreased from 0.718 in 1986 to 0.702

ratio for All Systems Mips, implying that the presence of users of large-scale computer has become more concentrated in regions where the presence had been low, but these users are basically small capacity users.

The changes in the distribution of computing capacity at the LEC level are interesting, considering the increasing skewness of computing capacity at large-scale computing sites. That is, the sites themselves are becoming more concentrated even though regions are not.[15,16] The Decile Distribution Ratio shows the same pattern. Further, there is a reduction in inequality of Fiber Optic cable. Although the major changes occurred from 1986 to 1989, the reduction of the inequality in the geographic distribution of fiber optic deployment continued to 1992.[17]

V.2 The Geographic Distribution of Access to Information Infrastructure

We turn now to our analysis of access to information infrastructure. We find that virtually all the indices show that access to advanced information infrastructure has become more equally distributed. This seems to be the result of both increasing access to advanced IT at the poorer LECs and decreases in the relative richness of LECs with greater access. Further, much of the changes in these rankings are due both to turbulence in computing generally and in fiber optic

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in 1992.

[15] A smaller fraction of the sites is holding a large percentage of total MIPS. The Gini coefficient of the site distribution of All Systems MIPs (across all sites), presented in Table 5, was 0.729, 0.733, and 0.750 in 1986, 1989, and 1992, respectively.

[16] Just 25 local exchange operating areas show a reduction of the Gini coefficient of the site distribution of All Systems Mips from 1986 to 1992, 34 from 1986 to 1989, and 33 from 1989 to 1992. In only 8 local exchange operating areas the Gini coefficient of the site distribution of Total Mips systematically decreased during the years 1986, 1989 and 1992. These places were UTFL in Florida, CBKY in Kentucky, UTMO in Missouri, NWNE in Nebraska, NJNJ in New Jersey, UTPA in Pennsylvania, UTIM in Tennessee, and MSWY in Wyoming.

[17] The Gini coefficient decreased from 0.855 in 1986 to 0.67 and 0.65 in 1989 and 1992, respectively.

technology during the earlier years of our sample. Indeed, much of the interesting action in access to computing occurs within the LECs that occupy the middle ranks.

In Table 6 we present the descriptive statistics of access indices in two different forms. One includes Washington D.C. in the sample and one does not.[18] Clearly, there is variance in the level of access to advanced IT across the U.S.. While it is difficult to evaluate whether these differences are large or small, as there is no natural baseline against which to compare them, the degree of access increases over the time in three of the indices -- fiber/mile, MIPS/pop, and the networking index.

Table 7 compares the quantile ratios in 1992 and 1986. We find that for all five indices almost all of the quantiles are getting closer to the median in 1992, implying greater diffusion of information technology in geographic areas where the access to this technology used to be low.

In Table 8 we observe a high correlation among the index of access to computing technology and the index of power of computing capacity (0.92, 0.90, and 0.88 in 1986, 1989, and 1992, respectively). Similarly, the correlation over time of Number of Sites/ Population shows that for this access index the ranking of geographic areas stayed basically the same over the years. The small changes that have occurred in the ranking pattern of All Systems MIPs/Population are due to changes in the rank of those regions that are between the 20th and

[18] Our data are subject to what we label the "D.C. Effect." The "D.C. effect" is an artifact of the accidents of political boundaries. Washington D.C. is a dense urban area filled with office buildings and, to a lesser extent, residential population. It is a unique combination of much administrative work and low residential population and small geographic area. As a result, it reports extraordinarily high per/capita and per/mile statistics for all our infrastructure data. This one observation strongly skews the distribution of any access statistic we construct. We are fairly certain that similar statistics would result if we could collect them for a comparable area of downtown Manhattan, Boston's financial district, Chicago's business loop, downtown San Francisco, or any other major urban hub. However, all these other urban areas are combined with much of the residential outlying regions to form the LEC territory. For well known historical reasons Washington D.C. is the only major urban hub of such a small geographic size to be so dense, to have its own telephone regulator and report separate statistics to the FCC. Thus, we present all our results with and without D.C..

80th percentile of the distribution. That is, the position of the smallest stays the same over time, as well as the ranking of the largest.

Concerning the Fiber/Land access index, the ranking pattern of geographic areas in 1986 is different from the ranking pattern at the end of the period. Table 8 also shows that after correcting for the influence of population in the distribution of Number of Sites and Computer Capacity and for the influence of land in the distribution of fiber optic deployment, the places that have higher levels of Fiber/Land tend to be, in general, places with higher levels of Number of Sites/Population and All Systems MIPs/Population.[19]

The two composite indices we constructed, the networking index and relative information infrastructure index, agree in part with the same picture discussed above. The networking index shows that over time regions contain a larger level of access to information infrastructure. Furthermore, the networking index indicates that the differences between regions are getting smaller.[20]

Table 9 shows that most of the indices seem to have become more equally distributed across the period. As with our analysis above, the skewness in these data are somewhat deceptive. Going back to Table 6, we observe that most of the U.S. population lives within territories that are in the upper quartile. Most of the under-performing territories are also relatively unpopulated.

Finally, Figure 2 summarizes our findings in a picture. It classifies the LECs' geographic

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[19]In particular, the correlation among the Number of Sites/Population and Fiber/Land are 0.43, 0.52, and 0.48 in 1986, 1989, and 1992, respectively. The correlation among All Systems MIPs and Fiber/Land is around 0.48 in the three years.

[20]Although the dispersion of the relative information infrastructure is getting smaller, the mean distance to the 'desirable' levels is getting larger. We take little from this because of the potential problems of this index when the individual sub-indices are highly asymmetric.

areas by the level of their networking indices in 1986, 1989, and 1992. The darkest group corresponds to those areas with a networking index in the top decile of the distribution for 1989. The second darkest group represents the areas with a networking index above the median but below the top decile in 1989. The next shade of gray is for those areas with a networking index above zero and below the median in 1989. Areas with nothing are white.[21] We apply the same cardinal levels for determining the colors to the maps for 1986 and 1992. All three together illustrate growth over time.

As we can see from the maps, the highest levels of information infrastructure are located in the big urban centers of the U.S. Differences between regions never completely disappear, nor should we expect them to. Second, much has changed over time.[22] Looking at the evolution over time, we observe that substantial changes occurred in those areas that occupy the middle ranks, reducing degrees of inequality. Overall, the distribution follows the U.S. population, with major urban centers having the most advanced infrastructure.[23]

The remaining discussion reviews some of the factors associated with change over time. Our analysis identifies two principal factors. First, the distribution of information intensive industries tends to be less concentrated geographically than that of less information intensive

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[21] Though our rankings come from networking indices computed at the LEC level, we make white any county where we do not find any large-scale computer users (even if the local telephone company primarily responsible for that country has fiber optics in other parts of its region). This is a more accurate visualization of the distribution of access since it also reflects the distribution of industry and population. Fiber optics in the local exchange is unlikely to be located where there is no industry.

[22] In 1986 only six LECs had a networking index above the 1989 median. In contrast, in 1992 there was 33 LECs with a networking index above the 1989 top decile.

[23] In 1992, the top areas include LECs that cover San Francisco, San Diego, and Los Angeles, Seattle, Tuscon and Phoenix, Denver, Houston, Dallas, Minneapolis, Chicago, St. Louis, Detroit, Indianapolis, Cincinnati and Cleveland, Pittsburgh and Philadelphia, Buffalo, New York City and environs in Connecticut and New Jersey, Boston, Washington D.C. and its environs, Raleigh-Durham, Atlanta, Miami, St. Petersburg and Tampa.

ones and the former have grown over time. Second, the distribution of advanced information infrastructure tends to be less concentrated in big cities over time, reflecting a declining hold of economic hubs on this technology's diffusion.

V.3 Location of Information Technology Intensive Economic Activities

In this section, we show that the pattern of IT capital is less concentrated in regions specialized in information technology intensive activities than in regions specialized in less IT intensive activities. Thus, as information intensive industries grew in the 1980s and 1990s, in response to declining prices in information intensive inputs, so too did the decentralization of IT itself.

We see in Table 10 that the economic activities with the larger number of sites using large-scale computers were, in 1992, business services, wholesale trade, education services, depositary institutions, insurance carriers, health services, and computers and related equipment.[24] These activities accounted for 46% of the total number of sites.

In order to compare the degree of inequality of the distribution of computing capacity among economic activities, we analyze the distribution of All Systems MIPs in a given economic activity across sites and across regions. We compare economic activities that are IT intensive with those that are not, as measured either by a high share of sites or by a high share of All Systems MIPs. Table 10 shows a high inequality of computing capacity across sites in relation to the less information technology intensive economic activities. Nonetheless, the distribution of the computing capacity across regions is relatively less concentrated in the former group of activities

[24] This excludes federal/state/local government.

than in the latter. Moreover, economic activities included in the former group are developed in a much larger number of regions.

We also present in Table 10 the Gini coefficient of the distribution of the regional specialization index of computing capacity. The Gini coefficients corresponding to information technology intensive economic activities are smaller than the median of the Gini coefficients of for all groups of economic activities. For those activities less intensive in information technology, the geographic distribution of the specialization index of computer capacity looks like the locational pattern of industrial employment discussed in Krugman (1991). According to Krugman many industries in the U.S. are highly geographically concentrated and most of these industries are not high tech sectors.

This evidence supports the theory that the diffusion of information technology can help overcome a centralized pattern of location of economic activities where some regions remain in the 'periphery' without the benefits of accessing more advanced technology. [25]

V.4 What determines the distribution of IT capital across the U.S.?

The demand for information infrastructure in a region is conditioned on the particular characteristics of the region. Of course in the long run the direction of causality may go both ways, since the infrastructure endowment may shape the type of business located in a region as well as the region's productivity level.[26] A regression analysis helps describe the cross-sectional pattern of information infrastructure prevailing during 1986, 1989, and 1992 and show its

[25]See Capello (1994) for a discussion of the effects of the diffusion of information technology on regional development.

[26] For example, see Roller and Waverman (1996).

association with the economic and demographic characteristics existing in the regions.

We estimate a reduced form equation for the networking index existing in a region as a function of a set of demographic and economic variables of the region. The data correspond to the 101 local exchange companies over the years 1986, 1989, and 1992.

The analysis shows how much of the information infrastructure existing in a region is explained by the local per capita income, population density, the fraction of the local employment devoted to finance, insurance, and real state (FIRE), the size of urbanized and rural populations, and a set of dummy variables that describe the characteristics of the region's main cities. Local per capita income measures the buying capacity of the local population. FIRE measures how intensely the local economy uses information technology. Population density, urbanized population, and rural population are key factors in the decision to deploy fiber optic cable since they determine the potential population served by each mile of fiber optic deployed. Urbanized population represents the population served by the LEC in cities with a population of 50,000 or more, while rural population represents rural settlements with less than 5,000 people. The fraction of local employment in FIRE identifies the importance in the local economy of a group of activities intensive in data processing and transmission. We expect all these variables, except rural population, to have a positive impact in the regional demand for information infrastructure.

Finally, we include a set of dummies to identify the characteristics of the cities included within the boundaries of the local exchange company. One of these dummy variables measures whether the LEC contains within its boundary a city with a population over a quarter million inhabitants in 1990. This variable attempts to capture the existence of a critical mass of potential business users of information infrastructure located in an urban hub.[27] Another dummy variable specifies whether the LEC covers an area considered (by the U.S. census) as one of the fifty fastest growing areas in the U.S. between 1980 and 1990. Since most of the fast growing areas in the 1980s were extensions of suburban communities in the Sunbelt, rather than growth in concentrated urban hubs, this variable should limit the deployment of backbone information technologies.

Descriptive statistics for the variables in the regression are presented in Table 11, and the regression results are in Table 12. A test of structural change shows that we can reject the hypothesis that the regression parameters are the same not only in the three years taken together, but also in either of the subsamples of 1986-1989, 1986-1992, and 1989-1992. Thus, we report a separate regression equation for each year.

The explanatory power of the regression increases over time, as the R-squared increases. The elasticities of the important variables increase from one year to another. For example, in 1986, a 10% increase in population density led to a 0.8% increase in the networking index, while in 1992 it led to 3.8%. Variation in population density across regions induces substantial differences in the networking indices prevailing in those regions. In 1986, when evaluating the impact of other regressors at their mean level, one standard deviation around the mean of log of population density showed that the networking index fluctuated from 0 to 0.20. During that year approximately 90% of the sample had a networking index in this range. A similar calculation at the mean of log of population density in 1992 would have created a fluctuation in the networking index from 2.362 to 7.939. This interval includes the middle 20% of the sample in 1992.

[27] See appendix for the list of major cites in each LEC.

In 1992, the presence of a city with population over a quarter million within the boundaries of an LEC makes a difference in the level of networking index. Holding constant the influence of other variables, the presence of a relatively large city increases the expected value of the networking index by 65%. In the case of the variable FASTGROW, on the other hand, the same presence decreases the expected value of the networking index by 63% in 1992.

Because of the skewness of the data and the presence of outliers, we are concerned that OLS does not properly model the determinants of infrastructure. Therefore, we analyze whether the economic and demographic characteristics influence the deployment of information infrastructure in low level regions as it does in high level regions. In order to answer this question we perform quantile regressions that allow us to estimate different points of the conditional distribution of the networking index.

The $\tau\text{-}th$ conditional quantile function of a response variable for regressors $x \in R^P$ is $Q_y(\tau/x)=x\_\beta(\tau)$. Koenker and Basset (1978) obtain a point estimate $\beta(\tau)$ of $\beta(\tau)$ by solving the problem

$$\min_{b \in \mathrm{R}^p} \sum_{i=1}^{n} \rho_\tau (y_i - x'b)$$

where $\rho_\tau(u)=u(\tau - I(u<0))$, and I is the indicator function. This problem can be solved using linear programing and the results show that the vector of estimated coefficients may change from different values of $\tau\text{-}th$ quantiles. [28] The results of the quantile regression for each year are

28 We use the algorithms presented in Koenker and d' Orey (1987, 1994) for the estimation of coefficients and construction of confidence intervals.

presented in Table 13, where we estimate the 25-th, 50-th, and 75-th quantiles of the conditional distribution of the networking index.

Table 13 shows that demographic and economic characteristics of the regions are important in explaining the cross-sectional pattern of information infrastructure observed during 1986, 1989 and 1992. Their effects, however, vary across time and across quantiles. Variables like population density and employment in FIRE, whose impact vary over time, also have a differential impact across quantiles. While FIRE is very important in explaining the lower and middle quantiles of the distribution of the networking index, it is less important in explaining the top quantiles of the distribution. Other variables, like population density and the presence of major metropolitan and fast-growing areas, seem to be important determinants of the networking index across all quantiles. This suggests that as IT grew, a region did not need to have a large city to be in the top quartile of the distribution.

VI. Conclusion

Have well-known changes to the quality and price of advanced computer and telecommunication technologies altered the geographic pattern of the information technology capital stock? In this study, we have examined the distribution of advanced large-scale backbone computing and telecommunication capital between 1986 and 1992, a period of rapid growth in basic backbone digital technology. In all our estimates, we interpret the level of capital stock as a proxy for a whole variety of activities associated with building public and private digital IT networks in a region.

