

# **Information Technology in Rural Areas: Waiting for the Revolution**

Liesl Eathington\*  
Dave Swenson

Department of Economics  
Iowa State University

---

The researchers are, respectively, a research associate in the Department of Economics and a regional scientist in the same department. This paper was prepared for the 2002 Annual Meeting of the Southern Regional Science Association, Arlington, VA, 11-14 April.

## Introduction

Information technologies have been compared to railroads and automobiles in their potential to influence the spatial distribution of jobs and people. Technological advances in microelectronics, telecommunications, software, and information services allow us to transmit greater volumes of information at higher speeds and lower costs to a growing network of places across the globe. We know these information technologies are changing the way firms operate. We don't know if these changes will counteract or accelerate the traditional forces of agglomeration that have shaped much of our current economic geography. Will information technology lead to greater concentration of jobs in large cities, or will it create new opportunities for employment growth in nonmetropolitan areas? Thus far, the answer appears to be yes and yes.

While scholars ponder how and if information technology will loosen the ties of geography on industry location, the idea of geographically distinct industry clusters continues to gain in popularity among economic development strategists. Many economic development officials are trying to incubate information technology (IT) industry "clusters" in their regions, hoping to emulate California's Silicon Valley or North Carolina's Research Triangle. Several states, including Missouri, Iowa, Minnesota, and Nebraska have developed targeted industry programs that include information services, communications equipment, and computer equipment manufacturing industries.

Some of these targeted industry programs are developed at the state level, and others are tailored for specific matches between industries and regions within the state. Most of these targeted industry programs provide financial and other incentives to businesses and communities. In this paper, we assess recent patterns of employment growth in a set of representative industries to determine how realistic the chances are for nonmetropolitan regions in their efforts to recruit these industries.

For several decades now, scholars have been considering the potential impacts of information technology on firm location decisions. Researchers have taken many different paths to explore this topic. Whether theoretical or applied, broad-based or industry-specific, the literature expresses widely differing views on this topic.

In a review of literature concerning the impact of technological change on the spatial distribution of jobs and people, Atkinson (1998) found the locational preferences of high-technology manufacturing firms to be a major category of research. A well-educated work force and the need for interaction between customers, suppliers, competitors, universities, and other institutions are key factors in the location decisions of high-tech manufacturing firms. Atkinson cites several studies showing these firms tend to be more concentrated in metropolitan areas than other kinds of manufacturing firms.

There is some evidence that high-tech manufacturing industries are dispersing over time, and may be more mobile than traditional manufacturing firms. Schneider and Kim (1996) studied changes in locational patterns of 29 high-tech manufacturing industries, and found that while the industries varied in the extent of decentralization, most became more geographically dispersed during the 10 year time period studied. They found a positive relationship between redistribution and industry growth, i.e. as a

high-tech industry grows it expands into new areas, although the regions preferred by these growing industries appeared to be wealthy suburbs. Kolko (1999) found no evidence of a rural renaissance caused by information technology. In analyzing high tech growth in the U.S. between 1988 and 1995, he noted that even though rural employment growth was strong during this period, “high-tech industry [was] not driving this growth (p. 1).”

Researchers have studied the location preferences of service industries as well as high-technology manufacturing industries. Nunn and Warren (2000) compared metropolitan core and non-core concentrations of employment in computer services industries. Their results, which highlight the importance of distinguishing between higher-order and low-order services, did not fit expectations derived from producer services literature. Low-order, routinized services such as data processing do not require close proximity to customers, and benefit less from agglomeration economies than higher-order services. These kinds of services are expected to disperse from metropolitan core areas. Nunn and Warren found low-order data processing to be more concentrated in the metropolitan core counties than non-core counties, and the degree of concentration exceeded that for higher-order computer programming services.

Moving beyond the question of where IT industries locate, some researchers have gone questioned the “why” of their location decisions. In a study of rural producer-service firms, which included several IT service industries, authors Lindahl and Beyers (1996) found that quality of life in nonmetropolitan areas was the most frequently cited reason for the location decisions of the proprietors surveyed. Still, these proprietors reported that face-to-face customer contacts were still very important methods of service delivery, and such meetings have not been replaced by written and graphical communications or sharing of electronic data. These firms reported using a mix of service delivery vehicles, including meetings at the client’s place of business and their own place of business.

Atkinson identified another category of research relating to the importance of localization and urbanization for growth in IT industries. Innovation can arise from competition among groups of like firms in a region, which is often called the localization effect. Industry clusters such as Silicon Valley in California illustrates the localization effect. Innovation may also be cultivated within the rich and diverse atmosphere of a large city. This is often called the urbanization effect. Some of the studies on localization and urbanization have focused on their relative importance within specific high technology industries. Other studies have addressed the question of how information technology might lessen the importance of localization and urbanization effects on industry location decisions.

A third major category of research identified by Atkinson focuses on how new information technologies might change the nature of economic transactions among firms, suppliers, customers, and competitors. These studies focus on the users of IT, and not just the producers. Industry-level studies have examined the transportation, communications, trade, and financial services industries to determine how the use of IT products and services might lift some of the constraints on the location of business functions within these kinds of firms.

Some of the industry studies have examined the kinds of business functions that can be spun off to achieve efficiencies. For example, service industry firms can move their back-office and other support functions to cost-efficient locations, while leaving their customer-contact functions near their client base. While such spin-offs provide opportunities for non-metropolitan employment growth, not all researchers believe they provide a long-term solution for rural areas. Glasmeier and Howland (1995) found that service sector branch plants are not proliferating in rural areas. These authors note that rural firms compete with low-wage workers in other communities around the world, and also face the prospect of displacement as computer technology continues to evolve.

### **The Focus of the Study**

This report tracks recent state-level employment changes in a set of 35 industries that our research leads us to believe have been profoundly affected by advances in information technologies. In this study, we are looking for recent evidence that these IT-related industries may be changing how they make location decisions. We grouped the study industries into two categories: those producing IT goods and services, and those consuming IT goods and services.

- **IT-Producing:** The IT-producing industries include computer and communications equipment manufacturing, instruments manufacturing, communications, and computer service industries. Particular industries were identified using the U.S. Commerce Department's annual report "Digital Economy," which tracks employment and productivity in IT industries.
- **IT-Consuming:** The IT-consuming industries include printing and publishing, components manufacturing, transportation and logistics, wholesale and retail trade, financial services, and business and professional services. These industries provide clear examples of how information technology can alter the ways industries operate. In some cases, IT has introduced new efficiencies into their markets, leading to employment decline. The commercial banking industry, for example, has experienced this type of change. In other cases, information technology products available to home and business users have replaced the products of another industry, such as the commercial printing industry. The growth of e-commerce in the retail trade industry provides an example of how IT products and services can create new opportunities in traditional industries.

The latter part of the 1990s witnessed such rapid change in capacity and use of information technology products (e.g. the dot-com boom and bust) that it seems an opportune time to revisit how technology may be loosening the ties of geography on industries. In this study, we are looking for recent evidence of any notable shifts in the location preferences in a set of 35 IT consuming and producing industries. We have examined recent characteristics of employment growth in these industries to determine which, if any, might provide good candidates for recruitment in non-metropolitan regions.

## **Data Sources**

In this report, we have used data from the Bureau of Labor Statistics Covered Employment and Wages Program. We have used annual state, metropolitan, and national-level data for the years 1997 through 2000. Most of our analysis uses average annual employment by industry and average annual earnings by industry. For all industries, we included only employment in private industries. At the state and metropolitan level, we encountered several industries where data were suppressed in certain regions to meet BLS disclosure standards.

These data provide the most detail we can muster about industry-level employment in the United States. For the most part, we are comparing states to themselves over time relative to national average rates of change. Therefore, minor differences across states in the inclusion or exclusion of industries under the CEW program should not make a material difference in our analysis.

A nagging problem with this data source is that it does not include sole proprietor employment or employment in very small firms that are not subject to unemployment insurance withholding requirements, the reporting of which vary considerably among the states. As a consequence we may not fully catalog the growth in small firms at the industry level. Because this omission is consistent across geographies, we have dismissed its importance as well.

## **Recent Performance in IT-Producing and IT-Consuming Industries**

The IT-producing and IT-consuming industries discussed in this study have experienced widely (and wildly) differing trends in employment and earnings growth in recent years. Rather than describe each industry and its performance individually, we have included four appendices with detailed industry information at the end of this report.\* In the remainder of this report, we have characterized the employment growth of the study industries along several dimensions. We are primarily concerned with the likelihood these jobs can be attracted to non-metropolitan areas, so this was the first dimension we examined. We compiled employment by metropolitan region for 1997 and 2000 in our study set of industries. For each industry, we calculated total employment in all metropolitan cities with employment data disclosed for both years. We classified these cities as the metropolitan control group. The size of the control group varied by industry, depending on the extent of data suppression we encountered in the particular industry. Next, we calculated the metropolitan control group share of national employment in both years.

Using the change in metropolitan control group shares between 1997 and 2000, we categorized our set of industries into three groups: those in which the metropolitan

---

\* Appendix 1 lists the original set of 35 industries and details characteristics of their recent employment and earnings growth. Appendix 2 includes maps of net shifts in employment (1997 through 2000) by state for the final study set of 18 industries. Appendix 3 describes the products and services of the 18 study industries. Appendix 4 compares employment growth trends in between 1992 and 2001 for selected sets of industries, and discusses how IT might be influencing some of these changes. Appendix 5 compares average annual earnings, indexed to national averages, for selected industry pairs in 1997 and 2000.

group employment share increased, those with no significant change in the metropolitan control group share, and those in which the metropolitan control group share decreased. The change in share of the metropolitan control group provides a measure of mobility and an indication of the centralizing or decentralizing tendencies of the industry. A declining share in the metropolitan control group suggests that the industries are either shifting toward nonmetropolitan regions or shifting to a new set of metropolitan cities. An increasing share in the metropolitan control group suggests strong urbanization or localization advantages within the particular industry.

The second dimension we examined was employment growth of the industry at the national level. Each industry was categorized into one of two groups: those with employment growth between 1997 and 2000, and those with employment decline. Table 1 shows how the industries fared along the decentralization and employment growth dimensions. Five industries had declining national employment with increasing or constant shares of employment in metropolitan cities. These industries, shown in gray in Table 1, were excluded from further analysis, as they obviously were not likely candidates for nonmetropolitan growth in the short term.

We examined a third dimension of industrial change to obtain a measure of the quality of new jobs being created within the study industries. We compared average annual earnings by industry to the national average for all industries in 1997 and 2000, to determine which industries show earnings growth and which show earnings erosion. Table 2 categorizes the study industries by the change in their metropolitan control group share and the measure of earnings change.

**Table 1. Industries Categorized by Direction of Change in Metropolitan Control Group Employment Shares and Direction of Change in National Employment**

Metropolitan Control Group Share	U.S. Employment Grew	U.S. Employment Declined
Increased (Concentrated)	Miscellaneous Plastics Products Mfg. General Warehousing and Storage Computer Programming Services Information Retrieval Services	Communications Equipment Mfg.
No Change in Share	Small Fabricated Metal Parts Mfg. Electronic and Electrical Equipment and Components Mfg. Telephone Communications, except Radiotelephone Wholesale Trade of Motor Vehicles and Motor Vehicle Parts Non-store Retailers Prepackaged Software Engineering, Architectural, and Survey Services	Book Printing & Publishing Commercial Printing Services Laboratory and Analytical Instruments Mfg. Direct Mail Advertising Services
Decreased (Dispersed)	Periodicals Printing & Publishing Miscellaneous Publishing Arrangement of Transportation of Freight and Cargo Packing and Crating Radiotelephone Communications Functions Related to Depository Banking Security Brokers and Dealers Services Allied with Exchange of Securities Medical Service and Health Insurance Insurance Agents, Brokers, and Services Consumer Credit Reporting Agencies Employment Agencies Data Processing Services Vocational Schools	Computer and Office Equipment Mfg. Search and Navigation Instruments Mfg. Travel Agencies Commercial Banks Computer Maintenance and Repair Services

**Table 2. Industries Categorized by Direction of Change in Metropolitan Control Group Employment Shares and Direction of Change in Average Earnings**

Metropolitan Control Group Share	U.S. Earnings Grew or Held Constant Relative to the Average for All Industries	U.S. Earnings Eroded Relative to the Average for All Industries
Increased (Concentrated)	Computer Programming Services Information Retrieval Services	General Warehousing and Storage Miscellaneous Plastics Products Mfg.
No Change in Share	Electronic and Electrical Equipment and Components Mfg. Non-store Retailers Engineering, Architectural, and Survey Services Prepackaged Software	Telephone Communications, except Radiotelephone Wholesale Trade of Motor Vehicles and Motor Vehicle Parts Small Fabricated Metal Parts Mfg.
Decreased (Dispersed)	Periodicals Printing & Publishing Miscellaneous Publishing Computer and Office Equipment Mfg. Radiotelephone Communications Functions Related to Depository Banking Services Allied with Exchange of Securities Employment Agencies Data Processing Services Travel Agencies Security Brokers and Dealers Medical Service and Health Insurance Vocational Schools	Arrangement of Transportation of Freight and Cargo Commercial Banks Insurance Agents, Brokers, and Services Search and Navigation Instruments Mfg. Packing and Crating Consumer Credit Reporting Agencies Computer Maintenance and Repair Services



From the original set of 35 industries, we only selected 18 for further analysis. (The industries *not* selected are shaded in gray.) Our selection includes a mix of centralizing and decentralizing, growing and declining industries with varying earnings performance. We have included industries requiring highly skilled and lower-skilled workers from the manufacturing, transportation, communications, trade, financial services, and business and professional service sectors. As we examine the geographic shifts in employment by industry in the next section, we can use these differences to qualitatively compare the kinds of jobs being attracted to certain regions or states. Table 3 lists the final study set of industries, along with the national employment growth rates for these industries between 1997 and 2000, and the direction of change in their average earnings relative to the average for all industries.