We find that virtually every index we analyze shows that these IT backbone technologies have become more widely distributed across the U.S. over time. This conclusion holds for both our analysis of the levels of advanced IT capital stock and for access to it. These changes are due both to increases in advanced IT at the bottom of the distribution and to declines in the relative wealth of the higher points in the distribution. We conclude that the recent period of rapid growth has contributed to a decrease in the concentration of advanced IT capital across the U.S..

These conclusions need to be stated carefully. We cannot argue on the basis of available evidence that the distribution of advanced IT capital matches some policy-relevant notion of an appropriate distribution. Indeed, no such distribution can be precisely defined given the inherent ambiguities of measuring the distribution of wealth and access to infrastructure. However, we can conclude that the period of rapid growth in advanced IT in the U.S. did not lead to an increased concentration of advanced IT capital. To the contrary, the evidence suggests that all regions, rural and urban, whether initially ahead or behind, became more alike over time.

Other market-driven changes are bound to follow on top of the growth in the information infrastructure backbone. Independent service providers, forms of electronic commerce, support services for digital communications, and high-speed fax machines, for example, all work better with advanced telecommunications networks. Many business services tied to local labor markets for technical help will also be aided. On-line-transaction-processing of large data bases, such as credit checking or inventory and reservation systems, all require advanced large-scale computing facilities to run well. To the extent that these services are more efficient as nationwide networks, it is important that advanced IT capital be widely diffused. Our analysis gives a positive conclusion about this concern. Our findings suggest that only a small number of areas, in particular small and less densely populated regions, may not have direct access to advanced IT capital. Furthermore, our analysis suggests that most areas have improved over time, easing the diffusion of nationwide services.

Finally, our results call for a more careful modulation of the debate regarding the redefinition of universal service in the new information infrastructure. It seems that in this instance market-driven investment has decreased the concentration of advanced IT over the period. Further research of these patterns may need to carefully focus on specific geographic areas of low access or specific populations whose experiences cannot be reflected in the data analyzed in this paper.

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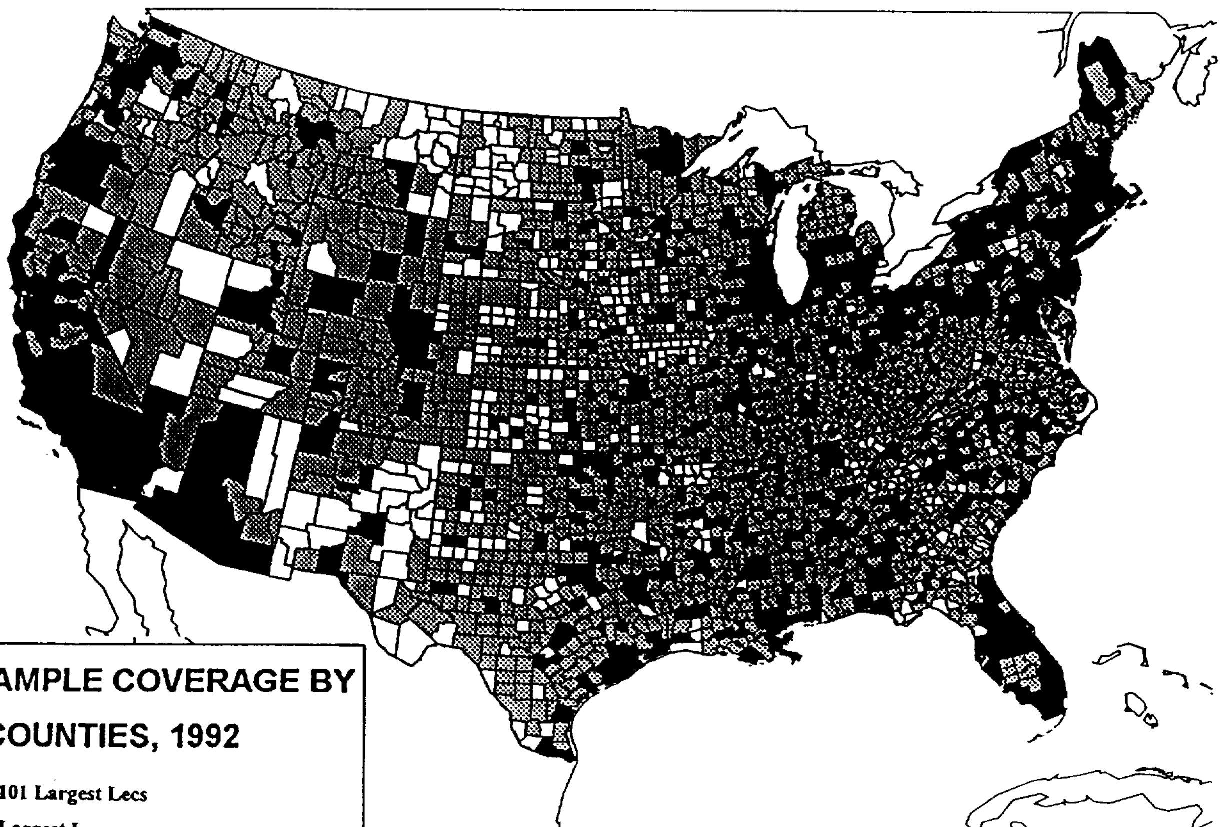

FIGURE 1: SAMPLE COVERAGE BY U.S. COUNTIES, 1992

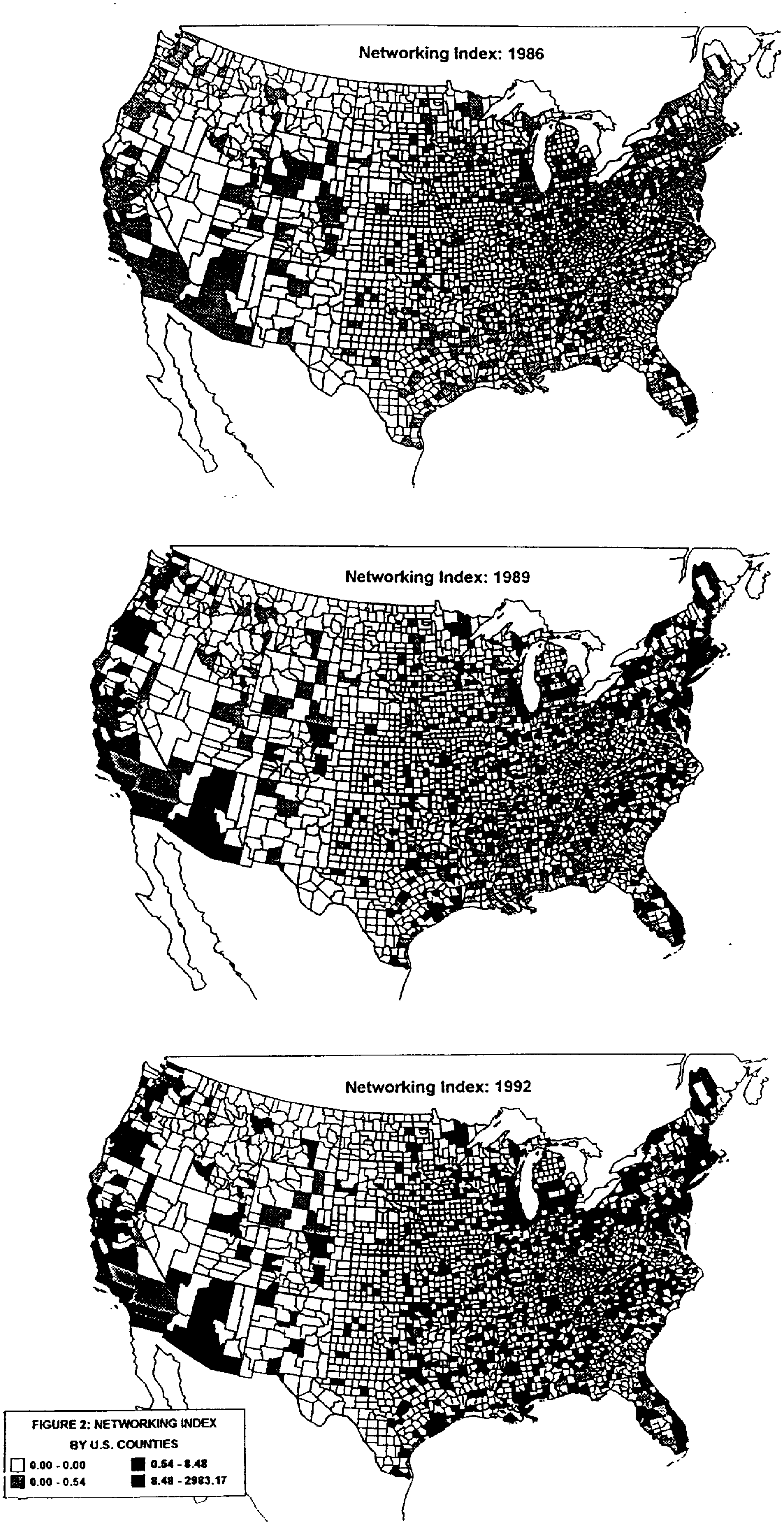

FIGURE 2: NETWORKING INDEX
BY U.S. COUNTIES

0.00 - 0.00
0.00 - 0.54
0.54 - 8.48
8.48 - 2983.17

TABLE 1: DESCRIPTIVE STATISTICS OF COMPUTER AND FIBER OPTIC INFRASTRUCTURES
LEC LEVEL

DESCRIPTIVE STATISTICS	No. SITES			ALL SYSTEMS MIPS			FIBER OPTIC (Miles)		
	1986	1989	1992	1986	1989	1992	1986	1989	1992
TOTAL	13,258	12,985	11,838	112,476.5	258,634.1	553,231.2	265,472	2,443,449	6,316,436
MEAN	131.3	128.6	117.2	1,113.6	2,560.7	5,477.5	2,628.4	24,192.6	62,539.0
MEDIAN	47	48	41	270.2	678.1	1,417.7	151	9,138	22,371
STD	218.0	208.9	184.9	2,030.4	4,476.8	9,491.1	7,148.3	37,972.0	89,721.6
CV	166.0	162.5	157.8	182.3	174.8	173.3	272.0	157.0	143.5
MIN	0	0	0	0	0	0	0	0	0
MAX	1,289	1,263	1,071	12,978.4	27,046.3	59,581.9	50,553	203,561	451,356
PERCENTAGE									
POPULATION BELOW*									
Median	12.38	11.91	12.58	13.19	13.57	14.04	14.02	13.79	13.80
75th-Quantile	29.95	30.11	30.27	31.46	32.13	31.17	38.78	31.81	32.28
90th-Quantile	54.15	54.34	54.59	54.71	54.34	55.66	84.60	55.73	55.75

* Percentage of Population in 101 largest LECs that is below the Qth-quantile of the variables listed in columns

TABLE 2: QUANTILES AND QUANTILES RATIOS
GEOGRAPHIC DISTRIBUTION OF COMPUTER AND FIBER OPTIC INFRASTRUCTURES
LEC LEVEL

	No. SITES			ALL SYSTEMS MIPS			FIBER OPTIC (Miles)		
	1986	1989	1992	1986	1989	1992	1986	1989	1992
QUANTILES									
10th	2	2	2	6.2	14.0	61.9	0	487	1,397
20th	13	13	13	52.3	109.9	274.5	0	2,053	5,442
30th	20	23	22	116.7	254.4	637.3	13	3,248	8,227
40th	32	34	30	206.9	471.6	963.4	89	4,830	15,344
50th	47	48	41	270.2	678.1	1,417.7	151	9,138	22,371
60th	69	63	60	492.8	1,261.9	3,023.2	365	14,798	42,111
70th	114	116	108	874.4	1,942.6	4,506.8	557	23,611	62,067
80th	197	194	173	1,774.9	3,536.4	7,931.6	1,390	33,848	93,111
90th	301	310	291	2,879.7	7,007.3	15,365.3	9,027	70,505	189,508
99th	942	873	796	8,816.4	18,709.7	44,205.7	33,837	184,734	385,781
QUANTILE RATIOS									
10th	0.043	0.042	0.049	0.023	0.021	0.044	0.000	0.053	0.062
20th	0.277	0.271	0.317	0.194	0.162	0.194	0.000	0.225	0.243
30th	0.426	0.479	0.537	0.432	0.375	0.450	0.086	0.355	0.368
40th	0.681	0.708	0.732	0.766	0.695	0.680	0.589	0.529	0.686
50th	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
60th	1.468	1.313	1.463	1.824	1.861	2.132	2.417	1.619	1.882
70th	2.426	2.417	2.634	3.236	2.865	3.179	3.689	2.584	2.774
80th	4.191	4.042	4.220	6.569	5.215	5.595	9.205	3.704	4.162
90th	6.404	6.458	7.098	10.658	10.334	10.838	59.781	7.716	8.471
99th	20.043	18.188	19.415	32.629	27.591	31.181	224.086	20.216	17.245

Quantile Ratios = Qth-Quantile/Median

TABLE 3 : SPEARMAN CORRELATION MATRIX
GEOGRAPHIC DISTRIBUTION COMPUTER AND FIBER OPTIC INFRASTRUCTURES
LEC LEVEL

		No. of Sites			All Systems Mips			Fiber Optic Cable		
		1986	1989	1992	1986	1989	1992	1986	1989	1992
No. of Sites	1986	1.0000	0.9975	0.9951	0.9719	0.9714	0.9676	0.7237	0.8611	0.8507
	1989		1.0000	0.9960	0.9670	0.9695	0.9966	0.7330	0.8696	0.8550
	1992			1.0000	0.9656	0.9681	0.9666	0.7345	0.8628	0.8550
All Systems Mips	1986				1.0000	0.9926	0.9829	0.7284	0.8546	0.8498
	1989					1.0000	0.9875	0.7229	0.8518	0.8434
	1992						1.0000	0.7429	0.8602	0.8489
Fiber Optic Cable	1986							1.0000	0.8282	0.8326
	1989								1.0000	0.9371
	1992									1.0000

* All coefficients have a p-value of 0.0001

TABLE 4: MEASURES OF INEQUALITY OF THE GEOGRAPHIC DISTRIBUTION LEVELS OF COMPUTER AND FIBER OPTIC INFRASTRUCTURES
LEC LEVEL

	1986	1989	1992
GINI COEFFICIENTS			
Number of Sites	0.667	0.669	0.661
All Systems Mips	0.718	0.708	0.702
Fiber optic	0.856	0.671	0.651
DECIL DISTRIBUTION RATIOS			
Number of Sites	0.056	0.060	0.066
All Systems Mips	0.031	0.035	0.037
Fiber optic	0.003	0.049	0.054

TABLE 5: MEASURES OF INEQUALITY OF DISTRIBUTION OF ALL SYSTEMS MIPS SITE LEVEL

YEAR	SAMPLE SIZE	GINI COEFFICIENT	DECILE DISTRIBUTION RATIO
1986	13,788	0.729	0.052
1989	13,553	0.733	0.044
1992	12,386	0.750	0.032

*Based on the sample that includes the 101 largest LECs and Other LECs. The coefficients remain practically the same when the sample is restricted to the 101 largest LECs