**Table 3. Industries Selected for Analysis of Employment Shifts**

Industry	Metropolitan Employment	Percentage Change in U.S. Employment	Index of Average Earnings
Periodicals	Decentralized	+ 9.0	Grew / NC
Miscellaneous Publishing	Decentralized	+ 8.8	Grew / NC
Computer and Office Equipment	Decentralized	- 3.8	Grew / NC
Electronic & Electrical Equipment and Components	No Change	+ 5.0	Grew / NC
General Warehousing and Storage	Centralized	+ 35.4	Eroded
Arrangement of Transportation of Freight & Cargo	Decentralized	+ 10.7	Eroded
Radiotelephone Communications	Decentralized	+ 42.3	Grew / NC
Telephone Communications, Except Radiotelephone	No Change	+ 14.9	Eroded
Motor Vehicles And Motor Vehicle Parts	No Change	+ 2.0	Eroded
Non-store Retailers	No Change	+ 18.5	Grew / NC
Commercial Banks	Decentralized	- 2.2	Eroded
Functions Related to Depository Banking	Decentralized	+ 33.7	Grew / NC
Services Allied with Exchange of Securities	Decentralized	+ 37.3	Grew / NC
Insurance Agents, Brokers, and Services	Decentralized	+ 4.3	Eroded
Employment Agencies	Decentralized	+ 15.1	Grew / NC
Computer Programming Services	Centralized	+ 67.3	Grew / NC
Data Processing Services	Decentralized	+ 13.5	Grew / NC
Engineering, Architectural, and Survey Services	No Change	+ 16.0	Grew / NC

### **Analysis of Employment Changes by State**

The next step in our analysis introduced a geographic dimension. We calculated the net shifts in employment by state for each of the study industries between 1997 and 2000. The employment shifts demonstrate changes in the states' competitive positions during the study period. We illustrated these changes using dot density maps, which are contained in Appendix 2.

The employment shift maps provide a useful tool for exploratory spatial data analysis. From these maps, we can see distinct differences in the location of employment growth by industry, and while some industries demonstrate no obvious geographic patterns of employment change, others do. For example, employment seemed to shift away from or towards states with higher initial concentrations of employment in some industries. In other industries, employment seemed to shift toward regional clusters of states. However, the maps don't allow us to draw conclusions about the forces behind the employment changes. In addition, if you stare at too many dot density maps, you can start hallucinating. To explore the employment changes more in depth, we ran simple correlations between the change in state shares of employment in each study industry and four other variables. These variables are described below:

- State's share of industry employment in 1997
- State average annual earnings indexed to the national average for the industry in 1997
- State growth rate in average earnings for the industry between 1997 and 2000
- State growth rate in population between 1990 and 2000

The correlation results for the study industries are shown in Table 4. All variables correlating with the change in share by 0.3 or greater or -0.3 or less are highlighted in blue.

**Table 4. Correlations between change employment shares and other variables**

<i>Industry</i>	<i>Share of Industry Employment in 1997</i>	<i>Industry Avg. Earnings Indexed to U.S. in 1997</i>	<i>Percentage Change in Industry Average Earnings</i>	<i>Percentage Change in Population, 1990-2000</i>
Periodicals Printing & Publishing	0.381	0.290	0.149	0.108
Miscellaneous Publishing	-0.322	0.085	0.072	0.032
Computer and Office Equipment Manufacturing	0.616	0.204	0.185	0.022
Electronic and Electrical Equipment & Components	0.126	0.037	0.270	-0.026
General Warehousing and Storage	0.011	-0.011	-0.125	0.094
Arrangement of Transportation of Freight and Cargo	-0.294	-0.240	-0.136	0.083
Radiotelephone Communications	-0.461	0.122	-0.237	0.258
Telephone Communications, except Radiotelephone	0.053	-0.252	-0.017	0.278
Wholesale Trade of Motor Vehicles and Parts	0.210	-0.032	0.033	-0.233
Non-store Retailers	-0.083	0.330	0.361	0.207
Commercial Banks	-0.394	-0.247	-0.122	0.167
Functions Related to Depository Banking	Insufficient Data			
Services Allied with Exchange of Securities	-0.290	-0.009	-0.090	0.338
Insurance Agents, Brokers, and Services	-0.158	-0.233	-0.071	0.026
Computer Programming Services	0.397	0.212	0.350	0.125
Data Processing Services	-0.452	-0.388	0.117	-0.076
Employment Agencies	-0.629	0.057	-0.204	-0.016
Engineering and Architectural Services	0.442	0.075	0.159	0.241

Four industries showed a positive correlation between their change in employment share and their share of employment in 1997. These industries were

periodicals printing & publishing, computer and office equipment manufacturing, computer programming services, and engineering and architectural services. These industries all have relatively high-paying, high-skilled jobs. These jobs may be concentrating in states with an already large and skilled labor pool.

Five industries showed a negative correlation between their change in employment share and their share of employment in 1997. These industries were miscellaneous publishing, radiotelephone communications, commercial banks, data processing services, and employment agencies. Average earnings in these industries are lower than the previous group. These jobs are diffusing throughout the United States.

Two industries showed an association between the change in employment share and earnings levels in 1997, although the relationship was in opposite directions. States with relatively higher earnings in the non-store retailing industry increased their shares of employment. States with relatively lower earnings in data processing industries increased their shares of employment.

Two industries showed a positive correlation between the change in employment shares and the change in average earnings. This relationship suggests two possible scenarios in the non-store retailing and computer programming industries: either most of the employment growth occurred in higher-skilled jobs in these states, or growth in these industries led to increased demand for workers and bid up average wages in these industries.

Only one industry showed a strong relationship between change in employment share and population change. Employment in services allied with exchange of securities was positively correlated with population growth.

### **Summary of State-Level Industry Analysis**

The employment shift analysis and the correlation table suggest that many different forces are at work among the study set of industries:

*Employment shifts towards lower-wage regions* were demonstrated in data processing services. State-by-state correlations suggest that states with relatively lower average earnings in the data processing industry had the largest positive shifts in data processing employment.

*Employment shifts toward regions with rapidly growing population* were demonstrated in services allied with exchange of securities. Most of the jobs in this industry involve providing investment advice to individuals and businesses. There was a positive association between population growth and growth in securities services jobs. In matters of personal finance, it is easy to believe that face-to-face interaction with their investment advisor will remain important, no matter how easily transactions may be conducted by phone.

*Employment shifts to capture new markets* were demonstrated in radiotelephone communications. States with lower shares of employment in 1997 had larger positive shifts in employment. It just took longer for Nebraska to get their cell phone towers than New York.

*Employment shifts toward concentrations of specialized labor* were demonstrated in the computer programming services industry. States with large shares of these jobs in 1997 increased their shares by the end of 2000.

*Employment shifts towards high-amenity places* were perhaps demonstrated by engineering, accounting and surveying services. The map for this industry shows strong positive shifts to states like Colorado and California. While engineers and accountants may be able to move anywhere and communicate with their clients, they appear to be choosing the slopes of Vail much more so than the Iowa prairie or the North Dakota tundra.

*Employment shifts due to industry consolidation* were demonstrated in commercial banking. The shifts in commercial banking suggest the opportunity for efficiency was greater where the concentration of banking employment was initially the highest. There was less efficiency to be gained in the small and scattered communities of the Plains states.

## **Employment Change in Iowa**

We take our analysis to the county level in Iowa to evaluate the performance of the study industries in non-metropolitan counties. Iowa makes an excellent state for comparative analysis of IT industries for the following reasons:

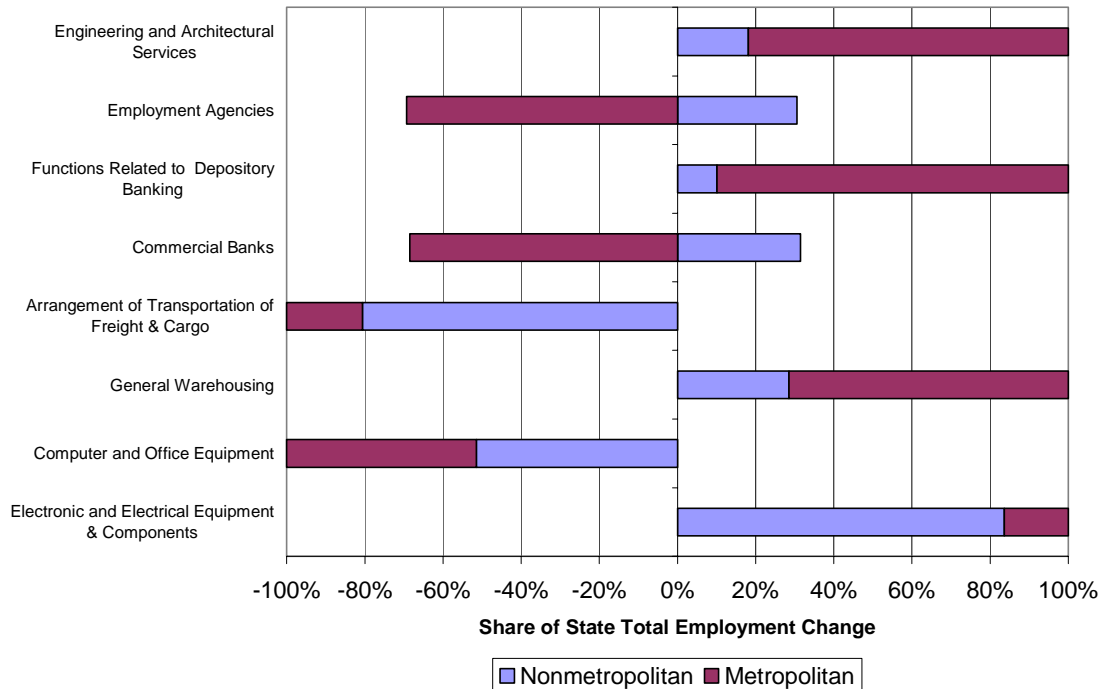
- The state has nine metropolitan cities of varying size.
- It has a several non-metropolitan, regional trade and employment centers and a relatively large non-metropolitan economy.
- It has a well-educated population.
- No region of the state boasts advantages in physical amenities.
- It has a well-developed telecommunications infrastructure, even in rural areas.
- It has a strong base in financial services industries, and its manufacturing sector has been growing faster than the national average rate of growth.
- It is centrally located in the United States. It is located at the juncture of two major interstate highways: I80 going east and west, and I35 going north and south. Its position in the Central Time Zone increases the possible business hours of contact with the rest of the nation.

Using our study set of industries, we examined employment change in Iowa between 1997 and 2000, to determine how the non-metropolitan counties fared relative to the metropolitan counties.

Statewide, Iowa experienced employment declines in four of the study industries: computer and office equipment manufacturing, arrangement of transportation of freight and cargo, commercial banks, and employment agencies. Iowa experienced moderate employment growth in engineering and architectural services, functions related to depository banking, general warehousing, and electronic and electrical equipment & components manufacturing. The percentage share of employment change by county type in these industries is shown in Figure 1. Iowa's largest employment gains occurred in data processing and telecommunications. The distribution of these jobs by county type is shown in Figure 2.

**Figure 1**

**Composition of Employment Change in Iowa by County Type, 1997-2000**



The nonmetropolitan counties attracted more than 80 percent of the state’s growth in electronic and electrical equipment and components. Among the industries that grew in Iowa, this was the only industry in which the state’s 88 nonmetropolitan counties captured a larger share of new jobs than the 11 metropolitan counties. It should be noted that Iowa’s average earnings in this industry were less than 40 percent of the national average in 2000.

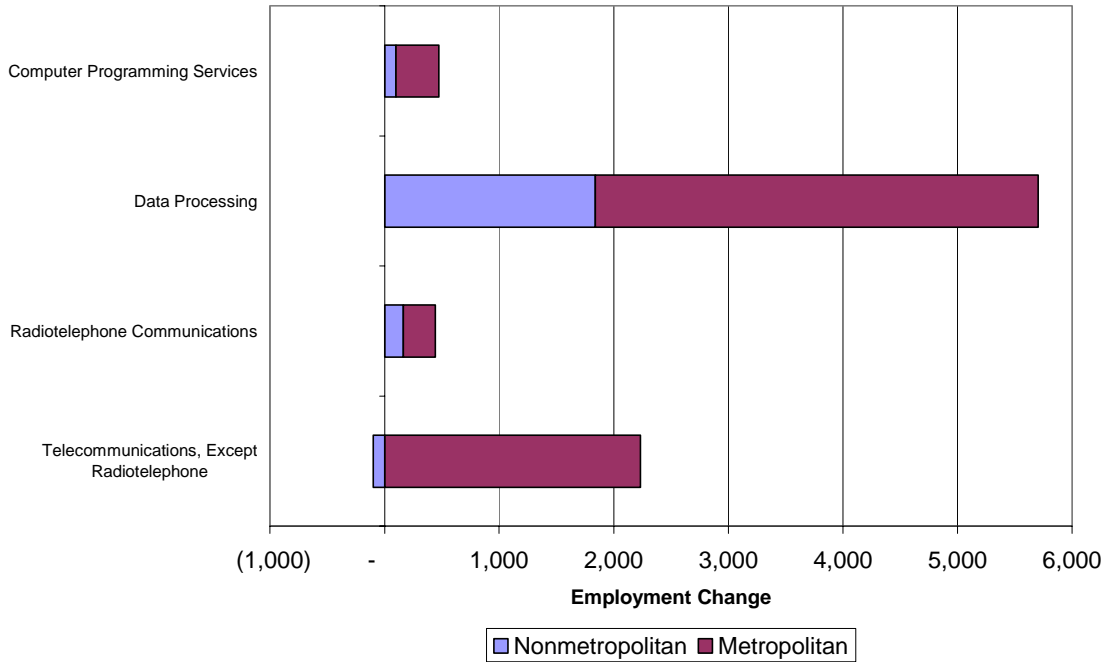
In other industries growing statewide, nonmetropolitan counties had slightly less than 30 percent of the state’s growth in general warehousing, and less than 20 percent of the state’s growth in engineering and accounting services and functions related to depository banking.

Among the industries declining statewide, the nonmetropolitan counties experienced employment growth in commercial banks and employment agencies. The nonmetropolitan counties bore a larger share of employment losses in arrangement of transportation of freight and cargo than the metropolitan counties. The losses in computer and office equipment manufacturing were split equally between the two county groups.

The nonmetropolitan counties gained a substantial number of data processing jobs (see Figure 2). Still, for every new data processing job in the nonmetropolitan counties, the metropolitan counties added two. In radiotelephone communications, the nonmetropolitan counties captured almost 40 percent of the state’s new jobs. The nonmetropolitan counties lost jobs in other telecommunications firms, while the metropolitan counties gained over 2,000 new jobs.

Figure 2

Telecommunications and Computer Services Employment Change in Iowa by County Type, 1997-2000



The study set of industries presented a mixed bag of opportunity in Iowa's nonmetropolitan counties. The electronic and electrical equipment manufacturing and data processing industries were the best performers in the nonmetropolitan Iowa economy between 1997 and 2000. Iowa's average earnings in these industries are far below the national average, suggesting qualitative differences in the kinds of jobs Iowa's nonmetropolitan counties are attracting.

Iowa's data processing industry deserves special attention because it helps illustrate that not all IT industries bring uniformly good jobs. Iowa's data processing industry followed the national trend by decentralizing from metropolitan cities. While growth in this industry has been strong in Iowa and surrounding states, the states seem to be attracting very different kinds of jobs. In Illinois, for example, the average earnings in the data processing industry are more than twice the average for Iowa. Iowa's average earnings were just 58 percent of the national average in 2000. Even within the state of Iowa, earnings vary considerably. The average data processing earnings in the metropolitan counties are twice the average for the nonmetropolitan counties, where average data processing earnings were just \$15,000 per year in 2000. These jobs may be better than no jobs at all, but if counties are targeting them just because they fall into the category of "information technology," their efforts may be better directed elsewhere. These jobs resemble low-technology manufacturing jobs more than they resemble service jobs, and they are unlikely to entice the young, professional class of worker Iowa is so desperate to attract.

## Conclusions

The ease with which we create, process, store, transmit, share, manipulate, and illustrate information in electronic form is reducing the need for physical proximity between firms and their suppliers, their customers, and even their workers. However, these changes are not occurring uniformly across all industries, or even for all functions within an industry. While IT industries present opportunities for employment growth in new industries, they are also contributing to employment decline in more traditional industries.

In this analysis of employment shifts in IT-producing and IT-consuming industries, we have found widely differing patterns of employment growth. The forces attracting growth in these industries appear to vary by the kind of industry: IT industries requiring lower skills are going where wages are low, high-skill IT jobs are going where amenities are higher and/or there exists a well-skilled labor pool. Jobs in consumer-oriented industries are following growth in consumer markets, or where the market is not yet saturated.

These patterns of employment change in some of the industries may indeed reflect loosening ties of geography on firm location. However, once their feet are loosened, there is no evidence these industries engage in a locational free-for-all. Old location patterns seem to hold in many instances, and some will be more difficult for information technologies to erase. The advantages of urbanization may be hardest to overcome. The spontaneity of “water-cooler” conversations among workers is hard to duplicate electronically, no matter how fast the connection or how clear the image. When IT products can accomplish that, it *will* be revolutionary.

Scholars will continue to ponder how continued enhancements in IT and the relationship between IT and productivity will ultimately create a new urban form. In the near term, even if industries no longer *need* to be in metropolitan areas, rural areas will probably not attract high-quality, high technology industries. The example of the data processing industry in Iowa shows that nonmetropolitan counties are attracting the digital dregs of the IT barrel.

In summary, we should remember that IT products and services are developed by businesses to provide business solutions, not regional economic development solutions. The extent to which they do provide new opportunities for nonmetropolitan regions depends on how many barriers to economic development they can lift. Information technology can overcome some negative attributes, such as remoteness, but they can't add positive attributes such as natural amenities, a large and skilled labor pool, or the often-overlooked feature of highly urban areas: that's where all the action is.

## References

- R. Atkinson, "Technological Change and Cities," *Cityscape: A Journal of Policy Development and Research*, vol. 3, no. 3, U.S. Department of Housing and Urban Development, Office of Policy Development and Research (1998).
- W. Beyers and D. Lindahl, "Lone Eagles and High Flyers in Rural Producer Services," *Rural Development Perspectives*, vol. 11, no. 3, Economic Research Service, U.S. Department of Agriculture (June 1996).
- Digital Economy 2000*, Economics and Statistics Administration, U.S. Department of Commerce, June 2000.
- A. Glasmeier and M. Howland, *From Combines to Computers: Rural Services and Development in the Age of Information Technology*, State University of New York Press, Albany, 1995.
- J. Kolko, "The High-Tech Rural Renaissance?: Information Technology, Firm Size, and Rural Employment Growth," prepared under contract for the U.S. Small Business Administration, Office of Advocacy, July 1999.
- S. Nunn and R. Warren, "The Intrametropolitan Distribution of Computer Services Employment, 1982 and 1993," *Urban Geography* 21(5): 406-427 (2000).
- M. Schneider and D. Kim, "The Effects of Local Conditions on Economic Growth, 1977-1990: The Changing Location of High-Technology Activities," *Urban Affairs Review* 32(2): 131-156 (1996).



**Information Technology in Rural Areas:  
Waiting for the Revolution**

Liesl Eathington  
Dave Swenson

*Department of Economics*

*Iowa State University*

APPENDIX SECTION

Appendix 1: National Employment and Earnings Data for Industries; Shares of U.S. Employment in California, Florida, Illinois, New York, and Texas; and Shares of Employment in Metropolitan Control Groups by Industry

Industry		U.S. Employment		U.S. Average Annual Earnings		Index of Earnings to U.S. Average for All Industries		Employment Share in CA, NY, IL, FL, and TX		Employment Share in Metropolitan Control Group	
Description	BLS ID	2000	Pct Chg from 1997	1997	2000	1997	2000	1997	2000	1997	2000
Periodicals	D272	145,947	9.0%	50,139	62,423	1.67	1.77	52%	53%	40%	39%
Books	D273	124,462	-1.2%	38,214	44,512	1.27	1.26	34%	34%	47%	47%
Miscellaneous Publishing	D274	95,093	8.8%	38,780	46,630	1.29	1.32	41%	39%	50%	48%
Commercial Printing	D275	558,152	-2.3%	33,219	37,067	1.10	1.05	31%	31%	63%	63%
Miscellaneous Plastics Products	D308	744,828	2.0%	30,290	33,711	1.01	0.95	27%	27%	44%	45%
Screw Machine Products	D345	105,959	1.9%	36,121	39,462	1.20	1.12	36%	36%	44%	45%
Computer and Office Equipment	D357	356,986	-3.8%	64,269	104,879	2.14	2.97	45%	48%	53%	51%
Communications Equipment	D366	274,855	-0.6%	52,284	74,193	1.74	2.10	49%	51%	66%	69%
Electronic and Electrical Equipment and Components	D367	680,709	5.0%	45,038	64,909	1.50	1.84	48%	47%	64%	65%
Search and Navigation Instruments	D381	151,537	-5.1%	57,757	65,184	1.92	1.84	ND	ND	46%	41%
Laboratory and Analytical Instruments	D382	298,767	-0.5%	47,023	63,167	1.56	1.79	39%	39%	60%	60%
General Warehousing and Storage	E4225	129,916	35.4%	25,439	28,385	0.85	0.80	37%	35%	50%	52%
Travel Agencies	E4724	168,560	-1.8%	25,656	31,524	0.85	0.89	40%	40%	52%	51%
Arrangement of Transportation of Freight and Cargo	E473	192,831	10.7%	36,328	41,274	1.21	1.17	50%	50%	63%	62%
Packing and Crating	E4783	18,550	32.0%	22,275	25,053	0.74	0.71	ND	ND	34%	29%
Radiotelephone Communications	E4812	212,572	42.3%	42,339	59,230	1.41	1.68	43%	39%	52%	46%
Other Telephone Communications	E4813	941,826	14.9%	52,536	61,183	1.75	1.73	36%	37%	52%	52%
Motor Vehicles And Motor Vehicle Parts	F501	523,673	2.0%	31,961	36,028	1.06	1.02	31%	31%	56%	56%
Nonstore Retailers	G596	402,730	18.5%	23,440	32,329	0.78	0.91	28%	30%	52%	52%
Commercial Banks	H602	1,425,858	-2.2%	36,058	41,782	1.20	1.18	34%	33%	64%	62%
Functions Related to Depository Banking	H6099	91,344	33.7%	40,829	48,551	1.36	1.37	ND	ND	27%	24%
Security Brokers and Dealers	H621	553,581	24.1%	118,088	157,449	3.93	4.46	53%	50%	65%	64%
Services Allied with Exchange of Securities	H628	172,051	37.3%	105,614	141,762	3.51	4.01	50%	49%	61%	58%
Medical Service and Health Insurance	H632	379,283	11.5%	39,422	45,937	1.31	1.30	29%	28%	53%	51%
Insurance Agents, Brokers, and Services	H641	758,029	4.3%	39,249	44,671	1.31	1.26	39%	38%	77%	76%
Consumer Credit Reporting Agencies	I732	158,216	18.4%	28,829	33,040	0.96	0.93	35%	37%	58%	56%
Direct Mail Advertising Services	I7331	104,998	-3.7%	29,731	38,011	0.99	1.08	37%	42%	44%	44%
Employment Agencies	I7361	389,984	15.1%	25,064	31,547	0.83	0.89	48%	43%	45%	42%
Computer Programming Services	I7371	541,367	67.3%	59,758	78,170	1.99	2.21	39%	42%	62%	63%
Prepackaged Software	I7372	296,922	33.1%	79,864	118,809	2.66	3.36	38%	36%	63%	63%
Data Processing Services	I7374	278,590	13.5%	44,398	53,439	1.48	1.51	35%	34%	52%	50%
Information Retrieval Services	I7375	264,119	225.1%	49,575	82,315	1.65	2.33	36%	50%	53%	65%
Computer Maintenance and Repair	I7378	53,898	-5.4%	40,781	44,542	1.36	1.26	38%	40%	42%	37%
Vocational Schools	I824	99,326	19.6%	28,288	33,904	0.94	0.96	39%	38%	32%	32%
Engineering, Architectural, and Survey Services	I871	1,011,001	16.0%	47,851	55,831	1.59	1.58	34%	35%	65%	65%

## Appendix 2. Employment Shift Maps, 1997-2000

The following set of dot density maps show the net shifts in industry employment for the period from 1997 through 2000. These shifts were calculated as follows:

Net Shift = State employment in the industry in 1997 \* (State rate of industry employment change – U.S. rate of employment change)

States with data suppressed in a particular industry are blank. Green dots indicate net gains in employment, and red dots indicate net losses. The jobs-per-dot ratio, which varies by industry, is indicated on the legend for each map. The maps are summarized by sector below:

### Manufacturing Industries

- Periodicals Printing & Publishing: New York, California, Maryland, Delaware, and Massachusetts stand out with strong net gains in employment. These states had high levels of employment in 1997. Illinois, Ohio, and Pennsylvania also had high employment levels in 1997, but these states show net losses in employment. In general, the Great Lakes region appears to be growing more slowly than Southeastern states such as Alabama, Georgia, South Carolina, and Tennessee.
- Miscellaneous Publishing: Employment shifts in this industry do not show any obvious patterns. Iowa, Nebraska, and Colorado showed strong gains, while Indiana, Connecticut, New Jersey, and California showed relatively large net losses.
- Electronic and Electrical Equipment & Components: Several states showed strong gains, including Wisconsin, Idaho, Pennsylvania, and Oregon. Gains were dispersed among many states throughout the Midwest and the West. Illinois, Indiana, Ohio, New York, Florida, and Arizona experienced net losses.
- Computer and Office Equipment: California and New York showed strong gains in these industries. Tennessee, Georgia, and Virginia also posted net gains. Losses were widespread throughout the Midwest the West.

### Transportation & Communications Industries

- General Warehousing and Storage: Employment in this category grew 35 percent between 1997 and 2000, and all states reporting data experienced employment growth in this category. The states showing net losses in employment just grew more slowly than the national average rate. These states include Florida, Illinois, and South Carolina. Indiana, Kentucky, North Carolina, and Georgia showed strong gains. Several states along the Mississippi River fared poorly relative to the nation. Most states in the Southwest grew faster than the national average rate.
- Arrangement of Transportation of Freight and Cargo: The region including Indiana, Ohio, Kentucky, and Tennessee appears to be leading the nation in this category of employment growth. South Carolina also had strong gains.
- Radiotelephone Communications: Washington, Virginia, South Carolina, and Florida posted very strong net gains. The region of Colorado, Utah, Arizona, and New Mexico also showed strong net gains. With the exception of Washington and Virginia, most states with a high concentration of employment in 1997 grew more slowly than the national average. These states include California, Texas, Illinois, and many Eastern states. The Dakotas, Nebraska, and Wyoming also grew more slowly than the rest of the nation.
- Telecommunications Except Radiotelephone: Employment has shifted from the East and the Great Lakes region to the South and West. Nebraska and Florida show strong net gains.