TABLE 6: INDICES OF ACCESS TO COMPUTER AND FIBER OPTIC INFRASTRUCTURES
DESCRIPTIVE STATISTICS
LEC LEVEL

	FIBER OPTIC / LAND			ALL SYSTEMS MIPS / POPULATION**			NUMBER OF SITES / POPULATION**			NETWORKING INDEX			RELATIVE INFORMATION INFRASTRUCTURE INDEX		
	1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992
							WASHINGTON D.C. INCLUDED								
MEAN	0.163	3.289	7.732	0.406	1.009	2.074	0.059	0.058	0.052	0.122	10.339	41.606	0.153	0.109	0.115
STD	0.436	14.833	31.525	0.423	1.326	2.257	0.102	0.102	0.078	0.556	79.517	296.620	0.017	0.012	0.015
CV	268.393	450.993	407.694	103.750	131.800	109.330	172.400	173.980	151.400	454.620	769.075	712.893	10.994	11.320	13.056
MIN	0	0	0	0	0	0	0	0	0	0	0	0	0.141	0.104	0.108
MAX	2.418	148.803	312.522	2.593	10.782	15.130	1.026	1.256	0.779	5.240	800.180	2983.170	0.255	0.225	0.257
							WASHINGTON D.C. EXCLUDED								
MEAN	0.144	1.834	4.685	0.387	0.965	1.999	0.058	0.057	0.050	0.071	2.441	12.192	0.144	0.143	0.133
STD	0.396	2.494	7.491	0.364	1.258	2.139	0.101	0.101	0.077	0.214	4.716	24.423	0.013	0.016	0.011
CV	275.248	136.005	159.911	93.935	130.344	106.979	175.249	177.288	153.393	300.000	193.195	200.313	9.201	11.009	8.404
MIN	0	0	0	0	0	0	0	0	0	0	0	0	0.133	0.131	0.121
MAX	2.418	13.246	57.795	2.577	10.782	15.130	1.026	1.026	0.779	1.222	28.973	178.881	0.232	0.266	0.185
PERCENTAGE															
POPULATION BELOW*															
Median	16.49	19.29	18.16	20.20	19.53	21.24	23.20	23.63	35.95	15.47	17.96	17.44	16.56	18.61	19.35
75th-Quantile	60.91	42.29	42.08	64.43	63.26	63.29	61.95	62.60	69.36	60.18	41.35	42.27	61.28	55.20	57.84
90th-Quantile	85.57	74.20	73.47	90.83	92.82	94.84	90.69	90.89	90.94	85.55	83.21	80.23	89.23	86.84	82.34

* Percentage of Population in 101 largest LECs (including Washington, D.C.) that is below the Qth-quantile of the variables listed in columns

** Denominator corresponds to 1,000 of people.

TABLE 7: QUANTILES AND QUANTILE RATIOS GEOGRAPHIC DISTRIBUTION
INDICES OF ACCESS TO COMPUTER AND FIBER OPTIC INFRASTRUCTURE
LEC LEVEL

	FIBER OPTIC / LAND			ALL SYSTEMS MIPS / POPULATION			NUMBER OF SITES / POPULATION			NETWORKING INDEX			RELATIVE INFORMATION INFRASTRUCTURE INDEX		
	1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992
							QUANTILES								
10TH	0.000	0.125	0.443	0.036	0.106	0.162	0.016	0.017	0.015	0.000	0.013	0.095	0.143	0.105	0.109
20TH	0.000	0.258	0.896	0.100	0.251	0.536	0.025	0.026	0.023	0.000	0.072	0.495	0.144	0.106	0.110
30TH	0.002	0.409	1.217	0.146	0.377	0.907	0.032	0.035	0.031	0.000	0.159	1.011	0.146	0.106	0.111
40TH	0.011	0.499	1.480	0.239	0.494	1.255	0.041	0.042	0.039	0.001	0.277	2.021	0.147	0.107	0.112
50TH	0.018	0.802	2.343	0.322	0.780	1.697	0.048	0.047	0.045	0.004	0.539	3.034	0.150	0.107	0.113
60TH	0.030	1.102	2.984	0.428	0.979	2.115	0.055	0.053	0.051	0.012	0.705	4.701	0.152	0.108	0.113
70TH	0.054	1.617	4.469	0.518	1.171	2.517	0.062	0.060	0.055	0.029	1.502	9.717	0.154	0.109	0.114
80TH	0.086	3.217	7.075	0.633	1.449	3.095	0.071	0.068	0.059	0.044	3.499	18.899	0.157	0.110	0.115
90TH	0.334	5.502	11.834	0.735	1.786	3.763	0.080	0.079	0.069	0.128	8.480	34.397	0.160	0.111	0.117
99TH	2.019	13.246	57.795	2.577	5.508	12.968	0.212	0.221	0.202	1.222	28.973	178.881	0.247	0.141	0.143
							QUANTILE RATIOS								
10TH	0.000	0.156	0.189	0.113	0.135	0.096	0.340	0.359	0.337	0.000	0.023	0.031	0.957	0.980	0.971
20TH	0.000	0.321	0.382	0.312	0.322	0.316	0.516	0.551	0.519	0.000	0.134	0.163	0.966	0.985	0.978
30TH	0.106	0.509	0.520	0.455	0.484	0.534	0.655	0.743	0.687	0.072	0.295	0.333	0.974	0.991	0.985
40TH	0.601	0.622	0.632	0.742	0.633	0.740	0.850	0.878	0.865	0.361	0.515	0.666	0.985	0.995	0.991
50TH	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
60TH	1.616	1.373	1.274	1.331	1.255	1.246	1.138	1.116	1.137	3.082	1.308	1.549	1.015	1.005	1.003
70TH	2.954	2.015	1.908	1.611	1.501	1.484	1.279	1.268	1.236	7.478	2.790	3.202	1.029	1.017	1.013
80TH	4.784	4.009	3.020	1.968	1.857	1.824	1.478	1.435	1.318	11.202	6.497	6.229	1.047	1.026	1.022
90TH	18.135	6.856	5.051	2.286	2.290	2.218	1.660	1.672	1.548	32.737	15.746	11.336	1.070	1.040	1.041
99TH	109.799	16.508	24.670	8.011	7.062	7.644	4.380	4.660	4.505	312.532	53.798	58.952	1.652	1.315	1.267

*Quantiles correspond to the distribution including Washington, D.C.

** Denominator corresponds to 1,000 of people.

TABLE 8: SPEARMAN CORRELATION MATRIX OF INDICES OF ACCESS TO COMPUTER AND FIBER OPTIC INFRASTRUCTURES
LEC LEVEL

		All Systems Mips / Population			No. of Sites/ Population			Fiber Optic/ Land			Networking Index			Relative Information Infrastructure Index		
		1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992
All Systems Mips / Population	1986	1.0000	0.9678	0.9246	0.9211	0.9079	0.8612	0.4808	0.5228	0.5587	0.6014	0.7754	0.8005	0.9089	0.9434	0.9168
	1989		1.0000	0.9395	0.9165	0.9038	0.8656	0.4557	0.5132	0.5574	0.5716	0.7795	0.8041	0.8961	0.9550	0.9215
	1992			1.0000	0.8686	0.8761	0.8815	0.4379	0.4492	0.4789	0.5509	0.7168	0.7831	0.8440	0.8975	0.9384
No. Sites / Population	1986				1.0000	0.9782	0.9305	0.4255	0.5258	0.5677	0.5440	0.7450	0.7746	0.8942	0.9365	0.9133
	1989					1.0000	0.9612	0.4337	0.5183	0.5499	0.5486	0.7338	0.7644	0.8838	0.9309	0.9204
	1992						1.0000	0.3813	0.4494	0.4828	0.4893	0.6710	0.7218	0.8390	0.8784	0.9168
Fiber / Land	1986							1.0000	0.6360	0.6424	0.9726	0.6633	0.6669	0.6675	0.5407	0.5283
	1989								1.0000	0.8975	0.6605	0.9039	0.8113	0.5780	0.6741	0.6134
	1992									1.0000	0.6730	0.8652	0.8816	0.6097	0.6896	0.6547
Networking Index	1986										1.0000	0.7347	0.7461	0.7568	0.6435	0.6276
	1989											1.0000	0.9543	0.7854	0.8695	0.8164
	1992												1.0000	0.8026	0.8750	0.8754
Relative Information Infrastructure Index	1986													1.0000	0.9160	0.8848
	1989														1.0000	0.9626
	1992															1.0000

*All coefficients have a p-value of 0.0001.

TABLE 9: MEASURES OF INEQUALITY OF THE GEOGRAPHIC DISTRIBUTION
INDICES OF ACCESS TO COMPUTER AND FIBER OPTIC INFRASTRUCTURES
LEC LEVEL

	1986	1989	1992
GINI COEFFICIENTS			
No. Sites/Population	0.415	0.402	0.388
All Systems Mips/Population	0.457	0.493	0.462
Fiber/Land	0.844	0.621	0.612
Networking Index	0.864	0.754	0.735
Relative Information Infrastructure Index	0.038	0.042	0.039
DECIL DISTRIBUTION RATIOS			
No. Sites/Population	0.362	0.391	0.411
All Systems Mips/Population	0.225	0.204	0.238
Fiber/Land	0.005	0.086	0.109
Networking Index	0.001	0.018	0.026
Relative Information Infrastructure Index	1.739	1.703	1.729

Washington DC excluded.

TABLE 10: CHARACTERISTICS OF THE DISTRIBUTION OF ALL SYSTEMS MIPS BY GROUP OF ECONOMIC ACTIVITIES, 1992
LEC LEVEL

ECONOMIC ACTIVITIES	Group Code	SIC Composition	Share of Sites	Share of All Systems Mips	Number of Lecs with Business in Econ. Activ.	GINI COEFFICIENT		
						Dist. All Systems Mips Across Sites	Dist. All Systems Mips Across Lecs	Dist. Specialization Index Computer Capacity across Lecs
Federal/State/Local Government	35	91-97	14.42	14.85	85	0.756	0.736	0.593
Business Services	31	73	11.67	11.93	79	0.788	0.785	0.604
Wholesale Trade	21	50-51	6.23	2.64	73	0.705	0.781	0.695
Education Services	34	82	6.10	6.63	83	0.735	0.691	0.647
Depositary Institutions	25	60	5.91	5.30	81	0.781	0.800	0.716
Insurance Carriers	28	63	5.49	7.95	66	0.719	0.725	0.618
Health Services	32	80	5.43	4.09	77	0.569	0.717	0.638
Computers and Related	11	35, 365-368	5.41	5.44	67	0.740	0.795	0.720
Legal, Social, Engin. Serv., Museums	33	81,83,84-89	3.79	3.50	55	0.766	0.847	0.764
Misc. Retail	22	52,55-59	3.04	1.83	58	0.725	0.797	0.782
Printing and Publishing	6	27	2.64	1.46	57	0.645	0.798	0.717
Manufacturing	3	21-25, 29	2.49	1.74	59	0.758	0.823	0.871
Chemicals	7	28	2.04	2.38	44	0.687	0.850	0.862
Misc. Manufacturing	8	30-32, 39	1.93	0.91	60	0.755	0.815	0.865
Transportation Services	16	40-47	1.85	2.99	47	0.760	0.811	0.785
Insurance Brokers and Real Estate	29	64-69	1.80	2.27	48	0.716	0.838	0.787
Fabricated Metals	10	34	1.55	0.46	49	0.696	0.829	0.831
Electrical Apparatus	12	361-364, 369	1.42	1.08	45	0.715	0.803	0.894
Food Products	4	20	1.41	0.96	48	0.665	0.836	0.909
Gas and Sanitary Services	20	492-495	1.34	1.61	52	0.613	0.801	0.796
Other Transportation Equip.	14	372-379	1.33	2.67	46	0.757	0.883	0.858
Instruments	15	38	1.29	0.95	42	0.624	0.835	0.872
Motor Vehicles and Equip.	13	371	1.25	1.31	39	0.767	0.892	0.876
Primary Metals	9	33	1.10	0.52	46	0.704	0.858	0.934
Security and Commercial Brokers	27	62	1.01	1.94	27	0.645	0.936	0.891
Electric Services	19	491	0.98	1.49	55	0.593	0.779	0.785
Food Stores	24	54	0.95	0.49	40	0.580	0.829	0.863
General Merchandise Stores	23	53	0.94	1.71	42	0.758	0.842	0.883
Non-Depositary Institutions	26	61	0.93	1.24	43	0.696	0.853	0.852
Paper and Allied Products	5	26	0.84	0.57	42	0.681	0.830	0.847
Telephone Communication	17	481	0.76	3.09	44	0.562	0.824	0.765
Hotel, Personal Services	30	70-72,75-79	0.75	0.62	30	0.697	0.893	0.903
Mining and Construction	1	10-12, 14-17	0.66	0.64	37	0.858	0.930	0.922
Other Communication Services	18	482-489	0.55	0.31	28	0.667	0.901	0.906
Oil and Gas Extraction	2	13	0.47	2.35	13	0.724	0.976	0.950
Agric, Forestry, Fish., and Hunting	0	1,2,7,8,9	0.22	0.08	17	0.740	0.957	0.964
DESCRIPTIVE STATISTICS								
Mean			2.78	2.78	50.67	0.704	0.830	0.810
Std. Dev.			3.11	3.19	17.65	0.067	0.064	0.103
Median			1.41	1.72	47.50	0.716	0.829	0.850
Min			0.22	0.08	13.00	0.562	0.691	0.593
Max			14.42	14.85	85.00	0.858	0.976	0.964

Economic Activities are presented in descending order of Share of Sites.