### **Trade Industries**

- Wholesale Trade of Motor Vehicles & Parts: Shifts in this industry were somewhat evenly dispersed among the states, with only Arizona and Ohio showing relatively strong net losses.
- Non-store Retailers: Washington, New York, Missouri, and Tennessee stand out for their net gains in this industry. In general, the Midwest looks to be lagging the nation in employment growth. Texas, Florida, and the West all increased their shares of employment in this category.

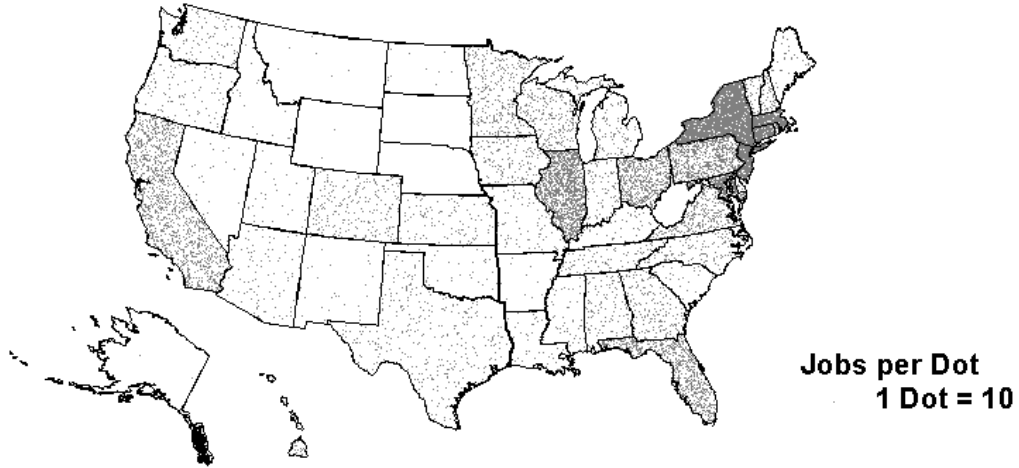
### **Financial Services Industries**

- Commercial Banks: New York, Pennsylvania, Illinois, Indiana, and Michigan all lost banking jobs more rapidly than the national average. California and other western states also experienced net losses. North Carolina, Texas, Florida, and Ohio had strong net gains. Most states throughout the Plains and the Southeast had net gains in commercial banking jobs.
- Functions Related to Depository Banking: States with relatively high concentrations of employment, such as New York, Illinois, Florida, and Utah grew more slowly than the national average rate. Many southeastern states showed strong gains. Data for many states were suppressed in this industry.
- Services Allied with Exchange of Securities: Illinois, Missouri, and New York all started with relative concentrations of employment in this industry, and all three states experienced net losses. In contrast, California and Colorado increased their already large shares of employment.
- Insurance Agents, Brokers, and Services: Pennsylvania, Georgia, Indiana, Louisiana, and Oregon posted strong gains. New York and Michigan had strong net losses. California, Washington, and several New England states also had net losses in this industry.

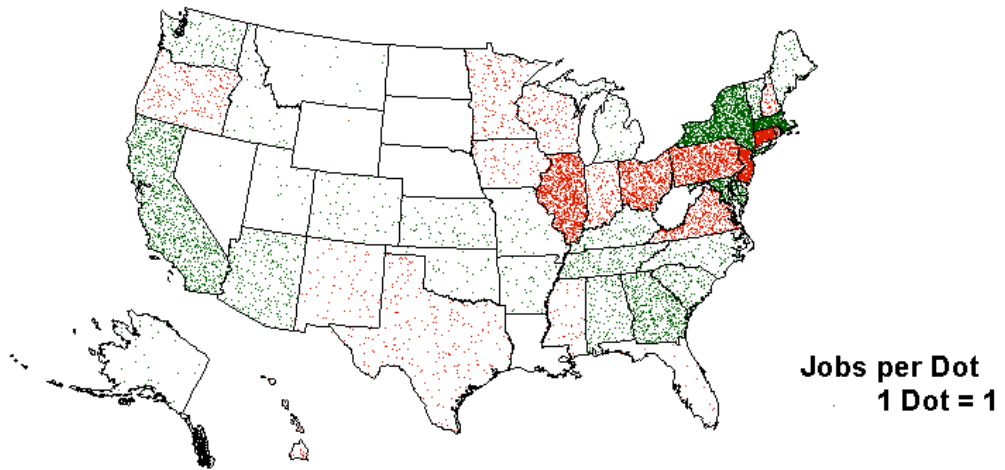
### **Service Industries**

- Computer Programming: Employment appears to have shifted westward in this industry. Among eastern states, Massachusetts, Virginia, and South Carolina grew faster than the national average rate. In the Midwest, Illinois stood out as the strongest performer. California, Texas, and Oregon posted strong gains. Several other states in the West showed moderate net gains.
- Data Processing Services: The region of Iowa, Illinois, and Wisconsin showed the strongest gains in this industry. California, Texas, and Florida had net losses.
- Employment Agencies: Illinois and California experienced large net losses in this industry, while Michigan, Ohio, Florida, and North Carolina posted net gains. Many states in the East posted gains, while states in the West had only minor gains or net losses.
- Engineering, Architectural, and Surveying Services: California, Florida, Texas, Colorado, New York, and Virginia grew more rapidly than other states. Pennsylvania and Ohio experienced large net losses.