TABLE 11: DESCRIPTIVE STATISTICS ENDOGENOUS AND EXOGENOUS VARIABLES

	MEAN	STD. DEV	MEDIAN	MIN	MAX	NUM. OBS
ENDOGENOUS VARIABLES						
LOG (1+ NETWORKING INDEX)						
1986	0.0698	0.2260	0.0027	0.0000	1.8310	101
1989	0.7813	1.0885	0.3480	0.0000	6.6861	101
1992	1.6116	1.4891	1.3218	0.0000	8.0011	101
EXOGENOUS VARIABLES						
LOG PERCAPITA INCOME						
1986	9.5436	0.1553	9.5371	9.2287	9.9186	101
1989	9.5999	0.1613	9.5794	9.2831	10.0268	101
1992	9.6300	0.1470	9.6157	9.2978	10.0453	101
LOG POPULATION DENSITY						
1986	4.6411	1.2585	4.6750	-0.0202	9.2557	101
1989	4.6637	1.2696	4.6840	-0.0202	9.2334	101
1992	4.6966	1.2698	4.7140	-0.4080	9.1621	101
LOG (1+ URBANIZED POP)						
1986	5.5945	2.5217	6.0714	0.0000	9.9280	101
1989	5.6185	2.5334	6.1039	0.0000	9.9924	101
1992	5.6487	2.5436	6.1297	0.0000	10.0408	101
LOC (1+ RURAL POP)						
1986	5.6182	1.3252	5.9571	0.0000	7.5690	101
1989	5.6410	1.3281	5.9796	0.0000	7.5730	101
1992	5.6741	1.3266	6.0247	0.0000	7.5796	101
FRACTION POP EMPLOYED IN FIRE						
1986	0.0667	0.0175	0.0666	0.0338	0.1173	101
1989	0.0656	0.0176	0.0652	0.0343	0.1180	101
1992	0.0635	0.0174	0.0619	0.0323	0.1164	101
CITY OF QUARTER MILLION	0.3762	0.4869	0.0000	0.0000	1.0000	303
FAST GROWING AREA	0.1485	0.3574	0.0000	0.0000	1.0000	303

TABLE 12: REGRESSION RESULTS

REGRESSORS	ALL YEARS	1986-1989	1989-1992	1986	1989	1992
DUMMY 1986	-7.765 *	-4.702		2.868 *		
	-(1.987)	-(1.385)		(1.948)		
DUMMY 1989	-7.055 **	-3.981	-13.333 *		-9.802 *	
	-(1.793)	-(1.168)	-(2.918)		-(2.099)	
DUMMY 1992	-6.167		-12.460 *			-19.161 *
	-(1.568)		-(2.724)			-(2.465)
LOG POP DENSITY	0.320 *	0.264 *	0.414 *	0.081 *	0.430 *	0.385 *
	(5.418)	(4.022)	(7.085)	(2.373)	(5.826)	(4.513)
LOG PERCAPITA INCOME	0.645	0.393	1.245 *	-0.299 *	0.920 **	1.911 *
	(1.509)	(1.078)	(2.531)	-(1.963)	(1.841)	(2.299)
LOG (1 + URBANIZED POP)	0.071 **	0.027	0.106 *	0.023	0.045	0.164 *
	(1.648)	(0.630)	(2.215)	(1.266)	(0.788)	(2.357)
LOG(1 + RURAL POP)	-0.182 **	-0.154	-0.240 *	-0.090	-0.238	-0.232
	-(1.709)	-(1.274)	-(2.106)	-(1.530)	-(1.555)	-(1.413)
CITY OF QUARTER MILLION	0.397 *	0.278 *	0.574 *	0.112 *	0.487 *	0.654 *
	(3.634)	(2.679)	(4.446)	(2.419)	(3.464)	(3.246)
FAST GROWING AREA	-0.370 *	-0.210 *	-0.526 *	0.002	-0.398 *	-0.632 *
	-(3.466)	-(2.117)	-(3.928)	(0.027)	-(2.706)	-(2.958)
FRACTION POPULATION EMPLOYED IN FIRE	11.041 *	6.678	13.532 *	0.367	11.324 *	14.006 *
	(2.475)	(1.604)	(3.048)	(0.284)	(2.468)	(2.071)
Adj. R-squared	65.827	55.147	74.102	32.141	72.583	73.455
Number Observ.	303	202	202	101	101	101
Residual Sum of Squares	151.177	60.604	88.575	3.347	27.493	51.417

Numbers in parentheses are t-statistics. All standard errors and associated t-statistics were computed using White's covariance matrix estimator and are heterokedastic-consistent.

* Significant at 5%

** Significant at 10%

TABLE 13: QUANTILE REGRESSION RESULTS

INDEPENDENT VARIABLES	25th-Quantile Coeff.	Median Coeff.	75th-Quantile Coeff.
1986			
CONSTANT	0.04705	0.10128	0.49590
LOG POPULATION DENSITY	0.00472 *	0.00479 *	0.00770 *
LOG PERCAPITA INCOME	-0.00891	-0.01337 **	-0.05769
LOG (1 + URBANIZED POP)	0.00002	0.00127 **	0.00105
LOG (1 + RURAL POP)	0.00043	-0.00263	-0.00356
CITY OF QUARTER MILLION	0.01027 *	0.01646 *	0.09590 *
FAST GROWING AREA	-0.00789	-0.00685	0.00162
FRAC. EMPLOYMENT IN FIRE	0.27111 *	0.31648 *	0.77440 *
1989			
CONSTANT	-6.41506	-5.45145 *	-10.67881
LOG POPULATION DENSITY	0.32208 *	0.36835 *	0.40033 *
LOG PERCAPITA INCOME	0.46640	0.42408 **	1.05834
LOG (1 + URBANIZED POP)	-0.01606	0.02111	0.05882
LOG (1 + RURAL POP)	0.00294	-0.17246	-0.30329 *
CITY OF QUARTER MILLION	0.42706 *	0.46340 *	0.61243 *
FAST GROWING AREA	-0.28270	-0.35025 *	-0.58906
FRAC. EMPLOYMENT IN FIRE	13.78780 *	18.24785 *	14.91867
1992			
CONSTANT	-7.00038	-11.40842 *	-27.91650
LOG POPULATION DENSITY	0.34150 **	0.36465 *	0.45181 *
LOG PERCAPITA INCOME	0.41513	1.01907 *	2.93146
LOG (1 + URBANIZED POP)	0.04554	0.13919 *	0.22632 *
LOG (1 + RURAL POP)	0.03024	-0.16368	-0.38446 *
CITY OF QUARTER MILLION	0.56877 *	0.60194 *	0.44301 **
FAST GROWING AREA	-0.88925 *	-0.72134 *	-0.31901 **
FRAC. EMPLOYMENT IN FIRE	35.45870 **	25.40275 *	7.54589

Estimation based on algorithms in Koenker and d'Orey (1987, 1994). Confidence intervals are computed using regression rank score inversion.

* Significant at 5%

** Significant at 10%

APPENDIX 1: GEOGRAPHIC AND ECONOMIC INDICATORS OF LOCAL EXCHANGE COMPANIES

STATE	LOCAL EXCHANGE COMPANY NAME	LEC CODE	MAIN CITIES	POPULATION 1992 (1,000)	LAND (Sq. miles)	POPULATION DENSITY 1992	OPERATING REVENUE 1992 (US$ 1987)	% LOCAL REVENUE 1992
AL	GTE South, Inc.	GTAL	Dothan	821.2	5,775	41.1	91,486	35.84
	South Central Bell Telephone Co.	SBAL	Huntsville, Birmingham, Montgomery, Mobile.	3,316.3	27,067	107.8	905,277	56.40
AR	GTE Southwest, Inc.	GTAR	Bentonville, Fort Smith	486.0	6,086	42.6	47,614	37.62
	Southwestern Bell Telephone Co.	SWAR	Little Rock	1,468.1	18,620	63.4	418,079	47.94
AZ	The Mountain States Telephone and Telegraph Co.	MSAZ	Phoenix, Tempe, Tucson.	3,568.8	27,105	47.8	890,505	52.65
CA	Contel of California, Inc	COCA	San Bernardino, Bakersfield.	2,286.7	19,049	46.7	319,948	24.20
	GTE California	GTCA	Riverside, Santa Barbara.	2,350.5	10,916	199.3	2,308,162	33.58
	Pacific Bell	PTCA	Los Angeles, San Diego, San Francisco.	26,130.4	51,142	333.7	6,422,464	42.72
CO	The Mountain States Telephone and Telegraph Co.	MSCO	Denver, Boulder, Colorado Springs.	2,913.6	75,486	35.6	1,096,924	47.91
CT	The Southern New England Telephone Co.	SNCT	State	3,279.0	4,938	676.7	1,150,364	36.02
DC	The Chesapeake and Potomac Telephone Co.	CDDC	D.C.	585.2	61	9,529.4	444,751	52.07
DE	The Diamond State Telephone Co.	DSDE	State	690.9	2,057	353.5	192,992	43.17
FL	Central Telephone Company of Florida	CEFL	Tallahassee	578.9	4,448	88.2	146,603	38.61
	GTE Florida, Inc.	GTFL	Tampa, St Petersburg.	2,633.4	5,164	561.2	952,542	43.18
	Southern Bell Telephone and Telegraph Co.	SBFL	Jacksonville, Miami, Orlando.	7,980.2	20,905	404.8	2,583,836	44.59
	United Telephone Company of Florida	UTFL	Fort Myers	1,799.5	16,139	119.3	612,396	33.67
GA	GTE South, Inc.	GTGA	Dalton	891.1	8,800	93.2	148,439	37.60
	Southern Bell Telephone and Telegraph Co.	SBGA	Atlanta, Savannah, Columbus.	4,975.0	27,248	186.5	1,684,576	54.68
IA	GTE North, Inc.	GTIA	Ames, Dubuque.	446.3	9,252	38.5	68,181	31.87
	Northwestern Bell Telephone Co.	NWIA	Des Moines, Cedar Rapids.	1,510.8	12,773	74.4	474,810	41.59
	United Telephone Company of Missouri	UTIA	Newton	132.4	3,364	26.5	n.a.	n.a.
ID	GTE Northwest, Inc.	GTID	Moscow	177.3	6,824	15.8	71,967	27.01
	The Mountain States Telephone and Telegraph Co.	MSID	Boise	733.0	20,676	24.1	184,920	39.26
IL	Central Telephone Company of Illinois	CEIL	O'Hare Airport	16.6	1,400	37.4	108,092	54.70
	Contel of Illinois, Inc	COIL	Freeport, Effingham. Dixon.	491.5	9,216	54.2	100,305	34.69
	GTE North, Inc.	GTIL	Bloomington, Decatur, Normal.	1,265.3	20,203	59.9	287,139	42.33
	Illinois Bell Telephone Co.	LBIL	Chicago, Urbana, Springfield, Moline.	9,539.7	12,009	538.3	2,431,897	60.15
IN	General Telephone Company of Indiana, Inc	GTIN	Fort Wayne, Terre Haute.	1,721.3	7,473	124.3	379,552	37.49
	Indiana Bell Telephone Company, Inc	NBIN	Indianapolis, Evansville, South Bend.	3,019.1	10,377	248.3	864,429	45.87
	United Telephone Company of Indiana, Inc	UTIN	Jasper	454.3	6,102	88.0	117,354	30.92
KS	Southwestern Bell Telephone Co.	SWKS	Wichita, Topeka, Kansas City.	1,851.9	29,200	50.4	594,440	39.33
	United Telephone Company of Missouri	UTKS	Manhattan	7.7	7,988	4.2	n.a.	n.a.
KY	Cincinnati Bell Telephone Co.*	CBKY	Crestview Hills	327.0	4,298	272.7	n.a.	n.a.
	General Telephone Company of the South	GTKY	Lexington	917.5	6,920	90.2	227,989	41.39
	South Central Bell Telephone Co.	SCKY	Louisville	2,070.9	19,227	107.2	539,054	52.09
LA	South Central Bell Telephone Co.	SCLA	New Orleans, Baton Rouge, Shreveport.	3,692.6	33,735	117.2	1,074,585	57.19
MA	New England Telephone and Telegraph Co.	NEMA	State	5,992.8	8,140	764.6	2,036,953	47.31
MD	The Chesapeake & Potomac Teleph. Co. Maryland	CMMD	State	4,917.4	10,418	503.1	1,524,391	52.76
ME	New England Telephone and Telegraph Co.	NEME	State	1,236.4	12,908	40.1	355,958	32.15
MI	GTE North, Inc.	GTMI	Holland, Muskegon.	1,501.3	17,450	84.5	319,386	30.94
	Michigan Bell Telephone Co.	MBMI	Detroit, Lansing, Grand Rapids.	7,755.6	25,064	243.9	2,214,732	43.64
MN	General Telephone Company of the Midwest	GTMN	Austin	37.2	474	52.3	1,879	32.48
	Northwestern Bell Telephone Co.	NWMN	Minneapolis, St Paul.	3,576.7	23,882	84.9	877,805	50.42
MO	GTE North, Inc.	GTMO	Columbia, Springfield.	1,330.5	4,215	53.6	56,390	21.70
	Southwestern Bell Telephone Co.	SWMO	Kansas City, St Louis + Suburbs.	3,129.1	19,475	164.6	1,081,866	51.16
	United Telephone Company of Missouri	UTMO	Jefferson City	406.0	7,876	42.1	121,789	23.88
MS	South Central Bell Telephone Co.	SCMS	Jackson	2,376.8	39,212	59.0	670,320	47.93
MT	General Telephone Company of the Northwest, Inc	GTMT	Libby	17.7	3,427	4.9	5,055	26.34
	The Mountain States Telephone and Telegraph Co	MSMT	Helena	472.7	34,384	6.9	181,710	42.19
NC	Central Telephone Company	CENC	Wilkesboro	606.5	3,470	110.3	95,772	41.46
	Carolina Telephone and Telegraph Co.	CTTC	Greenville	1,911.9	4,339	92.3	466,056	35.75
	GTE South, Inc.	GTNC	Research Triangle, Durham.	188.1	862	647.2	134,353	33.02
	Southern Bell Telephone and Telegraph Co.	SBNC	Charlotte, Raleigh, Winston-Salem.	2,891.7	12,789	255.5	1,011,213	45.37

APPENDIX 1 CONTINUATION

STATE	LOCAL EXCHANGE COMPANY NAME	LEC CODE	MAIN CITIES	POPULATION 1992 (1,000)	LAND (Sq. miles)	POPULATION DENSITY 1992	OPERATING REVENUE 1992 (US$ 1987)	% LOCAL REVENUE 1992
ND	Northwestern Bell Telephone Co.	NWND	Grand Forks, Fargo.	330.0	28,430	11.3	139,111	37.62
NE	GTE North, Inc.	GTNE	Columbus	125.9	4,422	23.7	24,606	27.32
	The Lincoln Telephone and Telegraph Co.	LTNE	Lincoln	379.5	10,167	41.6	130,276	41.86
	Northwestern Bell Telephone Co.	NWNE	Omaha	786.2	21,114	21.8	349,486	34.83
NH	New England Telephone and Telegraph Co.	NENH	Portsmouth, Manchester, Nashua.	995.2	8,163	123.9	350,394	38.48
NJ	New Jersey Bell Telephone Co.	NJNJ	Rosela, Princenton, Jersey City, Newark.	7,479.9	6,675	1,224.3	2,604,891	34.24
NM	GTE Southwest, Inc.	GTNM	Hobbs	56.7	2,589	12.9	24,481	36.92
	The Mountain States Telephone and Telegraph Co.	MSNM	Los Alamos, Albuquerque, Santa Fe.	1,114.4	61,404	34.4	346,442	46.40
NV	Central Telephone Co.	CENV	Las Vegas	845.6	1,636	106.9	174,322	47.17
	Contel of California, Inc	CONV	Stateline	53.4	1,643	19.8	n.a.	n.a.
	Nevada Bell	PTNV	Reno, Carson City.	376.0	5,967	6.0	133,090	38.26
NY	GTE New York	GTNY	Binghamton	1,007.0	11,190	92.8	150,888	29.87
	New York Telephone Co.	NYNY	New York, Albany, Syracuse, Buffalo.	15,887.8	28,126	499.8	6,333,320	60.19
	Rochester Telephone Corp.	RTNY	Rochester	885.4	2,454	457.4	244,671	47.84
OH	Cincinnati Bell Telephone	CBOH	Cincinnati	1,335.2	2,761	1,006.4	482,330	50.23
	General Telephone Company of Ohio	GTOH	Dayton	2,160.4	15,174	145.0	405,884	38.31
	The Ohio Bell Telephone Co.	OHOH	Columbus, Cleveland, Akron.	5,511.4	11,513	486.0	1,686,172	54.96
	United Telephone Company of Ohio	UTOH	Sidney	1,313.6	8,762	147.6	302,539	37.68
OK	GTE Southwest, Inc.	GTOK	Shawnee	142.4	6,814	24.4	73,881	34.44
	Southwestern Bell Telephone, Co.	SWOK	Tulsa, Oklahoma City.	2,632.5	30,322	67.5	677,004	48.51
OR	GTE Northwest, Inc.	GTOR	Beaverton	560.0	4,097	53.3	190,937	43.62
	Pacific Northwest Bell Telephone Co.	PNOR	Portland, Medford, Eugene.	1,630.9	26,069	33.4	574,642	42.39
PA	GTE New York/Contel New York	COPA	Allentown, Williamsport.	486.4	1,925	197.7	n.a.	n.a.
	GTE North, Inc.	GTPA	Erie, York.	883.5	4,787	231.4	227,467	40.46
	The Bell Telephone Company of Pennsylvania	PAPA	Pittsburgh, Philadelphia, Harrisburg.	8,557.3	18,230	395.9	2,588,097	43.03
	United Telephone Company of Pennsylvania	UTPA	Camp Hill	675.5	5,809	147.1	165,432	28.63
RI	New England Telephone and Telegraph Co.	NERI	State	1,001.4	1,206	958.3	271,481	51.31
SC	General Telephone Company of the South	GTSC	Georgetown	71.3	2,292	47.5	97,466	39.79
	Southern Bell Telephone and Telegraph Co.	SBSC	Aiken, Columbia, Greenville.	2,404.5	14,183	156.1	721,545	51.48
SD	Northwestern Bell Telephone Co.	NWSD	Pierre, Vermillion, Aberdeen.	447.7	33,070	10.5	136,850	42.67
TN	General Telephone Company of the South	GTTN	Martin	121.8	1,333	73.2	35,836	37.34
	South Central Bell Telephone Co.	SCTN	Memphis, Nashville, Chattanooga, Knoxville.	4,105.9	25,131	149.0	1,057,513	53.95
	United Inter-Mountain Telephone Co.	UTIM	Kingsport	405.8	2,279	158.4	139,645	40.30
TX	General Telephone Company of the Southwest	GTTX	College Station, Corpus Christi, Texarkana.	1,742.3	43,845	26.4	819,936	31.12
	Southwestern Bell Telephone Co.	SWTX	Houston, Dallas , Austin, San Antonio.	13,639.9	78,930	142.0	3,635,518	48.46
UT	The Mountain States Telephone and Telegraph Co.	MSUT	Salt Lake City, Ogden, Provo.	1,672.2	32,464	41.9	356,488	43.81
VA	Central Telephone Company of Virginia	CEVA	Bassett, Altavista,	623.9	6,698	84.4	124,581	36.81
	Contel of Virginia, Inc	COVA	Quantico, Chesapeake.	986.3	9,712	105.9	233,193	39.02
	The Chesapeake & Potomac Teleph. Co. of Virginia	CVVA	Richmond, Reston, Arlington, Alexandria.	4,387.3	15,348	292.2	1,447,258	48.83
	General Telephone Company of the South	GTVA	Tazewell	78.5	979	76.7	20,123	36.03
VT	New England Telephone and Telegraph Co.	NEVT	Montpelier, Burlington.	392.3	7,232	66.2	188,590	39.17
WA	GTE Northwest, Inc.	GTWA	Everett	659.1	7,788	78.1	369,893	36.96
	Pacific Northwest Bell Telephone Co.	PNWA	Seattle, Olympia, Spokane.	3,684.2	20,444	96.5	1,081,120	37.39
WI	GTE North, Inc.	GTWI	Madison, Wausau.	1,208.2	19,100	56.6	170,490	46.45
	Wisconsin Bell,Inc.	WBWI	Milwaukee, Green Bay, Appleton, Racine.	2,960.2	8,449	225.9	900,570	43.80
WV	The Chesapeake & Potomac Teleph. Co. West Virginia	CWWV	Charleston	1,340.6	15,143	92.6	464,015	48.96
	General Telephone Company of the South	GTWV	Princeton, Bluefield.	192.0	2,247	73.5	47,541	42.85
WY	The Mountain States Telephone and Telegraph Co.	MSWY	Cheyenne, Casper.	437.2	58,013	5.1	120,761	39.20

* Cincinnati Bell Telephone Company of Kentucky's revenue is included in Cincinnati Bell Telephone Company of Ohio.

APPENDIX 2: DISTRIBUTION OF COMPUTER CAPACITY AND FIBER OPTIC DEPLOYMENT

LEC LEVEL

STATE	LEC	No. SITES			ALL SYSTEMS MIPS			POPULATION			% MAINFRAME MIPS			FIBER OPTIC		
		1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992
AL	GTAL	13	13	15	18.9	49.1	61.9	791.2	799.4	821.2	88.9	93.5	93.2	0	2,706	7,274
	SBAL	177	171	173	1,007.6	2,330.1	5,746.4	3,200.8	3,230.8	3,316.3	95.5	85.8	70.0	9,027	20,199	70,541
AR	GTAR	25	24	25	117.0	399.3	876.3	461.2	470.1	486.0	99.1	96.8	70.8	0	917	4,134
	SWAR	62	71	61	363.0	678.1	1,843.0	1,449.2	1,448.3	1,468.1	96.5	86.1	77.9	240	7,858	22,371
AZ	MSAZ	136	134	129	1,465.5	3,902.5	7,552.0	3,083.3	3,376.1	3,568.8	95.2	93.8	87.5	10,274	29,330	121,129
CA	COCA	41	49	39	152.8	578.1	846.9	1,788.6	2,061.1	2,286.7	89.6	72.7	50.0	0	4,907	11,069
	GTCA	48	58	51	236.8	730.2	1,369.5	1,863.3	2,141.3	2,350.5	69.7	76.2	47.2	150	34,091	53,771
	PTCA	1291	1261	1071	12,980.4	27,042.2	59,630.1	23,342.4	24,896.9	26,130.4	94.2	88.9	78.1	2,778	203,561	306,093
CO	MSCO	215	193	155	1,948.3	4,257.4	10,043.5	2,739.7	2,766.2	2,913.6	93.0	85.9	83.2	13,545	30,851	189,508
CT	SNCT	301	275	223	3,033.9	5,863.9	10,288.7	3,224.1	3,283.5	3,279.0	95.6	91.8	82.6	415	39,866	97,694
DC	CDDC	135	138	118	1,655.1	3,356.6	5,586.0	638.3	624.2	585.2	95.4	88.4	74.6	124	9,138	19,192
DE	DSDE	40	48	46	377.7	1,234.5	2,771.1	627.7	658.2	690.9	96.8	91.6	73.7	134	9,814	16,894
FL	CEFL	24	24	29	212.8	617.7	2,921.3	497.0	535.6	578.9	89.5	91.0	87.7	107	2,002	4,144
	GTFL	98	113	108	801.7	1,850.8	4,332.5	2,388.5	2,533.7	2,633.4	96.0	89.1	75.6	581	23,611	38,518
	SBFL	291	310	291	2,863.7	6,580.7	14,347.4	6,864.2	7,446.6	7,980.2	97.1	93.7	84.9	50,553	111,492	247,379
	UTFL	27	29	29	122.0	322.2	365.5	1,464.6	1,653.3	1,799.5	96.1	85.3	71.7	557	20,321	37,809
GA	GTGA	18	25	16	88.8	320.5	401.2	804.3	846.6	891.1	94.3	91.3	93.9	0	4,000	11,324
	SBGA	318	330	297	2,234.4	7,014.1	14,287.8	4,454.9	4,701.9	4,975.0	96.0	93.9	77.0	33,837	112,594	192,426
IA	GTIA	20	18	17	140.7	331.4	789.5	453.9	446.5	446.3	81.0	68.3	37.6	18	1,269	4,821
	NWIA	123	123	112	874.4	1,673.0	3,903.7	1,472.1	1,477.7	1,510.8	89.7	87.2	78.5	488	16,285	132,330
	UTIA	2	2	2	6.2	14.0	60.8	136.6	132.5	132.4	100.0	98.6	74.8	0	0	0
ID	GTID	1	1	1	4.1	4.1	6.6	166.1	164.1	177.3	100.0	100.0	100.0	0	455	656
	MSID	25	27	26	116.7	471.6	916.6	673.8	682.1	733.0	85.2	84.0	73.7	2,494	5,225	35,455
IL	CEIL	0	0	0	0.0	0.0	0.0	17.5	16.9	16.6	0.0	0.0	0.0	0	358	1,269
	COIL	27	29	28	60.0	236.4	582.1	491.5	487.2	491.5	92.5	92.8	52.2	58	7,395	6,851
	GTIL	49	46	49	493.3	1,621.8	3,371.6	1,270.7	1,257.0	1,265.3	97.6	97.0	89.1	0	10,412	22,655
	LBIL	842	821	728	6,336.1	15,618.2	29,848.6	9,305.9	9,348.2	9,539.7	96.4	91.2	81.7	1,390	70,505	174,087
IN	GTIN	100	91	85	691.8	1,513.7	3,146.7	1,658.6	1,683.6	1,721.3	89.8	90.8	76.6	160	8,522	22,303
	NBIN	211	201	178	1,438.0	3,031.9	6,961.2	2,931.6	2,953.1	3,019.1	92.7	87.3	78.9	15,166	32,895	61,171
	UTIN	8	10	10	11.7	109.9	178.0	425.0	437.2	454.3	95.7	92.9	63.3	85	1,230	5,449
KS	SWKS	131	120	124	1,146.6	2,280.8	5,738.1	1,751.0	1,805.2	1,851.9	93.0	93.4	85.7	537	34,723	78,439
	UTKS	8	8	6	20.1	84.1	116.5	7.8	7.8	7.7	100.0	98.1	66.7	0	0	0
KY	CBKY	9	9	7	52.3	78.7	218.9	302.8	313.5	327.0	97.5	99.4	84.4	7	2,357	2,622
	GTKY	36	37	25	239.0	496.2	785.1	894.6	896.8	917.5	94.7	86.3	78.8	0	7,650	20,229
	SCKY	95	93	85	614.5	1,634.5	3,023.2	2,061.7	2,040.5	2,070.9	95.3	92.2	87.2	9,882	20,496	45,968
LA	SCLA	172	165	157	930.8	1,971.1	4,054.1	3,806.3	3,672.3	3,692.6	95.7	92.8	68.4	17,663	33,848	62,098
MA	NEMA	458	416	368	3,737.5	7,495.3	15,365.3	5,903.6	6,015.4	5,992.8	89.0	78.4	60.9	652	107,826	209,948
MD	CMMD	280	286	272	2,756.3	7,007.3	15,907.8	4,487.5	4,727.2	4,917.4	96.4	92.3	86.9	411	59,892	158,149
ME	NEME	41	43	38	279.5	601.7	1,485.0	1,170.4	1,219.9	1,236.4	94.3	82.2	69.5	355	17,491	38,801
MI	GTMI	47	49	58	119.6	376.8	772.9	1,405.7	1,450.3	1,501.3	90.5	85.2	61.0	0	3,494	19,892
	MBMI	447	459	437	3,616.8	8,034.2	17,718.2	7,555.1	7,631.3	7,755.6	95.6	92.4	81.5	1,120	83,367	256,583
MN	GTMN	1	1	2	4.1	14.0	62.4	38.6	37.5	37.2	100.0	100.0	54.3	0	96	209
	NWMN	268	275	257	2,879.7	6,771.9	16,177.2	3,344.1	3,467.0	3,578.7	96.1	94.8	86.1	811	37,672	179,623
MO	GTMO	52	50	51	225.4	497.6	1,206.3	1,217.4	1,273.1	1,330.5	86.1	81.0	51.6	0	1,381	1,869
	SWMO	303	283	258	2,261.8	5,641.6	12,490.2	3,096.0	3,104.6	3,129.1	96.1	92.2	88.5	797	51,567	111,613
	UTMO	13	16	20	193.8	299.1	560.0	388.4	395.5	406.0	99.7	90.4	84.1	0	2,139	7,054
MS	SCMS	91	99	98	321.4	966.5	3,742.7	2,369.7	2,345.2	2,378.8	97.9	97.0	81.7	9,013	26,393	52,458
MT	GTMT	0	0	0	0.0	0.0	0.0	18.0	17.5	17.7	0.0	0.0	0.0	0	0	0
	MSMT	11	15	14	67.5	188.2	275.0	461.6	457.2	472.7	90.4	70.3	93.4	89	1,861	42,111
NC	CENC	28	27	24	89.2	222.7	571.7	576.1	590.3	606.5	98.4	94.3	83.8	0	3,085	4,549
	CTTC	45	48	39	173.1	444.5	963.4	1,812.7	1,863.0	1,911.9	86.3	71.9	64.7	365	11,356	35,790
	GTNC	27	27	28	253.2	988.2	2,439.3	169.3	179.4	188.1	96.5	80.2	78.5	0	4,534	7,309
	SBNC	197	201	200	1,892.7	5,323.3	8,540.5	2,610.7	2,744.7	2,891.7	96.0	94.0	80.5	19,892	55,704	103,353