## Periodicals Printing & Publishing Employment in 1997

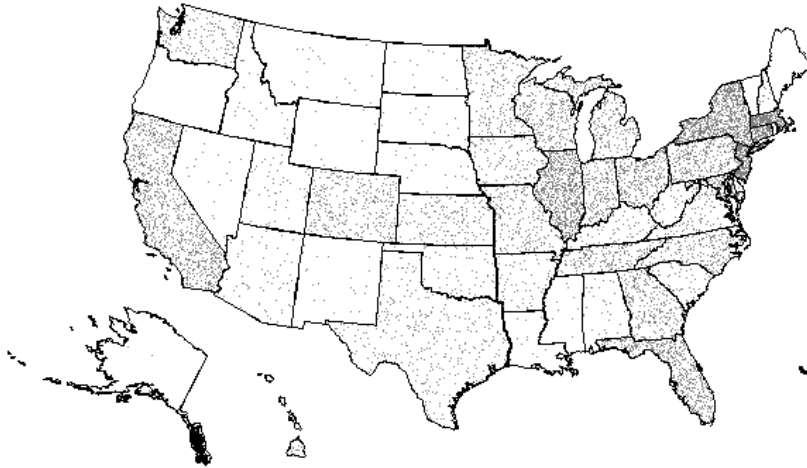


## Employment Shifts, 1997-2000



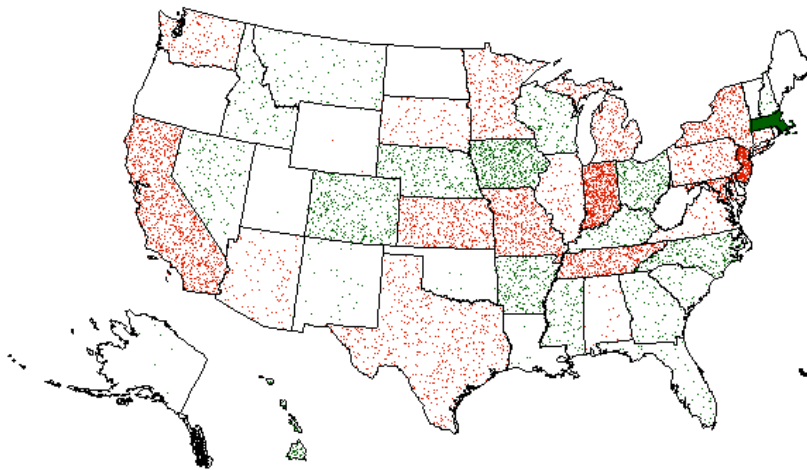
Red for Net Decline, Green for Net Gain

## Miscellaneous Publishing Employment in 1997



Jobs per Dot  
1 Dot = 10

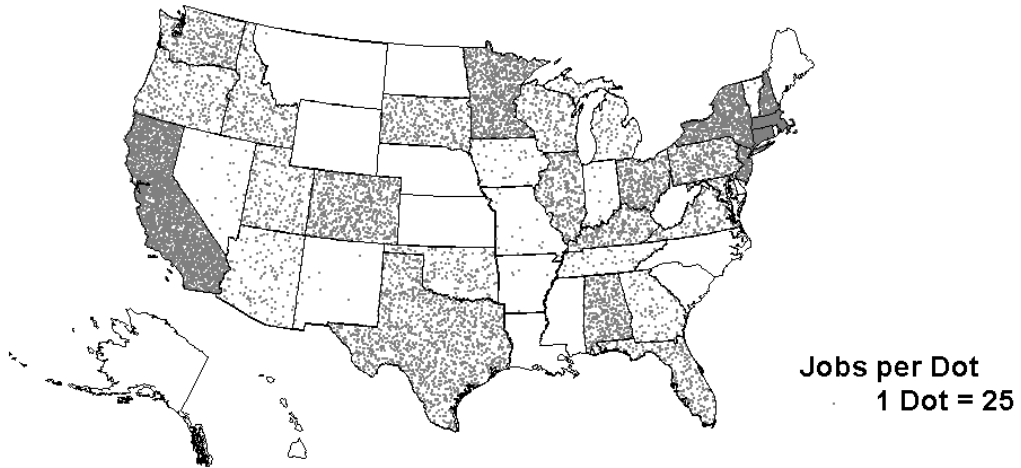
## Employment Shifts, 1997-2000



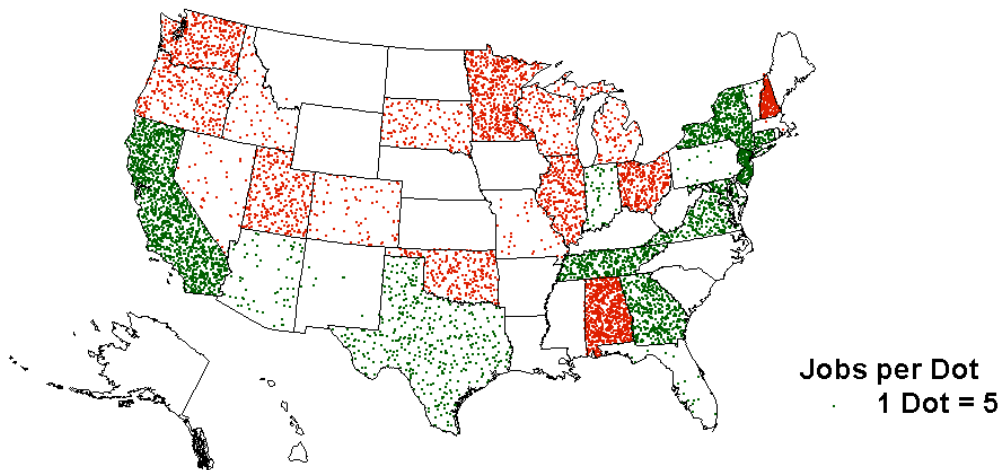
Jobs per Dot  
1 Dot = 1

Red for Net Decline, Green for Net Gain

## Computer and Office Equipment Manufacturing Employment in 1997

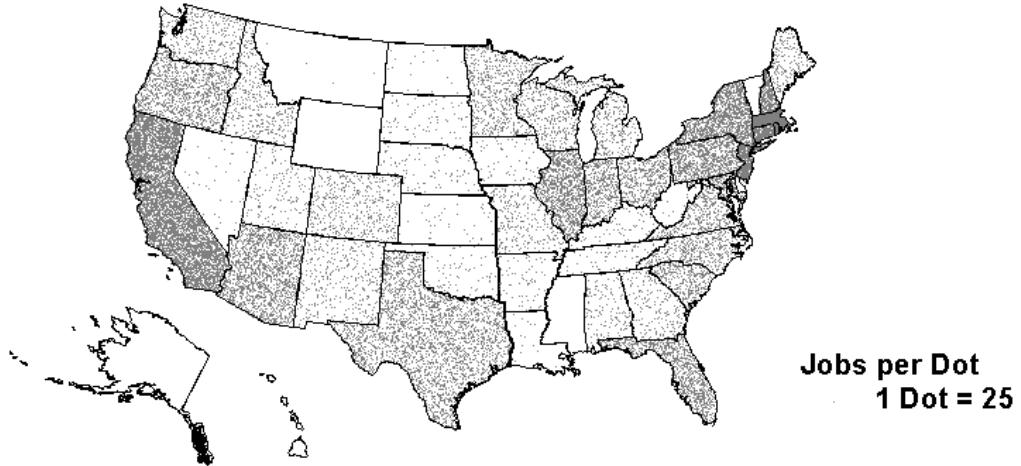


## Employment Shifts, 1997-2000

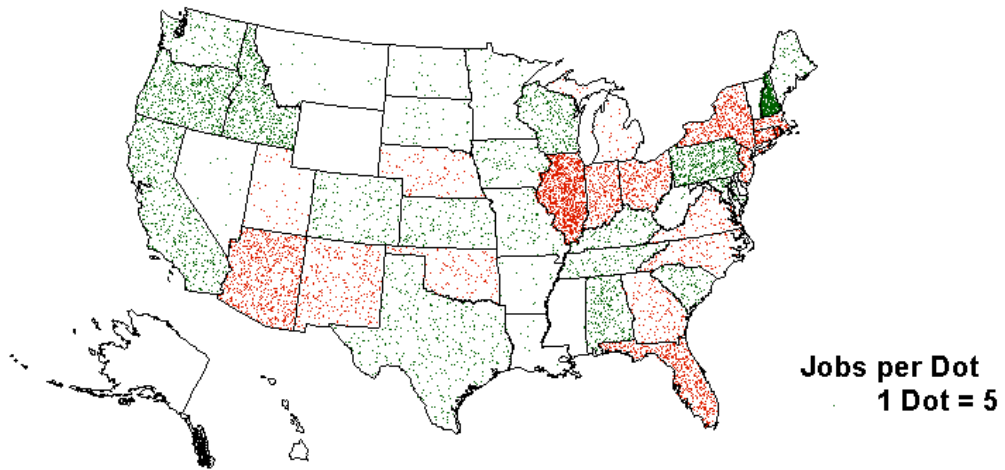


Red for Net Decline, Green for Net Gain

## Electronic and Electrical Equipment & Components Employment in 1997



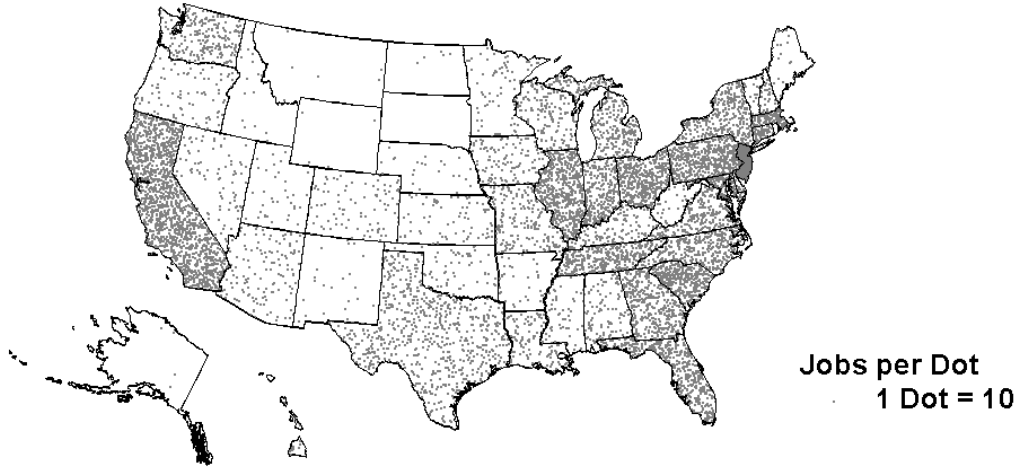
## Employment Shifts, 1997-2000



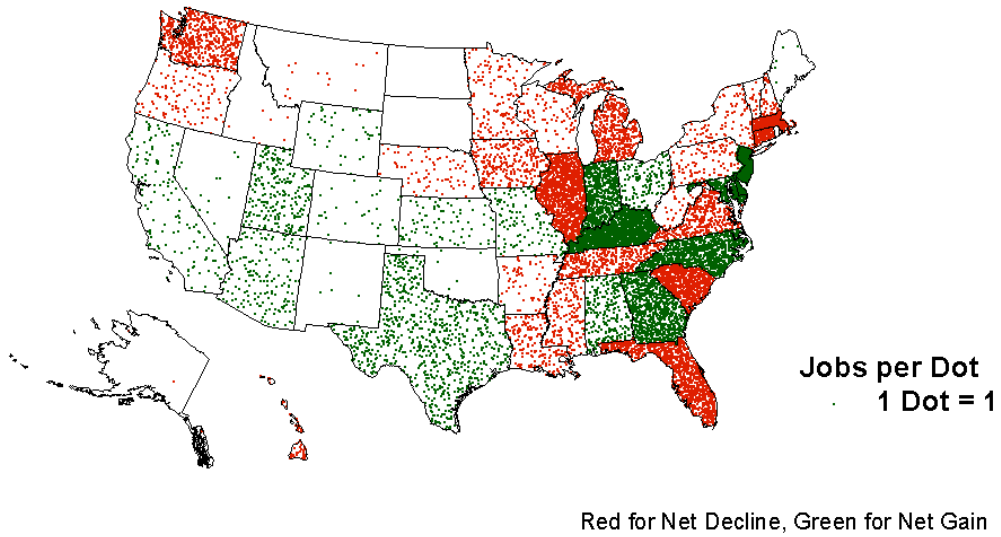
Red for Net Decline, Green for Net Gain



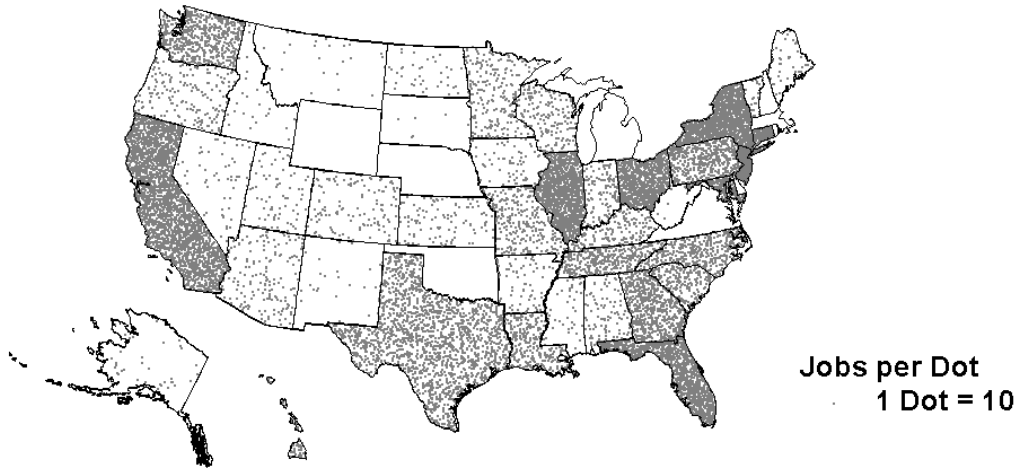
## General Warehousing & Storage Employment in 1997



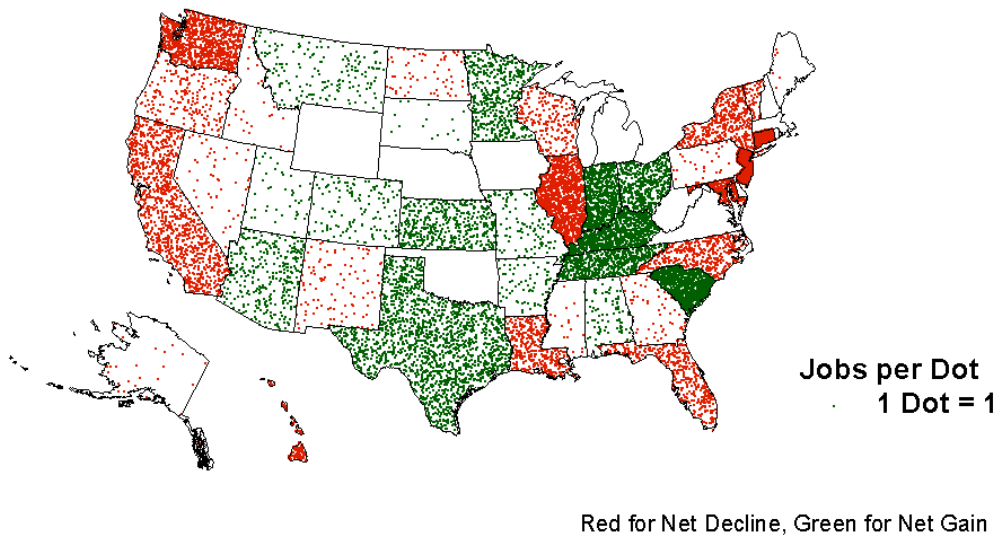
## Employment Shifts, 1997-2000



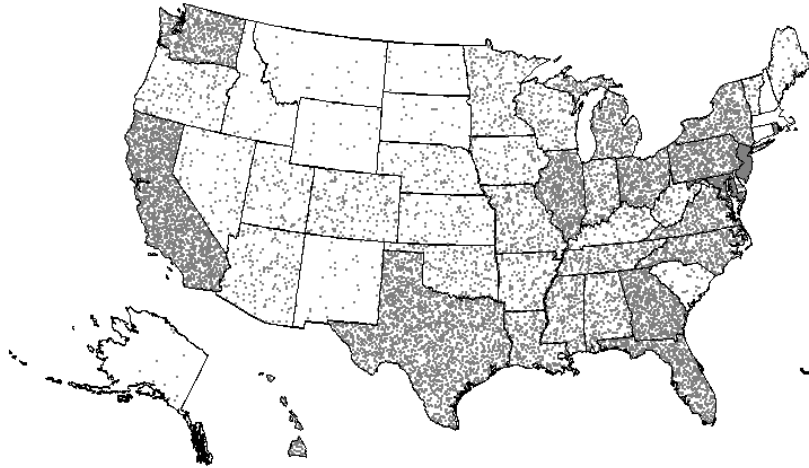
## Arrangement of Transportation of Freight & Cargo Employment in 1997



## Employment Shifts, 1997-2000

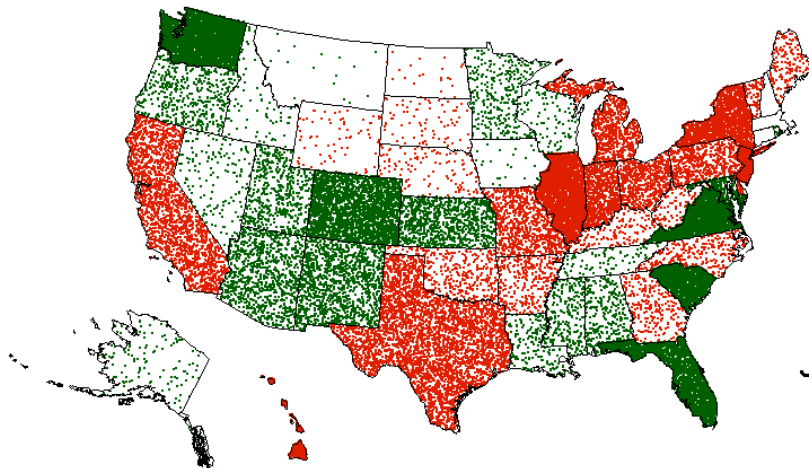


## Radiotelephone Communications Employment in 1997



Jobs per Dot  
1 Dot = 10

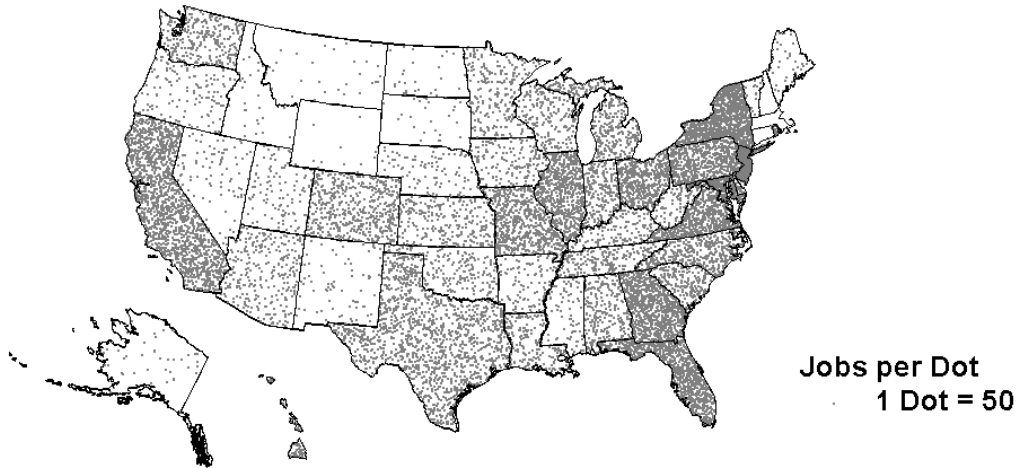
## Employment Shifts, 1997-2000



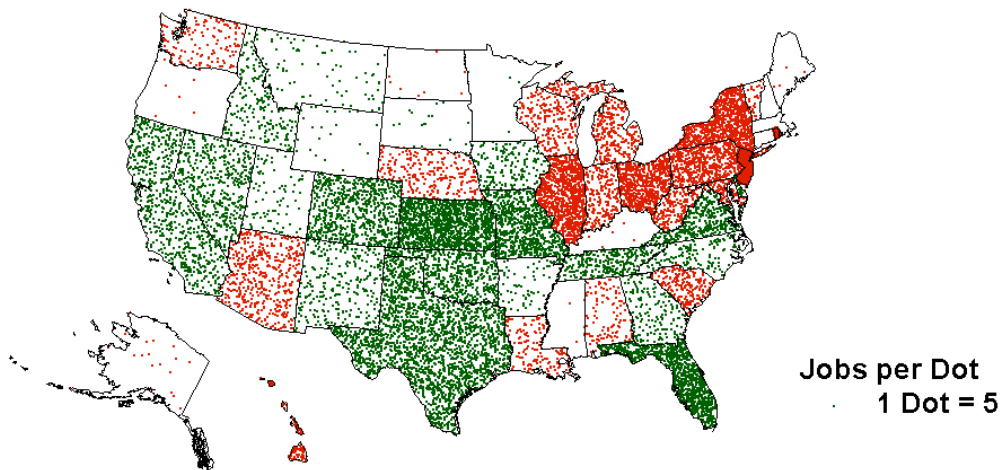
Jobs per Dot  
1 Dot = 1

Red for Net Decline, Green for Net Gain

## Telephone Communications, Except Radiotelephone Employment in 1997

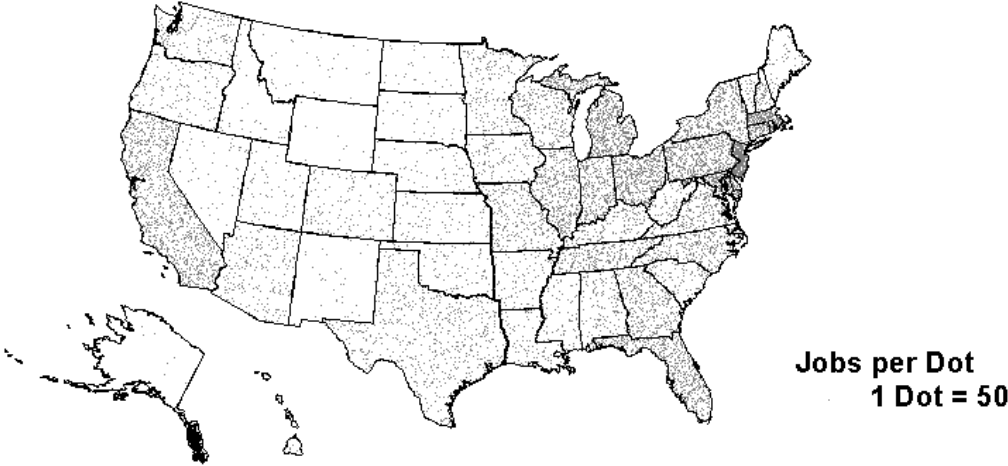


## Employment Shifts, 1997-2000

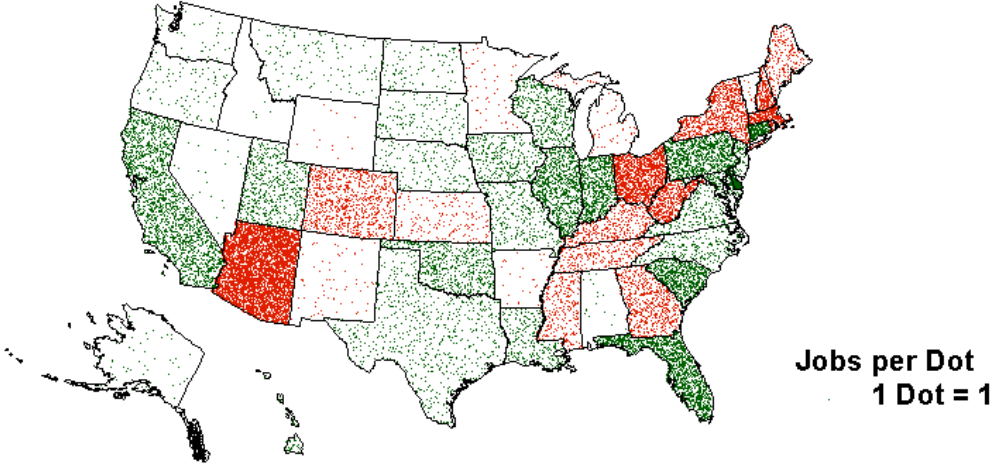


Red for Net Decline, Green for Net Gain

# Wholesale Trade of Motor Vehicles and Parts Employment in 1997

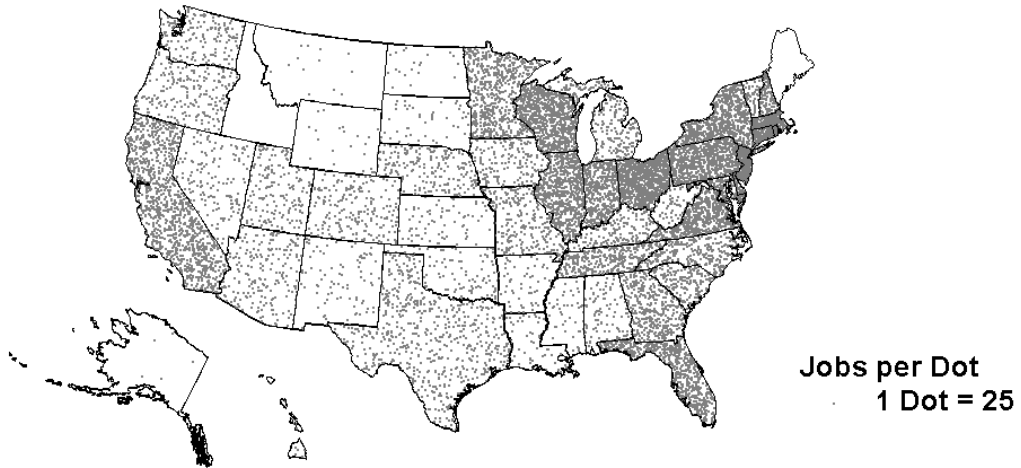


# Employment Shifts, 1997-2000

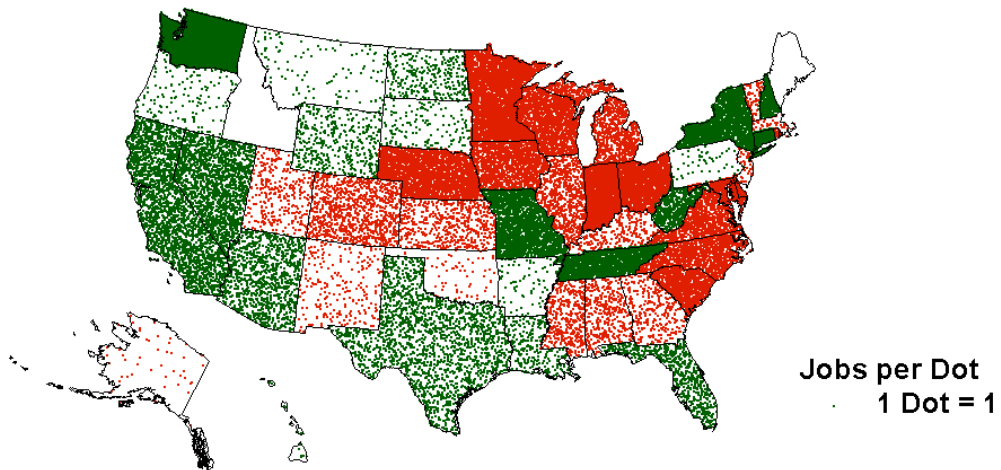


Red for Net Decline, Green for Net Gain

## Non-store Retailers Employment in 1997

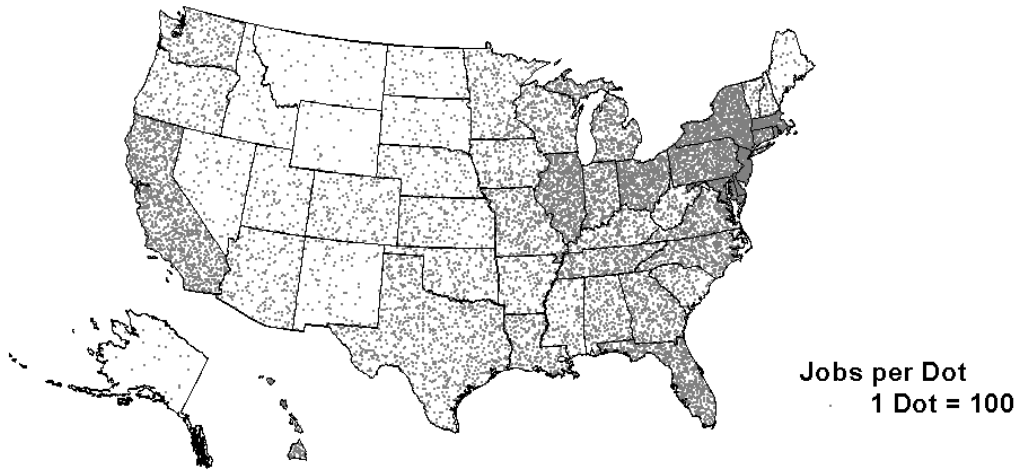