CONTINUATION APPENDIX 2

STATE	LEC	No. SITES			ALL SYSTEMS MIPS			POPULATION			% MAINFRAME MIPS			FIBER OPTIC		
		1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992
ND	NWND	13	17	19	47.3	164.8	1,123.6	338.3	333.7	330.0	97.7	89.0	82.4	248	12,838	62,067
NE	GTNE	3	6	6	27.3	30.4	213.6	124.7	124.6	125.9	87.9	87.2	26.3	79	692	1,397
	LTNE	32	35	33	270.2	618.9	1,103.1	367.4	371.8	379.5	98.2	77.5	60.5	0	4,303	14,212
	NWNE	70	63	57	920.8	2,325.4	3,307.5	765.8	768.6	786.2	97.4	95.8	80.9	295	14,798	64,928
NH	NENH	49	48	40	443.6	773.5	1,366.9	916.2	965.3	995.2	85.6	76.1	51.1	193	30,124	57,894
NJ	NJNJ	569	559	495	5,607.0	13,213.5	23,151.1	7,311.0	7,398.5	7,479.9	97.5	91.2	82.5	748	78,128	385,781
NM	GTNM	0	0	0	0.0	0.0	0.0	63.7	56.8	56.7	0.0	0.0	0.0	0	94	91
	MSNM	39	39	33	562.5	1,261.9	4,506.8	996.9	1,047.2	1,114.4	95.8	85.9	67.8	5,734	12,988	48,248
NV	CENV	17	14	20	58.9	227.3	514.1	587.0	698.4	845.6	95.9	95.8	66.9	0	140	5,442
	CONV	1	1	0	3.1	8.2	0.0	40.1	45.3	53.4	100.0	19.5	0.0	0	38	704
	PTNV	16	16	13	124.7	249.2	578.6	309.6	340.6	376.0	95.5	98.8	82.8	13	2,986	7,289
NY	GTNY	36	38	39	109.2	208.4	678.6	965.3	990.2	1,007.0	93.5	75.1	41.6	258	4,126	8,227
	NYNY	943	873	796	8,817.4	18,494.7	34,054.0	15,681.4	15,794.6	15,887.8	96.0	90.5	78.3	1,760	184,734	451,356
	RTNY	61	56	52	492.8	1,455.9	2,328.0	864.0	871.5	885.4	89.4	85.1	60.4	0	2,171	9,938
OH	CBOH	127	116	105	1,238.4	3,057.4	6,639.3	1,283.2	1,302.6	1,335.2	95.9	92.9	80.5	113	18,213	10,572
	GTOH	111	105	97	670.1	1,942.6	4,568.3	2,083.1	2,114.5	2,160.4	92.5	87.2	79.7	36	4,830	16,607
	OHOH	420	409	382	3,565.0	7,786.3	20,738.8	5,423.4	5,440.2	5,511.4	96.1	89.3	80.3	516	31,584	86,527
	UTOH	62	61	59	206.9	448.8	1,139.2	1,266.3	1,285.8	1,313.6	95.9	85.8	57.3	105	4,169	15,344
OK	GTOK	0	0	1	0.0	0.0	0.4	147.2	141.9	142.4	0.0	0.0	100.0	59	2,057	7,642
	SWOK	164	158	148	2,021.7	3,189.0	8,491.4	2,655.6	2,577.4	2,632.5	98.1	92.1	79.7	454	31,681	62,936
OR	GTOR	8	13	9	43.3	147.5	617.6	474.8	511.1	560.0	95.4	99.7	92.2	118	6,623	3,991
	PNOR	88	90	78	602.5	1,766.0	3,175.1	1,509.3	1,550.1	1,630.9	90.2	84.8	72.7	226	16,731	79,739
PA	COPA	32	33	30	224.2	604.4	1,019.8	453.5	470.9	486.4	97.5	91.6	77.2	0	0	0
	GTPA	47	48	41	209.5	423.2	933.5	855.1	864.3	883.5	96.0	84.7	54.2	63	3,853	10,091
	PAPA	580	544	505	4,433.4	11,896.3	25,472.1	8,466.8	8,501.0	8,557.3	96.1	91.7	81.1	2,686	110,466	287,841
	UTPA	34	34	34	477.4	1,011.3	1,373.4	634.1	652.1	675.5	98.8	98.7	86.3	511	3,248	12,194
RI	NERI	69	60	52	352.8	805.8	1,623.4	977.4	1,000.6	1,001.4	91.4	87.5	75.9	96	10,144	32,323
SC	GTSC	2	2	2	1.8	4.0	5.2	65.7	68.0	71.3	100.0	100.0	100.0	0	3,907	6,189
	SBSC	114	125	133	829.8	1,896.5	4,888.6	2,243.0	2,312.3	2,404.5	96.2	88.4	82.4	15,650	45,622	72,611
SD	NWSD	14	17	15	41.3	72.3	274.5	442.7	442.3	447.7	95.2	95.2	38.4	390	14,500	48,957
TN	GTTN	2	2	1	8.9	29.8	39.0	114.0	117.4	121.8	25.8	7.7	10.0	0	833	4,210
	SCTN	211	216	209	1,774.9	3,274.7	6,674.5	3,851.4	3,960.0	4,105.9	96.9	84.3	81.6	7,633	19,104	97,328
	UTIM	19	17	16	125.7	244.6	494.4	394.3	395.2	405.8	96.7	92.4	69.6	49	2,053	5,676
TX	GTTX	50	49	43	352.3	692.6	2,591.2	1,727.0	1,706.9	1,742.3	94.8	79.7	71.7	449	17,222	38,136
	SWTX	916	837	746	8,439.0	18,709.7	44,205.7	12,708.7	12,914.7	13,639.9	96.3	91.9	84.3	2,346	144,465	304,439
UT	MSUT	96	88	89	777.9	1,688.7	3,610.2	1,529.2	1,574.2	1,672.2	90.3	83.4	57.1	2,419	4,071	58,062
VA	CEVA	9	7	7	21.4	31.6	69.2	590.3	607.1	623.9	92.5	68.0	73.1	74	2,395	8,731
	COVA	7	6	7	92.3	105.8	160.0	845.0	915.4	986.3	96.7	54.5	69.3	740	10,700	22,769
	CVVA	245	264	223	2,350.1	6,614.2	14,047.0	3,978.2	4,203.7	4,387.3	93.7	90.6	84.3	1,138	84,439	263,745
	GTVA	2	2	1	0.9	0.9	0.4	83.1	78.3	78.5	100.0	100.0	100.0	0	487	1,384
VT	NEVT	24	23	22	248.8	670.9	987.5	365.2	382.2	392.3	74.1	97.0	68.9	151	6,595	19,941
WA	GTWA	7	10	10	45.7	138.3	353.2	527.6	592.3	659.1	94.5	85.0	46.4	196	12,277	14,744
	PNWA	176	177	166	1,450.5	3,536.4	8,417.1	3,225.7	3,422.4	3,684.2	89.9	86.8	79.2	617	34,488	93,111
WI	GTWI	75	74	70	452.9	1,144.7	2,795.4	1,142.0	1,169.5	1,208.2	97.2	93.6	73.5	0	5,529	18,463
	WBWI	213	221	198	1,899.9	3,891.8	7,931.6	2,833.7	2,899.9	2,980.2	97.4	92.7	77.8	15,400	26,172	45,154
WV	CWWV	37	38	36	239.0	509.5	1,226.3	1,399.5	1,340.7	1,340.6	98.1	89.1	85.1	125	24,026	68,266
	GTWV	2	4	5	2.4	9.0	71.1	199.2	191.0	192.0	100.0	81.1	39.9	0	829	3,266
WY	MSWY	13	11	13	62.4	97.6	262.9	465.6	430.6	437.2	94.6	71.4	45.8	9	3,213	20,889

APPENDIX 3: DISTRIBUTION OF INDICES OF ACCESS TO INFORMATION INFRASTRUCTURE BY LECS

STATE	LEC	FIBER OPTIC / LAND			ALL SYSTEMS MIPS/ POPULATION			NUMBER OF SITES / POPULATION			NETWORKING INDEX			RELATIVE INFORMATION INFRASTRUCTURE INDEX		
		1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992
AL	GTAL	0.0000	0.4689	1.2[illegible]	0.0239	0.0614	0.0754	0.0164	0.0163	0.0183	0.0000	0.0288	0.0949	0.1427	0.1049	0.1094
	SBAL	0.3335	0.7463	2.[illegible]	0.3148	0.7212	1.7328	0.0553	0.0529	0.0522	0.1050	0.5382	4.5159	0.1556	0.1072	0.1127
AR	GTAR	0.0000	0.1507	0.5[illegible]	0.2537	0.8494	1.8031	0.0542	0.0511	0.0514	0.0000	0.1280	1.2248	0.1479	0.1071	0.1123
	SWAR	0.0129	0.4220	1.2[illegible]	0.2505	0.4682	1.2554	0.0428	0.0490	0.0416	0.0032	0.1976	1.5083	0.1473	0.1065	0.1115
AZ	MSAZ	0.3790	1.0621	4.[illegible]	0.4753	1.1559	2.1161	0.0441	0.0397	0.0362	0.1802	1.2508	9.4567	0.1574	0.1077	0.1128
CA	COCA	0.0000	0.2576	0.5[illegible]	0.0654	0.2805	0.3704	0.0229	0.0238	0.0171	0.0000	0.0723	0.2152	0.1438	0.1054	0.1095
	GTCA	0.0137	3.1230	4.[illegible]	0.1282	0.3391	0.6032	0.0268	0.0262	0.0217	0.0018	1.0590	2.9710	0.1448	0.1067	0.1108
	PTCA	0.0543	3.9803	5.[illegible]	0.5560	1.0863	2.2802	0.0552	0.0507	0.0410	0.0302	4.3239	13.6472	0.1523	0.1091	0.1135
CO	MSCO	0.1794	0.4087	2.5[illegible]	0.7111	1.5399	3.4855	0.0785	0.0701	0.0535	0.1276	0.6293	8.7504	0.1587	0.1089	0.1143
CT	SNCT	0.0840	8.0733	19.7[illegible]	0.9410	1.7920	3.1378	0.0934	0.0838	0.0680	0.0791	14.4671	62.0777	0.1601	0.1133	0.1188
DC	CDDC	2.0192	148.8031	312.5[illegible]	2.5930	5.3774	9.5455	0.2115	0.2211	0.2016	5.2358	800.1804	983.1683	0.2472	0.2247	0.2568
DE	DSDE	0.0651	4.7710	8.2[illegible]	0.6017	1.8756	4.0109	0.0637	0.0729	0.0666	0.0392	8.9484	32.9409	0.1537	0.1116	0.1167
FL	CEFL	0.0241	0.4501	0.[illegible]	0.4282	1.1533	5.0463	0.0483	0.0448	0.0501	0.0103	0.5191	4.7014	0.1498	0.1076	0.1150
	GTFL	0.1125	4.5722	7.[illegible]	0.3357	0.7305	1.6452	0.0410	0.0446	0.0410	0.0378	3.3399	12.2715	0.1501	0.1085	0.1132
	SBFL	2.4182	5.3333	11.[illegible]	0.4172	0.6837	1.7979	0.0424	0.0416	0.0365	1.0089	4.7131	21.2751	0.1830	0.1090	0.1141
	UTFL	0.0345	1.2591	2.[illegible]	0.0633	0.1949	0.2031	0.0184	0.0175	0.0161	0.0029	0.2454	0.4758	0.1441	0.1054	0.1097
GA	GTGA	0.0000	0.4546	1.2[illegible]	0.1104	0.3663	0.4502	0.0224	0.0284	0.0180	0.0000	0.1665	0.5794	0.1441	0.1057	0.1098
	SBGA	1.2418	4.1322	7.[illegible]	0.5016	1.4940	2.8719	0.0714	0.0704	0.0597	0.6229	6.1734	20.2816	0.1777	0.1105	0.1151
IA	GTIA	0.0020	0.1372	0.52[illegible]	0.3100	0.7422	1.7690	0.0441	0.0403	0.0381	0.0006	0.1018	0.9218	0.1478	0.1066	0.1117
	NWIA	0.0382	1.2750	10.3[illegible]	0.5940	1.1322	2.5839	0.0836	0.0832	0.0741	0.0227	1.4435	26.7692	0.1546	0.1090	0.1163
	UTIA	0.0000	0.0000	0.[illegible]	0.0454	0.1057	0.4592	0.0146	0.0151	0.0151	0.0000	0.0000	0.0000	0.1428	0.1047	0.1094
ID	GTID	0.0000	0.0667	0.[illegible]	0.0247	0.0250	0.0372	0.0060	0.0061	0.0056	0.0000	0.0017	0.0036	0.1420	0.1043	0.1086
	MSID	0.1206	0.2527	1.7[illegible]	0.1732	0.6914	1.2505	0.0371	0.0396	0.0355	0.0209	0.1747	2.1443	0.1482	0.1065	0.1113
IL	CEIL	0.0000	0.2557	0.9[illegible]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1413	0.1042	0.1085
	COIL	0.0063	0.8024	0.7[illegible]	0.1221	0.4852	1.1843	0.0549	0.0595	0.0570	0.0008	0.3894	0.8804	0.1467	0.1070	0.1120
	GTIL	0.0000	0.5154	1.1[illegible]	0.3882	1.2902	2.6647	0.0386	0.0366	0.0387	0.0000	0.6649	2.9681	0.1481	0.1076	0.1126
	LBIL	0.1158	5.8710	14.4[illegible]	0.6809	1.6707	3.1289	0.0905	0.0878	0.0763	0.0788	9.8088	45.3575	0.1580	0.1122	0.1179
IN	GTIN	0.0214	1.1404	2.9[illegible]	0.4171	0.8991	1.8281	0.0603	0.0541	0.0494	0.0069	1.0253	5.4559	0.1505	0.1077	0.1128
	NBIN	1.4615	3.1700	5.8[illegible]	0.4905	1.0267	2.3123	0.0720	0.0681	0.0590	0.7169	3.2546	13.6310	0.1812	0.1092	0.1143
	UTIN	0.0139	0.2016	0.8[illegible]	0.0275	0.2514	0.3918	0.0188	0.0229	0.0220	0.0004	0.0507	0.3499	0.1432	0.1053	0.1098
KS	SWKS	0.0184	1.1891	2.[illegible]	0.6550	1.2635	3.0985	0.0754	0.0665	0.0670	0.0121	1.5024	8.3234	0.1541	0.1087	0.1146
	UTKS	0.0000	0.0000	0.[illegible]	2.5769	10.7821	15.1299	1.0256	1.0256	0.7792	0.0000	0.0000	0.0000	0.2551	0.1410	0.1427
KY	CBKY	0.0016	0.5484	0.6[illegible]	0.1727	0.2510	0.6694	0.0297	0.0287	0.0214	0.0003	0.1377	0.4084	0.1453	0.1056	0.1100
	GTKY	0.0000	1.1055	2.[illegible]	0.2672	0.5533	0.8557	0.0402	0.0413	0.0273	0.0000	0.6117	2.5014	0.1470	0.1067	0.1109
	SCKY	0.5140	1.0660	2.[illegible]	0.2981	0.8010	1.4599	0.0461	0.0456	0.0410	0.1532	0.8539	3.4902	0.1582	0.1072	0.1119
LA	SCLA	0.5236	1.0034	1.8[illegible]	0.2445	0.5368	1.0979	0.0452	0.0449	0.0425	0.1280	0.5386	2.0210	0.1576	0.1067	0.1115
MA	NEMA	0.0801	13.2464	25.7[illegible]	0.6331	1.2460	2.5640	0.0776	0.0692	0.0614	0.0507	16.5053	66.1300	0.1555	0.1141	0.1194
MD	CMMD	0.0395	5.7489	15.1[illegible]	0.6142	1.4823	3.2350	0.0624	0.0605	0.0553	0.0242	8.5218	49.1085	0.1531	0.1109	0.1172
ME	NEME	0.0275	1.3551	3.[illegible]	0.2386	0.4932	1.2011	0.0350	0.0353	0.0307	0.0066	0.6684	3.6104	0.1469	0.1065	0.1114
MI	GTMI	0.0000	0.2002	1.1[illegible]	0.0851	0.2598	0.5148	0.0334	0.0338	0.0386	0.0000	0.0520	0.5869	0.1446	0.1056	0.1106
	MBMI	0.0447	3.3235	10.2[illegible]	0.4787	1.0528	2.2846	0.0592	0.0602	0.0564	0.0214	3.4990	23.3687	0.1516	0.1091	0.1151
MN	GTMN	0.0000	0.2025	0.4[illegible]	0.1062	0.3733	1.6774	0.0259	0.0267	0.0538	0.0000	0.0756	0.7396	0.1443	0.1056	0.1122
	NWMN	0.0340	1.5774	7.5[illegible]	0.8611	1.9532	4.5204	0.0801	0.0793	0.0718	0.0292	3.0611	33.9993	0.1569	0.1104	0.1172
MO	GTMO	0.0000	0.3276	0.4[illegible]	0.1852	0.3909	0.9067	0.0427	0.0393	0.0383	0.0000	0.1281	0.4020	0.1463	0.1060	0.1109
	SWMO	0.0409	2.6479	5.7[illegible]	0.7281	1.8142	3.8799	0.0969	0.0908	0.0818	0.0298	4.8036	22.2361	0.1572	0.1110	0.1167
	UTMO	0.0000	0.2716	0.8[illegible]	0.5183	0.7800	2.2404	0.0412	0.0430	0.0542	0.0000	0.2118	2.0066	0.1496	0.1068	0.1129
MS	SCMS	0.2299	0.6731	1.3[illegible]	0.1356	0.4121	1.5734	0.0384	0.0422	0.0412	0.0312	0.2774	2.1048	0.1500	0.1063	0.1118
MT	GTMT	0.0000	0.0000	0.[illegible]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1413	0.1041	0.1083
	MSMT	0.0026	0.0541	1.2[illegible]	0.1462	0.4116	0.5818	0.0238	0.0328	0.0296	0.0004	0.0223	0.7125	0.1446	0.1058	0.1104
NC	CENC	0.0000	0.8891	1.3[illegible]	0.1548	0.3773	0.9426	0.0486	0.0457	0.0396	0.0000	0.3354	1.2357	0.1464	0.1064	0.1111
	CTTC	0.0841	2.6172	8.2[illegible]	0.0955	0.2386	0.5039	0.0248	0.0258	0.0204	0.0080	0.6245	4.1564	0.1457	0.1063	0.1114
	GTNC	0.0000	5.2599	8.4[illegible]	1.4956	5.5084	12.9681	0.1595	0.1505	0.1489	0.0000	28.9732	109.9581	0.1688	0.1201	0.1260
	SBNC	1.5554	4.3556	8.0[illegible]	0.7250	1.9395	2.9535	0.0755	0.0732	0.0692	1.1276	8.4477	23.8680	0.1871	0.1115	0.1158