## Employment Shifts, 1997-2000

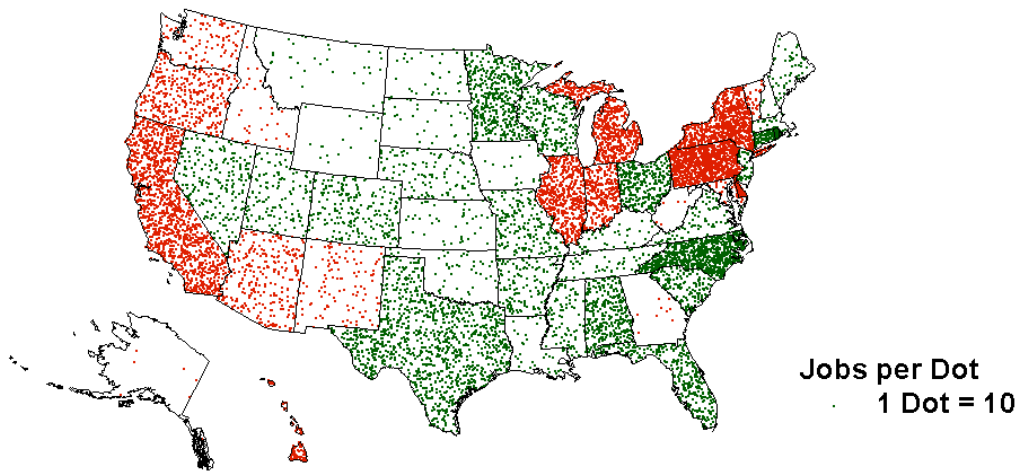


Red for Net Decline, Green for Net Gain

## Commercial Banks Employment in 1997

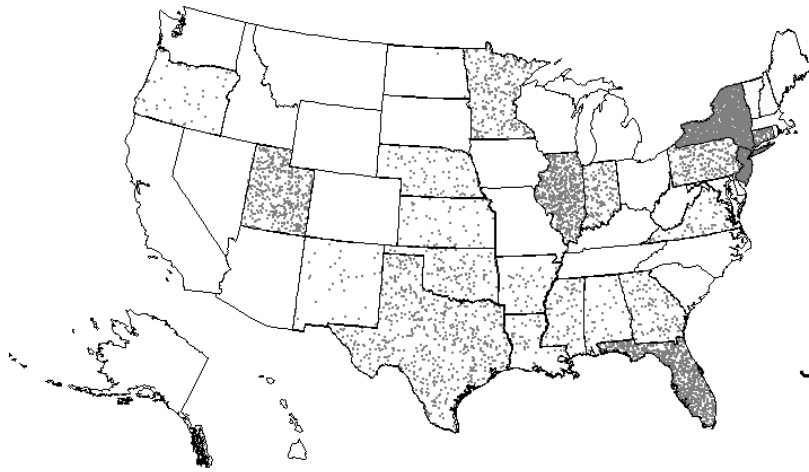


## Employment Shifts, 1997-2000



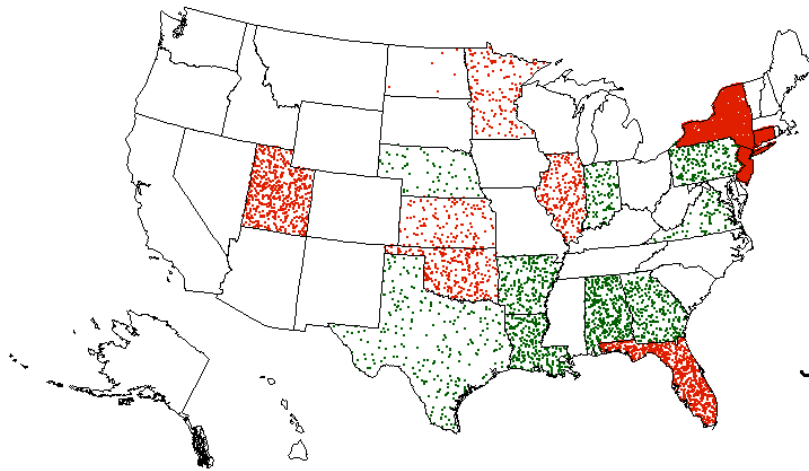
Red for Net Decline, Green for Net Gain

## Functions Related to Depository Banking Employment in 1997



Jobs per Dot  
1 Dot = 5

## Employment Shifts, 1997-2000

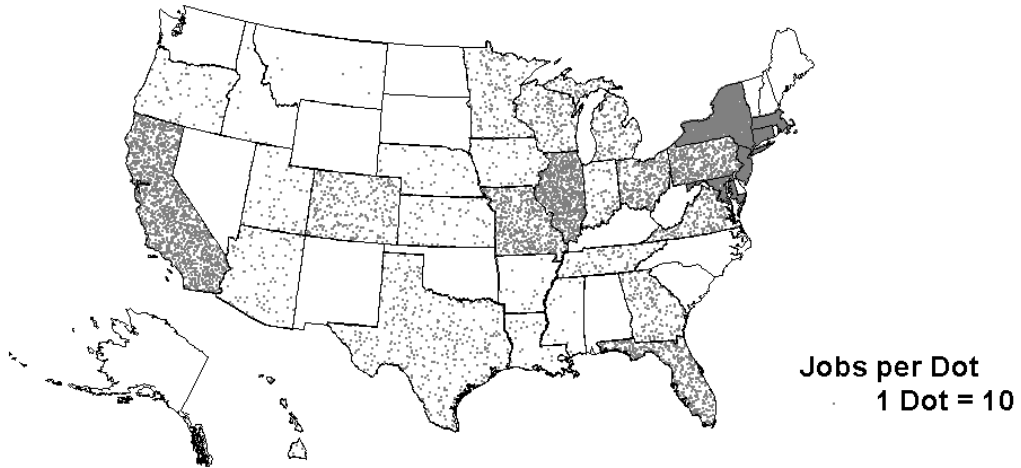


Jobs per Dot  
1 Dot = 1

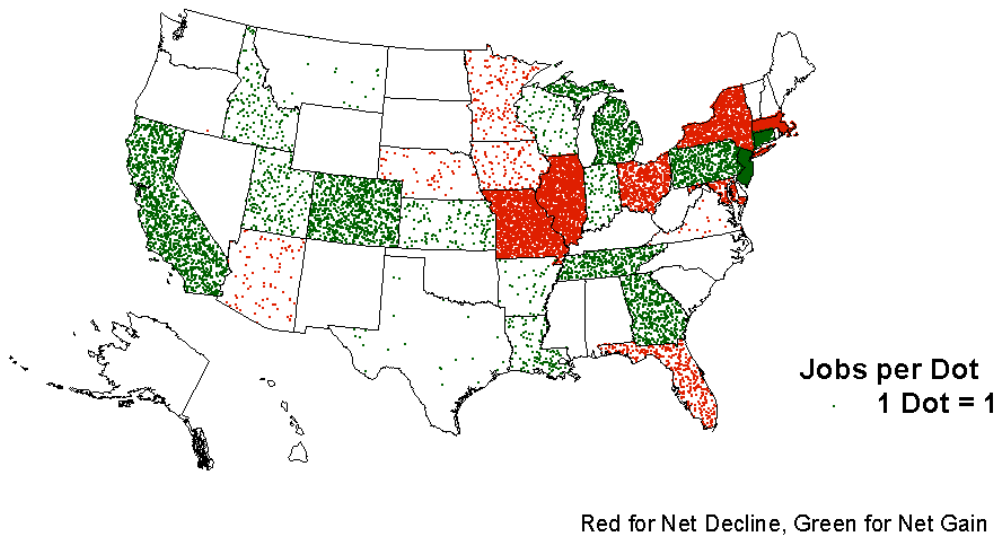
Red for Net Decline, Green for Net Gain



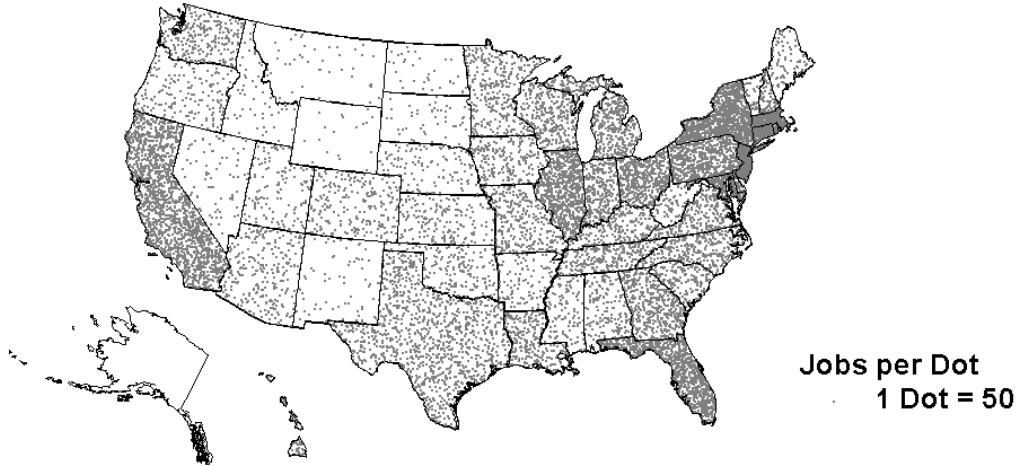
## Services Allied With Exchange of Securities Employment in 1997



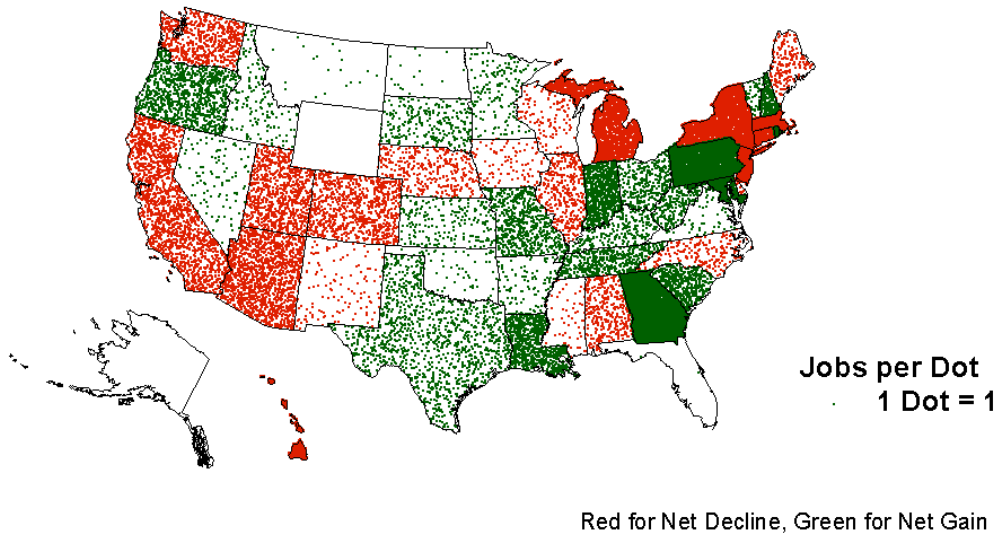
## Employment Shifts, 1997-2000



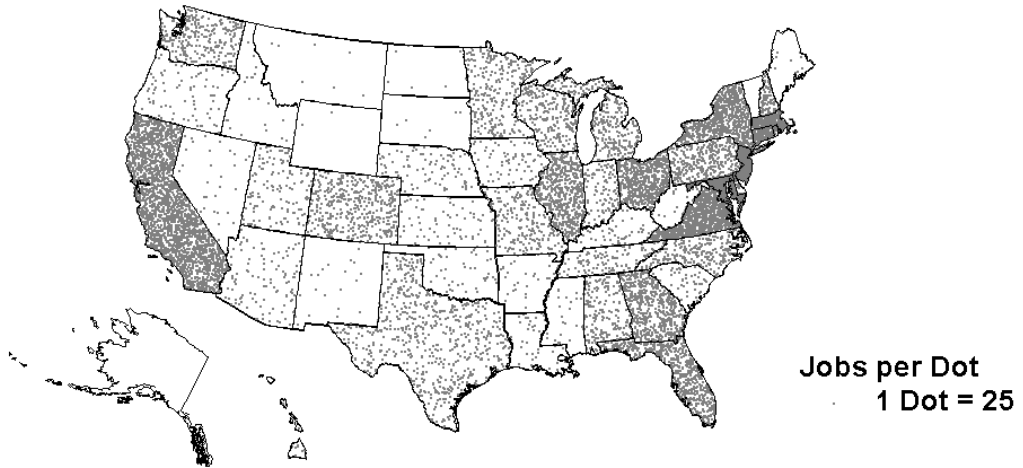
## Insurance Agents, Brokers, and Services Employment in 1997