CONTINUATION APPENDIX 3

STATE	LEC	FIBER OPTIC / LAND			ALL SYSTEMS MIPS/ POPULATION			NUMBER OF SITES / POPULATION			NETWORKING INDEX			RELATIVE INFORMATION INFRASTRUCTURE INDEX		
		1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992	1986	1989	1992
ND	NWND	0.0087	0.4516	2.1832	0.1398	0.4939	3.4049	0.0384	0.0509	0.0576	0.0012	0.2230	7.4333	0.1457	0.1066	0.1143
NE	GTNE	0.0179	0.1565	0.3159	0.2189	0.2440	1.6966	0.0241	0.0482	0.0477	0.0039	0.0382	0.5360	0.1456	0.1059	0.1120
	LTNE	0.0000	0.4232	1.3979	0.7354	1.6646	2.9067	0.0871	0.0941	0.0870	0.0000	0.7045	4.0632	0.1555	0.1099	0.1150
	NWNE	0.0140	0.7009	3.0751	1.2024	3.0255	4.2069	0.0914	0.0820	0.0725	0.0168	2.1205	12.9368	0.1604	0.1119	0.1159
NH	NENH	0.0236	3.6813	7.0749	0.4842	0.7850	1.3735	0.0535	0.0487	0.0402	0.0114	2.8900	9.7173	0.1507	0.1084	0.1128
NJ	NJNJ	0.1121	11.7046	57.7949	0.7669	1.7860	3.0951	0.0778	0.0756	0.0682	0.0859	20.9040	178.8815	0.1576	0.1147	0.1285
NM	GTNM	0.0000	0.0363	0.0352	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1413	0.1041	0.1063
	MSNM	0.0934	0.2115	0.7858	0.5643	1.2050	4.0442	0.0391	0.0372	0.0296	0.0527	0.2549	3.1777	0.1519	0.1073	0.1133
NV	CENV	0.0000	0.0856	3.3264	0.1003	0.3255	0.6080	0.0290	0.0201	0.0237	0.0000	0.0279	2.0224	0.1444	0.1053	0.1106
	CONV	0.0000	0.0231	0.4285	0.0773	0.1810	0.0000	0.0249	0.0221	0.0000	0.0000	0.0042	0.0000	0.1439	0.1051	0.1084
	PTNV	0.0022	0.4988	1.2175	0.4028	0.7317	1.5388	0.0517	0.0470	0.0346	0.0009	0.3649	1.8735	0.1493	0.1069	0.1115
NY	GTNY	0.0231	0.3687	0.7352	0.1136	0.2105	0.6739	0.0383	0.0384	0.0387	0.0026	0.0776	0.4955	0.1457	0.1057	0.1107
	NYNY	0.0626	6.5681	16.0476	0.5623	1.1710	2.1434	0.0601	0.0553	0.0501	0.0352	7.6909	34.3966	0.1529	0.1105	0.1161
	RTNY	0.0000	0.8847	4.0497	0.5704	1.6706	2.6293	0.0706	0.0643	0.0587	0.0000	1.4779	10.6480	0.1525	0.1092	0.1141
OH	CBOH	0.0406	6.5491	3.8015	0.9651	2.3472	4.9715	0.0990	0.0891	0.0779	0.0392	15.3717	18.8994	0.1597	0.1137	0.1169
	GTOH	0.0024	0.3183	1.0944	0.3217	0.9187	2.1146	0.0533	0.0497	0.0449	0.0008	0.2924	2.3143	0.1486	0.1072	0.1124
	OHOH	0.0448	2.7433	7.5156	0.6573	1.4313	3.7629	0.0774	0.0752	0.0693	0.0295	3.9264	28.2804	0.1549	0.1099	0.1164
	UTOH	0.0120	0.4781	1.7512	0.1634	0.3490	0.8682	0.0490	0.0474	0.0457	0.0020	0.1669	1.5204	0.1468	0.1062	0.1114
OK	GTOK	0.0087	0.3019	1.1215	0.0000	0.0000	0.0028	0.0000	0.0000	0.0070	0.0000	0.0000	0.0032	0.1415	0.1042	0.1089
	SWOK	0.0150	1.0448	2.0756	0.7613	1.2373	3.2256	0.0618	0.0613	0.0562	0.0114	1.2928	6.6950	0.1539	0.1084	0.1141
OR	GTOR	0.0288	1.6166	0.9741	0.1559	0.4978	1.1380	0.0274	0.0352	0.0232	0.0045	0.8046	1.1086	0.1454	0.1066	0.1106
	PNOR	0.0087	0.6418	3.0588	0.3789	1.0596	1.9208	0.0550	0.0535	0.0448	0.0033	0.6801	5.8754	0.1495	0.1077	0.1127
PA	COPA	0.0000	0.0000	0.0000	0.4944	1.2835	2.0966	0.0706	0.0701	0.0617	0.0000	0.0000	0.0000	0.1517	0.1083	0.1129
	GTPA	0.0132	0.8049	2.1080	0.2450	0.4896	1.0566	0.0550	0.0555	0.0464	0.0032	0.3941	2.2273	0.1481	0.1069	0.1117
	PAPA	0.1473	6.0596	15.7894	0.5236	1.3994	2.9767	0.0685	0.0640	0.0590	0.0772	8.4798	46.9996	0.1551	0.1110	0.1172
	UTPA	0.0880	0.5591	2.0992	0.7529	1.5506	2.0332	0.0536	0.0521	0.0503	0.0662	0.8671	4.2679	0.1548	0.1085	0.1128
RI	NERI	0.0796	8.4113	26.8018	0.3610	0.8053	1.6211	0.0706	0.0600	0.0519	0.0287	6.7737	43.4493	0.1520	0.1108	0.1181
SC	GTSC	0.0000	1.7046	2.7003	0.0274	0.0588	0.0729	0.0304	0.0294	0.0281	0.0000	0.1003	0.1969	0.1438	0.1057	0.1101
	SBSC	1.1034	3.2167	5.1196	0.3700	0.8202	2.0331	0.0508	0.0541	0.0553	0.4082	2.6382	10.4086	0.1707	0.1084	0.1137
SD	NWSD	0.0118	0.4385	1.4804	0.0933	0.1635	0.6131	0.0316	0.0384	0.0335	0.0011	0.0717	0.9077	0.1448	0.1056	0.1106
TN	GTTN	0.0000	0.6249	3.1583	0.0781	0.2538	0.3202	0.0175	0.0170	0.0082	0.0000	0.1586	1.0113	0.1434	0.1053	0.1096
	SCTN	0.3037	0.7602	3.8728	0.4609	0.8269	1.6256	0.0548	0.0546	0.0509	0.1400	0.6286	6.2956	0.1566	0.1074	0.1128
	UTIM	0.0215	0.9008	2.4906	0.3188	0.6189	1.2183	0.0482	0.0430	0.0394	0.0069	0.5576	3.0343	0.1486	0.1068	0.1116
TX	GTTX	0.0102	0.3928	0.8698	0.2040	0.4058	1.4872	0.0290	0.0287	0.0247	0.0021	0.1594	1.2936	0.1457	0.1058	0.1109
	SWTX	0.0297	1.8303	3.8571	0.6640	1.4487	3.2409	0.0721	0.0648	0.0547	0.0197	2.6516	12.5004	0.1542	0.1093	0.1145
UT	MSUT	0.0745	0.1254	1.7885	0.5087	1.0727	2.1590	0.0641	0.0559	0.0532	0.0379	0.1345	3.8613	0.1530	0.1076	0.1130
VA	CEVA	0.0111	0.3576	1.3035	0.0363	0.0521	0.1109	0.0153	0.0115	0.0112	0.0004	0.0186	0.1446	0.1430	0.1047	0.1092
	COVA	0.0762	1.1017	2.3444	0.1092	0.1156	0.1622	0.0083	0.0066	0.0071	0.0083	0.1273	0.3803	0.1444	0.1049	0.1093
	CVVA	0.0742	5.5016	17.1843	0.5907	1.5691	3.2128	0.0616	0.0623	0.0513	0.0438	8.6327	55.2097	0.1536	0.1110	0.1174
	GTVA	0.0000	0.4975	1.4137	0.0108	0.0115	0.0051	0.0241	0.0255	0.0127	0.0000	0.0057	0.0072	0.1431	0.1050	0.1091
VT	NEVT	0.0209	0.9119	2.7573	0.6813	1.7554	2.5172	0.0657	0.0602	0.0561	0.0142	1.6008	6.9408	0.1536	0.1092	0.1136
WA	GTWA	0.0252	1.5764	1.8932	0.0866	0.2335	0.5359	0.0133	0.0169	0.0152	0.0022	0.3681	1.0145	0.1436	0.1056	0.1099
	PNWA	0.0302	1.6870	4.5544	0.4497	1.0333	2.2847	0.0552	0.0517	0.0451	0.0136	1.7431	10.4053	0.1507	0.1081	0.1133
WI	GTWI	0.0000	0.2895	0.9667	0.3966	0.9788	2.3137	0.0657	0.0633	0.0579	0.0000	0.2833	2.2365	0.1503	0.1077	0.1131
	WBWI	1.8227	3.0976	5.3443	0.6705	1.3421	2.6614	0.0752	0.0762	0.0664	1.2221	4.1572	14.2235	0.1896	0.1100	0.1148
WV	CWWV	0.0083	1.5866	4.5081	0.1708	0.3800	0.9147	0.0264	0.0283	0.0269	0.0014	0.6030	4.1237	0.1451	0.1062	0.1113
	GTWV	0.0000	0.3689	1.4535	0.0121	0.0471	0.3703	0.0100	0.0209	0.0260	0.0000	0.0174	0.5383	0.1422	0.1049	0.1101
WY	MSWY	0.0002	0.0554	0.3601	0.1340	0.2267	0.6013	0.0279	0.0256	0.0297	0.0000	0.0126	0.2165	0.1447	0.1052	0.1102

APPENDIX 4: REGIONAL SPECIALIZATION INDEX OF COMPUTING CAPACITY IN GROUP OF ECONOMIC ACTIVITIES 1992

STAT	LEC	GROUP OF ECONOMIC ACTIVITIES																																			
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
AL	GTAL				7.51		5.92		2.24	8.38			0.53			2.73	2.21	4.37			17.84		2.26													0.12	0.88
	SBAL	0.49	1.17		1.17	0.06	4.67	0.35	0.99	0.36	0.48	0.97	0.46	2.05	0.42	0.42	2.22	0.06	1.35		5.13	0.96	0.50	0.81	0.05	0.82	1.09			0.55		0.10	0.32	1.44	3.26	1.03	1.82
AR	GTAR					4.09		0.67		0.06		2.55	0.09	12.60				7.81				0.41		2.10	16.81		0.07				0.34		0.72	0.71		1.85	0.00
	SWAR	97.03	1.23	0.88	0.08		3.71	0.18	0.05	0.03		0.05	0.09			3.22	4.21		0.40		0.69		0.44	0.04	16.65	1.34	0.49		1.27	0.76			0.73	1.41		1.10	0.56
AZ	MSAZ	0.15	0.38					0.49		0.83	1.64	0.09	0.79			3.17	5.01	0.42	1.66		0.16	2.26	1.31	0.02		2.75	1.42	10.82	0.16	0.79	0.01	2.91	0.19	1.13	1.15	1.94	0.78
CA	COCA	2.87		6.10	0.43	0.06				0.17													8.33	1.87		1.82	0.06	1.14					0.07	6.81		2.87	1.39
	GTCA							0.06				2.45	2.96			0.23			0.70	1.34		1.98		0.34			0.15				0.02	1.65	0.91	2.58	2.60	0.94	2.49
	PTCA	4.17	0.42	0.91	1.13	0.86	0.16	0.70	0.35	0.25	0.16	0.73	1.41	0.51	0.06	3.29	1.74	0.72	1.09	0.73	0.90	0.84	1.27	0.90	0.58	1.35	1.32	0.75	0.16	0.61	0.85	1.03	1.01	1.01	1.59	0.89	0.89
CO	MSCO		31.73			1.70		0.36	0.02	0.30	0.07		2.14			0.07	0.47	0.03	0.63		0.02	3.66	0.34	0.65		0.34	0.35	0.40	0.41	1.00	0.17		0.74	0.47	1.24	0.29	1.73
CT	SNCT		0.01	0.20	0.20	0.47		0.10	2.50	1.10	0.10	0.70	1.08	1.07	0.10	2.07	1.24	0.07	0.77	1.45	0.15	1.08	0.60	1.13	0.81	0.41	0.84	6.81	0.40	3.61	0.54		0.42	1.44	0.49	0.60	0.19
DC	CDDC							1.43										0.94	0.01	1.38	0.84	1.26	1.19				0.06	2.03		1.85		0.22	0.12	0.75	0.87	0.95	3.81
DE	DSDE						6.89	0.15	11.66			0.71	0.13		3.45			1.18			1.17	0.06	0.50	0.01			4.61	0.56	1.45	0.25	0.34		1.06	0.82	0.08	0.47	0.36
FL	CEFL																										0.04						0.67	0.12		0.01	6.14
	GTFL					1.90		1.82	0.02	0.34	0.23		0.43	0.74		0.55	0.12	0.68		0.10	3.46	0.60	2.98	3.71		6.17	0.86	0.50	2.15	0.33	0.19		2.18	1.50	1.58	0.41	0.78
	SBFL	1.53	1.01	0.02	0.03	0.02	0.09	0.66	0.10	0.12		0.10	0.29	0.18		2.07	0.42	3.20	1.38	1.07	2.03	0.01	0.32	0.89	0.13	1.17	1.73	0.08		1.31	1.06	4.69	1.89	1.00	0.38	0.56	0.87
	UTFL							0.84		9.06							0.55			3.62			0.67			0.28	0.03						0.52	6.38		0.11	3.92
GA	GTGA				28.35	0.06																			1.53		0.09							0.18			3.14
	SBGA		0.01		0.48	3.14	0.14	0.55	0.06	0.36	0.60	0.53	0.50	0.63	0.45	1.01	0.22	3.63	0.30	0.70	1.32	0.72	0.50	0.86	3.76	0.64	1.29	0.46	0.87	1.15	0.66	0.09	1.77	1.07	0.11	1.54	0.47
IA	GTIA							0.55		1.10		0.38	6.16	7.50			6.94					0.29					0.04						0.88	0.09		5.20	0.62
	NWIA	2.46			4.88	0.16		0.40		1.35	2.10	0.53	0.70			0.42		0.31	3.57	0.77	1.04	1.28	0.48	0.01	0.22		0.16	0.13	0.57	3.06	0.34	1.81	1.79	1.70	0.04	0.87	0.20
	UTIA													96.26																			0.21				
ID	GTID																																			15.87	
	MSID		13.41		0.05	0.57	17.86														2.52		0.03			41.10	0.02			0.66	6.90		0.03			1.07	2.06
IL	CEIL																																				
	COIL	31.67			0.66	1.33		4.16		17.36		7.56	2.77	2.76	9.87								6.02				0.05			1.68			0.02	1.66		0.75	
	GTIL		3.68		0.19	6.67		0.03		0.60	0.09	0.30	8.41	0.41	2.72						0.02	2.59	0.74	0.00			0.19			3.46			0.01	0.23		0.67	0.01
	LBIL		0.29	0.02	0.34	2.20	0.98	2.15	1.18	1.14	0.30	2.48	1.22	1.27	0.31	0.40	1.67	0.94	0.09	0.19	0.52	1.43	2.58	1.65	0.40	0.93	0.39	1.00	1.27	1.05	2.68	1.71	0.89	0.63	1.85	1.70	0.52
IN	GTIN		0.02		1.14	0.54			1.17	2.13	16.81	2.19	0.36	0.22	2.67		1.71	2.05			0.17		1.61	2.06			0.24			0.32	6.19		1.59	0.82		3.21	0.14
	NBIN		0.84		0.09		0.99	0.20	10.12	0.91	4.72	2.48	0.55	1.02	1.12	0.03	0.82	0.53	1.06		0.22	2.86	0.34	1.23	0.21	0.99	0.40	2.15		0.93	1.14	1.67	0.65	1.50	0.96	0.67	0.81
	UTIN				33.89	2.17				1.18			0.13			0.40	37.74										0.05										
KS	SWKS	2.90			1.97	0.58	0.16	0.26		0.43		1.96	0.27		0.66	2.48	0.14	4.73	1.78		0.44	1.83	2.13	2.10	4.00		0.09	1.09	0.55	1.25	0.89		0.98	0.56	0.00	0.62	0.63
	UTKS									2.56											9.83		1.27												6.64	7.85	0.34
KY	CBKY										1.23												24.26											3.55	0.46	1.63	0.56
	GTKY				0.31								7.19								5.84		6.13	0.47			0.27	0.13		0.55			0.30	0.83	0.13	3.32	0.13
	SCKY				3.54	2.27		0.13	0.46		0.42	2.01	0.03	11.34	0.71			0.16			1.62	0.17	0.70	2.69		0.32	0.93	0.54	0.20	0.57	2.19		0.36	6.92	0.10	0.36	1.00
LA	SCLA		0.41	1.19	0.77	0.12	1.65	0.42	1.11			0.27	0.34		0.93	1.07		0.57	1.16	0.40	2.47	4.47	0.17	0.55	0.64	1.05	1.47	0.19	0.01	0.39	0.94		0.11	1.61	1.03	3.15	1.36
MA	NEMA		0.02		0.15	0.30	1.30	0.93	0.39	3.24	0.02	1.93	1.02	0.73	0.01	0.04	4.45	0.02		0.17	0.98	1.39	0.95	3.09	0.57	0.58	1.20	0.07	3.32	1.59	0.30	1.57	1.11	1.55	1.81	1.58	0.34
MD	CMMD		0.12		0.07	1.08	1.43	0.56	0.20	0.35	0.07		0.22	0.52	0.20	0.06	0.47	1.72	1.41			1.00	0.09	0.34	0.28	1.63	0.83	0.14	0.35	1.06	0.50	4.10	0.62	0.60	1.29	0.40	3.10
ME	NEME		0.21		0.05	0.07	10.11	0.26		1.26			0.85			2.83		0.12			2.51		0.48	4.78		6.09	0.01			4.07	0.12		0.09	0.65		3.21	0.36
MI	GTMI				11.49	0.26	0.32			4.43	0.10	11.56	0.89		8.90	1.76		2.21				0.51	1.05	0.55			0.12			0.16	4.84		0.29	0.09	4.19	0.69	0.13
	MBMI	0.04	0.00		0.58	2.17	0.58	0.35	1.63	0.17	1.17	1.70	0.94	1.50	17.86	0.06	0.94	0.40	0.97	0.33	0.48	0.30	1.59	1.16	1.55	0.04	0.96	0.47		0.63	0.75	0.02	0.58	1.30	2.19	0.72	0.53
MN	GTMN					101.3																														0.46	
	NWMN		0.44		0.35	2.14	4.08	1.27	0.32	0.24	0.02	0.01	0.85	0.40	0.87	0.00	1.33	1.94		0.06	0.16	0.94	1.17	2.19	2.17		0.28	1.52	0.51	2.07	2.09	0.37	2.51	0.88	0.33	0.26	0.33
MO	GTMO				1.88	1.77		1.70		4.01	5.36			5.92	4.07			0.44	3.27		2.19		0.26	0.06	4.02		0.06			1.94	0.44		0.03	1.88	0.29	3.07	0.39
	SWMO	0.63	1.66		0.45	3.25		1.96	1.23	0.18	0.25	0.86	0.32	1.14	0.18	0.76	0.41	1.71	6.28	4.93	0.50	0.43	0.66	1.45	0.87	1.65	0.79	1.26	2.72	0.67	1.14	0.03	0.65	1.15	1.39	0.28	0.72
	UTMO													1.46								0.09					0.28						4.65	0.07	0.04	0.29	2.83
MS	SCMS		1.11		0.44	0.22	1.23		0.16	1.39		1.11	0.27	1.74		0.44						0.05	0.38	0.01	0.29	0.44	1.13			0.51	1.19		1.28	1.23	0.41	2.72	2.46
MT	GTMT																																				
	MSMT										0.35											11.00				4.18	0.14		1.76	0.99			0.09	0.71		0.15	4.24
NC	CENC				15.23					0.06			0.72	12.52									0.09	24.17	0.32		0.02				3.68					0.11	0.12
	CTTC				5.31		15.20		7.22	1.66		0.63	0.76	0.12					1.30				1.29	2.60	3.37		1.94								0.23	0.47	1.78
	GTNC		0.26		0.27				10.08		0.72		4.26						0.17				0.09				0.61			1.26			0.22		2.16	1.45	1.21
	SBNC		0.18		7.47	0.37	0.36	0.99	0.03	0.43	0.27	0.91	0.26	1.07	0.83	0.02	0.67	2.26	0.79		5.04	0.14	0.70	0.04	0.14	0.74	0.70	1.72		1.55	2.59	0.15	1.16	1.64	0.38	1.07	0.47

CONTINUATION APPENDIX 4

STAT	LEC	GROUP OF ECONOMIC ACTIVITIES																																			
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
ND	NWND																				0.16		0.13				0.13			2.47				2.72	0.01	10.66	0.08
NE	GTNE	8.39										4.36	2.28									17.06														8.67	
	LTNE		0.07							0.47							0.53		11.35		0.07		2.32				1.23			0.55	2.17		1.25	1.11	0.03	0.80	1.14
	NWNE		2.62		0.22	0.03		2.48			1.83							2.62	1.09		1.38	1.82	1.53	0.01	0.63		0.72	1.01		1.51			1.22	1.56	0.69	0.73	1.81
NH	NENH							0.70		0.84		2.60	2.83	5.72			1.78				6.84	0.13	0.12	0.47			0.24	0.64		3.86			0.48	1.48		2.21	0.20
NJ	NJNJ				0.48	1.01	0.16	1.38	4.56	0.44	0.50	0.16	0.40	0.49	0.47	0.32	0.76	1.39	2.45	3.05	0.26	0.21	1.32	0.59	0.99	1.44	1.07	1.58	3.15	1.49	2.63	1.73	1.29	0.29	1.06	0.25	0.31
NM	GTNM																																				
	MSNM				0.02														0.80	0.74	0.96						0.41			0.22			0.06	0.14		0.82	5.73
NV	CENV				0.32																11.63	6.46		0.10			0.73	19.42		1.69		15.58	0.05				1.39
	CONV																																				
	PTNV											0.97							0.76		11.66		0.62		30.21		0.06						0.19	2.32			0.98
NY	GTNY							0.14		1.58		2.75	4.62	25.87									0.36			2.24	0.49			0.31			0.25	0.24	1.29	3.85	0.19
	NYNY				0.53	0.94	0.08	1.56	0.24	1.19	0.10	0.12	0.35	0.40	0.09	0.83	0.89	0.22	0.23	0.59		1.95	0.58	0.61	0.14	0.75	2.16	0.75	7.80	0.80	0.95	1.12	0.94	1.11	1.33	1.18	1.07
	RTNY				0.51	3.74		3.94	0.05			8.21	6.38			0.09	9.95		1.38		1.84		0.20			2.14	0.96	1.10		0.36	0.10		0.41	0.56	1.21	2.06	0.24
OH	CBOH				0.09		2.92	2.04	1.55	0.67	2.48	0.49	3.95	0.30		7.60		0.06	1.49		1.52		0.47	0.72	2.06	4.70	0.63			0.39	3.66	0.03	0.59	0.89	0.16	0.58	0.14
	GTOH			2.49	0.07		5.24	2.18	0.27	3.17	0.23	0.39	0.57	5.00	0.24	0.13		0.01			0.82	0.03	0.26	0.02	3.23		0.16	0.07		0.25	0.41		2.21	0.83	0.00	1.37	1.66
	OHOH	0.80	0.34	0.12	0.42	0.94	0.04	1.63	0.37	5.93	3.88	3.17	0.85	0.68	0.26	0.35	0.66	0.37	0.71	0.13	0.11	0.90	1.81	2.05	4.67	0.50	1.76	0.14	0.30	0.78	1.78	0.65	0.43	1.12	0.33	1.36	1.09
	UTOH					1.35		2.55	2.10	18.54	25.40	18.18	2.43	3.98	9.67	0.05			0.44				0.26	0.12			0.07			1.36			0.40	0.54		0.03	0.04
OK	GTOK																																	24.44			
	SWOK		3.38	12.11	11.63			0.13		0.14	0.01	0.25	0.54		0.43	0.32	0.17	2.21	1.00	0.78	1.07	0.62	1.86			0.20	0.20	1.04		0.21	0.15	10.60	0.31	0.69	0.02	0.41	0.43
OR	GTOR	3.82								86.47			0.86	0.80			10.79	0.50					0.74	0.34						0.11			0.02				0.03
	PNOR				0.88		1.02	0.37			1.54		0.34	1.40	5.29			2.62	0.43		3.44	2.77	0.28	1.44	0.87		4.90			0.93	0.21		0.62	1.13		0.94	0.71
PA	COPA		0.08			0.94	0.24	4.19	5.95			19.91	1.94		9.63	0.27		0.41		26.63	12.98		1.06	1.15	0.37		0.43	3.65					0.04	0.63		0.21	
	GTPA			0.90	0.24	0.06	6.32			3.27	0.99	0.79	2.23	0.26	0.24	7.70	12.83						0.85	3.27	7.09		0.02			1.13			0.03	0.41		1.76	0.11
	PAPA	0.40	0.67		0.57	0.84	0.87	1.41	2.03	0.46	4.03	0.93	2.80	1.87	0.03	0.48	0.86	1.06	0.73	2.70	2.16	0.16	0.61	1.46	0.14	1.19	1.78	0.04	0.21	1.06	0.24	0.06	1.11	0.92	0.53	0.97	0.60
	UTPA		0.77		0.37		0.06			1.13			1.28	0.65					0.86				1.85	0.59		1.79				3.39			1.31			1.28	1.99
RI	NERI				0.81			2.18	0.12	9.86	2.15				1.91		0.47			1.59		0.56		6.61			3.78	0.06		3.40			0.36	0.87	0.00	1.61	0.24
SC	GTSC				14.34						144.3																										
	SBSC				2.03	0.07	7.27	0.16	1.47	3.32		0.06	0.56	20.27	0.33		0.17	0.57	0.82		0.85	0.55	0.69		0.01	2.45	0.48	0.91		1.15	0.47	1.21	0.59	0.58	0.01	0.51	1.56
SD	NWSD		2.86										0.60								3.26	1.11		0.93			0.05	1.14		0.07	0.21					7.23	2.42
TN	GTTN																																			15.67	
	SCTN		0.26		0.77	0.31	4.87	1.07	0.87	1.70	2.55	0.61	0.17	1.30	1.28	0.70	0.49	5.76	0.26	1.28	0.44	0.71	1.19	1.51	0.15	0.26	1.06		0.28	1.26	0.26	1.78	0.14	1.86	0.10	0.75	1.60
	UTIM			6.76			4.24	1.86	17.47	5.05			1.46			1.14			2.62				0.35				0.09						0.02	1.11			0.54
TX	GTTX				1.00			0.06	2.05	0.21	0.70		0.06								2.24		0.06				0.03			0.71	0.02		1.43	1.31	0.06	8.47	0.28
	SWTX		0.70	8.22	1.17	0.67	0.20	0.92	0.40	0.18	0.11	0.66	1.11	0.01	0.04	0.69	0.41	0.46	1.41	0.48	1.39	1.43	0.70	0.46	1.01	1.31	0.25	0.59	0.10	0.42	1.17	0.31	1.59	1.02	1.41	0.47	0.77
UT	MSUT		0.64			0.10	0.31	5.12	0.13	1.12	3.31		0.75		2.05	0.58	1.67		1.02			1.49	1.47		0.18	3.46	1.55	4.07		0.18	0.96	0.01	0.63	0.40	1.78	2.08	1.43
VA	CEVA				46.09					0.80																										1.68	0.53
	COVA						13.86																	0.48									0.14	0.37			5.93
	CVVA				1.74	0.04	0.98	0.77	0.43	0.06	1.87	0.02	0.18	0.07	0.11	1.35	0.03	0.72	1.51	9.46	1.31		0.58	0.70	0.43	0.15	1.39	4.10	0.12	0.45	0.14		0.94	0.52	0.77	0.56	2.46
	GTVA																										18.86										
VT	NEVT						0.55						9.09					1.56					0.52				0.74	0.38		0.78			1.14	0.92	0.23	1.43	0.40
WA	GTWA							5.71			0.71						8.47			3.64		8.61											6.01	0.47			0.44
	PNWA	0.21	0.04		1.09	0.27	0.21	1.17			0.36		0.11		0.75	3.28	0.65	1.95	0.98	1.43	2.25	0.51	1.84	0.66	1.00	0.25	1.46	0.24	0.44	1.01	0.10	0.21	1.80	0.95	0.24	0.83	0.97
WI	GTWI	4.12	0.03		3.25	3.87	0.40		0.06	0.13		1.09	0.12	1.27		0.10		0.04				2.93	0.11	2.12		0.54		2.16		4.48		0.30	0.91	0.45	0.05	1.13	1.26
	WBWI				0.07	2.36	11.15	0.47	0.97	0.15	1.24	6.69	1.61	2.74	4.14	0.13	0.42	1.41	2.07		0.80	2.50	0.35	0.09	3.06		0.21		0.21	1.20	2.36	0.34	0.80	0.47	2.41	0.66	0.15
WV	CWWV							0.42	7.12		32.93		0.07								0.30	0.33	1.57		0.06		0.58						0.09	1.36			3.37
	GTWV															21.69							2.87				0.13						0.50	6.84			
WY	MSWY		12.12																								1.81									3.54	3.99

*The Computing Capacity Specialization Index is just defined for those lecs that have a positive amount of Mips in 1992. It is defined as the ratio:

(Mips in Activity / in region m / Mips in Activity /)

(Mips in region m / Mips in 101 lecs)

** See Table 10 for definition of economic activities.

***First five regions with the largest indices in each group of economic activities are highlighted