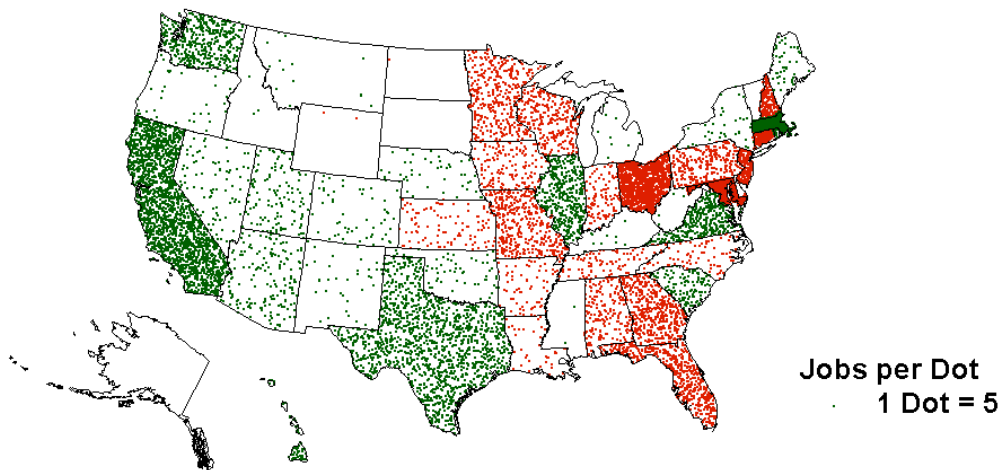
## Employment Shifts, 1997-2000



## Computer Programming Services Employment in 1997

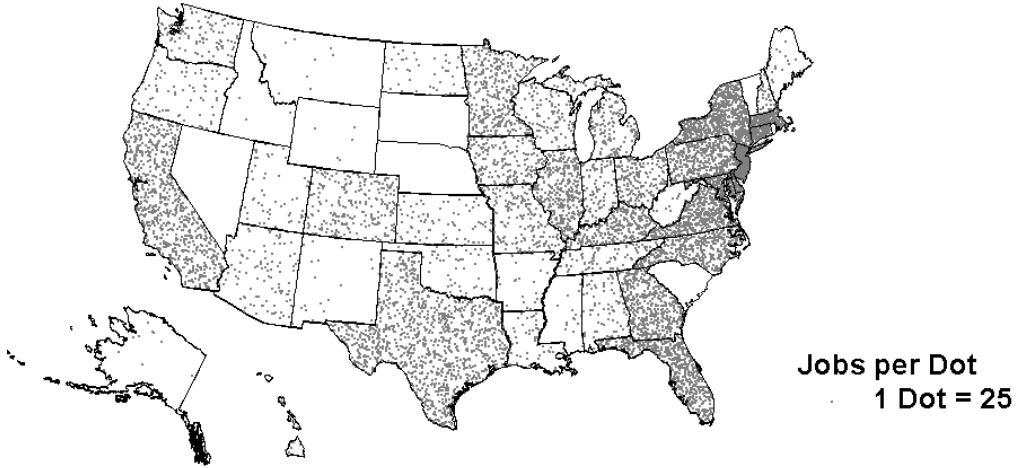


## Employment Shifts, 1997-2000

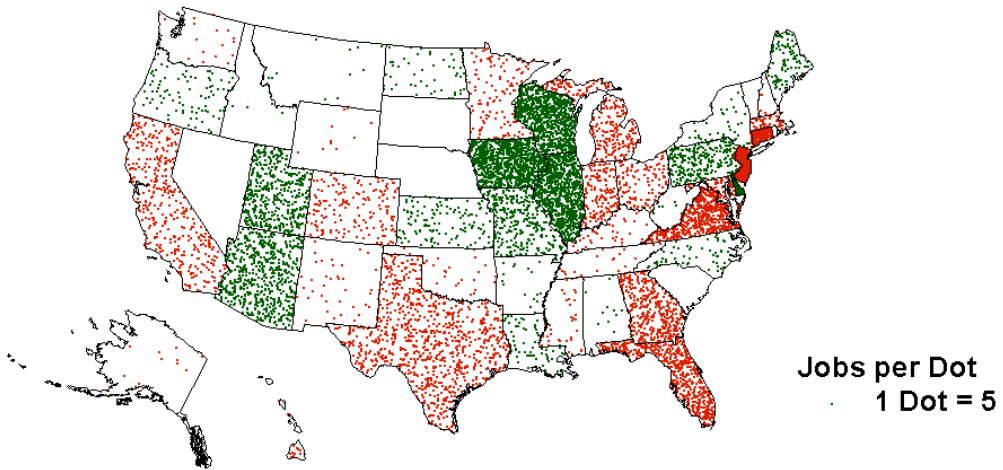


Red for Net Decline, Green for Net Gain

## Data Processing Services Employment in 1997

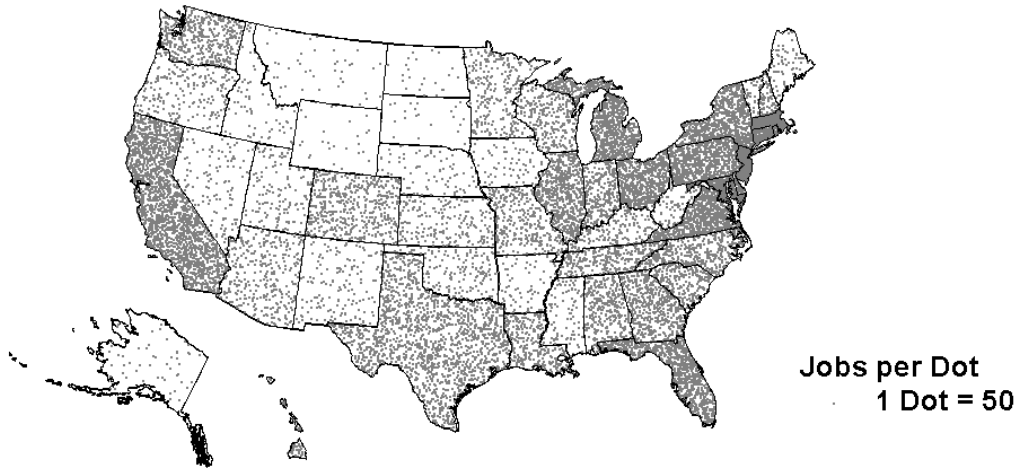


## Employment Shifts, 1997-2000

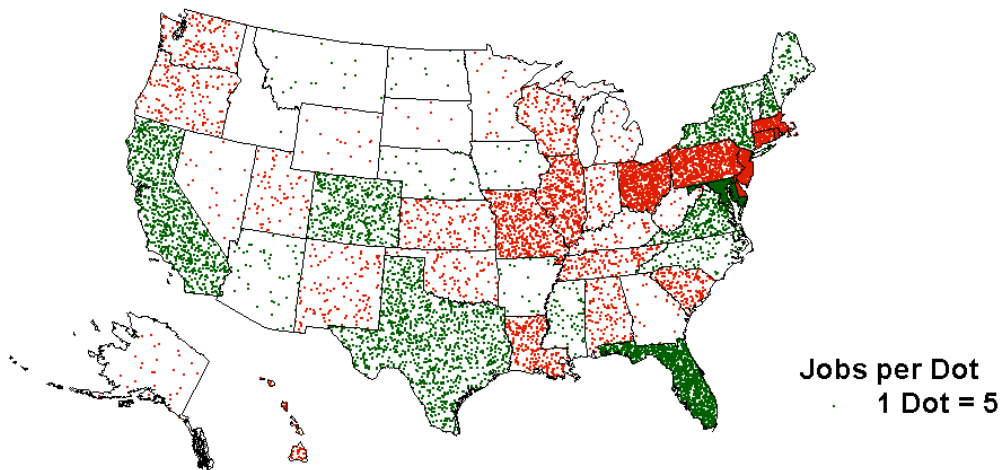


Red for Net Decline, Green for Net Gain

## Engineering, Architectural, and Surveying Services Employment in 1997

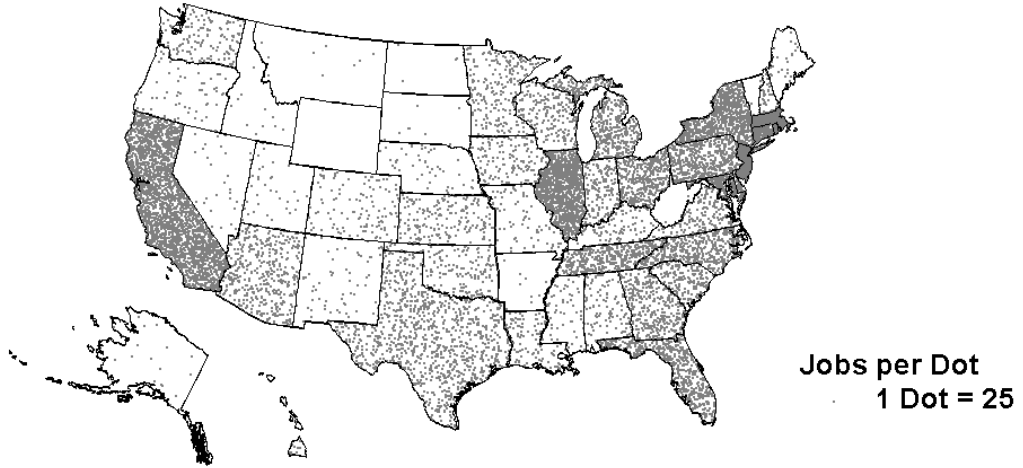


## Employment Shifts, 1997-2000

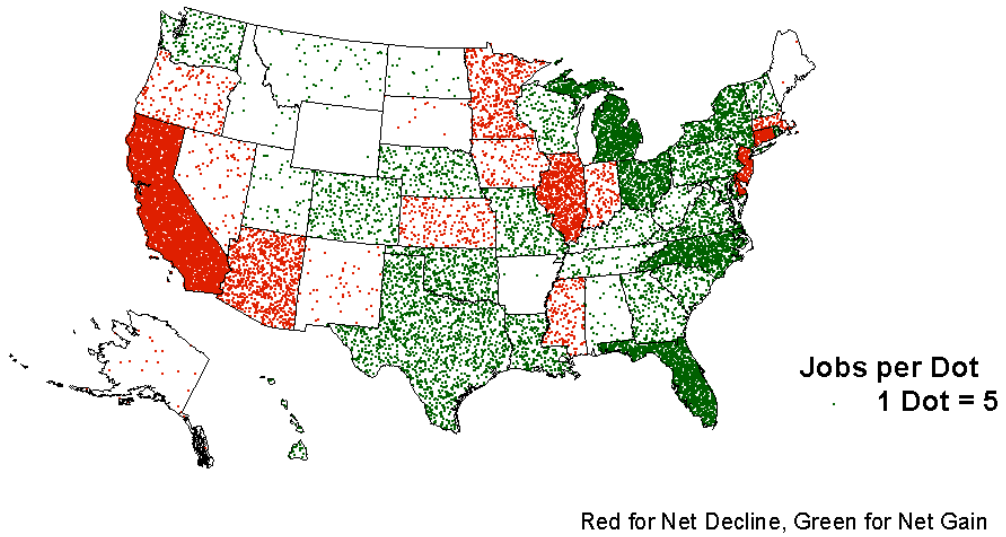


Red for Net Decline, Green for Net Gain

## Employment Agencies Employment in 1997



## Employment Shifts, 1997-2000



### Appendix 3. Industry Descriptions

Industry	Description
Periodicals Printing & Publishing	Publishing or publishing and printing of periodicals such as comic books, magazines, statistical reports, television schedules, trade journals, and other periodicals
Miscellaneous Publishing	Publishing of atlases, business service newsletters, calendars, catalogs, directories, maps, guides, sheet music, patterns, shopping news, technical manuals, educational kits, etc.
Computer and Office Equipment	Electronic computers, computer storage devices, computer terminals, computer peripheral equipment, calculating and accounting machines, and other office machinery
Electronic and Electrical Equipment and Components	Electron tubes, printed circuit boards, semiconductors, electronic capacitors, resistors, coils, transformers, inductors, and connectors
General Warehousing and Storage	Warehousing and storage of a general line of goods
Arrangement of Transportation of Freight and Cargo	Providers of shipping information and agents in arranging transportation for freight and cargo, including freight forwarders which make use of the services of other transportation establishments
Radiotelephone Communications	Two-way radiotelephone communications services, such as cellular telephone services, telephone paging and beeper services, leasing telephone lines or other methods of telephone transmission, such as optical fiber lines and microwave or satellite facilities, and reselling the use of such methods to others
Other Telephone Communications, except Radiotelephone	Telephone voice and data communications (except radiotelephone and telephone answering services), leasing telephone lines or other methods of telephone transmission, such as optical fiber lines and microwave or satellite facilities, and reselling the use of such methods to others
Wholesale Trade of Motor Vehicles & Parts	Automobiles and other motor vehicles, motor vehicle supplies and new parts, tires and tubes, and used motor vehicle parts

Industry	Description
Non-store Retailers	Catalog and mail-order houses, vending machines, and direct-selling establishments
Commercial Banks	Commercial banks and trust companies (accepting deposits) operating with or without federal or state charter
Functions Related to Depository Banking	Automated clearinghouses, check cashing agencies, deposit brokers, electronic funds transfer networks, foreign currency exchanges, regional clearinghouse associations, etc.
Services Allied with Exchange of Securities	Providers of investment information and advice to companies and individuals concerning securities and commodities, including investment advisory services, investment research services, and mutual fund managers; and providers of services to security or commodity holders, brokers, or dealers, such as quotation services, transfer agents, and clearinghouses
Insurance Agents, Brokers, and Services	Agents and brokers dealing in insurance and other organizations offering services to insurance companies and to policy holders, such as claims processing, insurance research services, insurance advising, and pension and retirement plan consultants
Computer Programming Services	Computer programming on a contract or fee basis, including custom applications software programming, computer code authors, computer programs or systems software development, and computer software systems analysis and design
Data Processing Services	Processing and preparation of reports from data supplied by the customer, or specialized services, such as data entry, data verification, optical scanning, or making data processing equipment available on an hourly or time-sharing basis
Employment Agencies	Establishments assisting employers or those seeking employment, including executive placing services, labor contractors, and employment registries
Engineering, Architectural, and Surveying Services	Included mechanical, civil, industrial, and electrical engineering services, machine tool designers, architectural engineering and architectural services, and professional land, water, and aerial surveying services

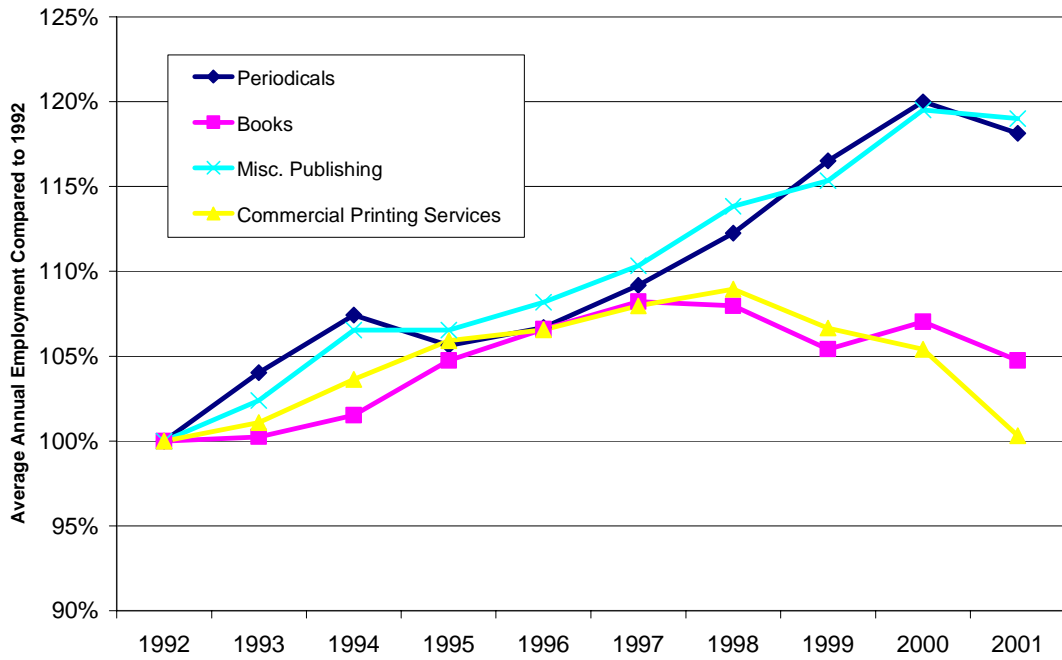


## Appendix 4. National Employment Growth Trends

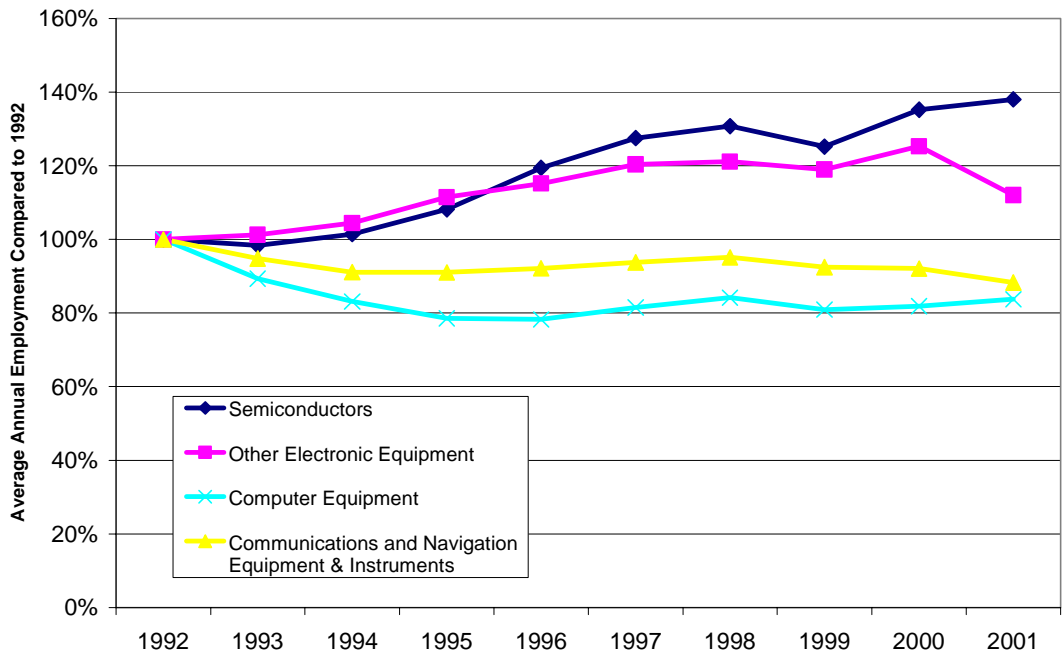
Employment growth patterns in several of our study industries indicate that they are experiencing fundamental changes in their markets or competitive environment. Information technology may or may not have played a part in these changes.

- **Printing industries:** Diverging trends among various printing industries demonstrate how IT can either help or hurt an industry. Periodicals and miscellaneous publishing industries have grown throughout the 1990s, while employment in book printing and commercial printing services appears to be in decline. Demand for commercial printing services may be falling because desktop publishing software enables users to perform many printing services by themselves.
- **Components manufacturing:** Manufacturers of electronic components and small plastic and metal parts have experienced modest employment growth. These industries produce unassembled parts that are usually manufactured on a job or order basis. The use of “jobbing” by manufacturing firms has been facilitated by improved communications and transportation and logistics services.
- **IT equipment and instruments:** Employment in IT equipment manufacturing industries such as communications equipment and computer equipment has been declining at the national level. The U.S. faces strong competition from other nations in these industries.
- **Transportation and logistics:** Changing inventory management practices and growth in e-commerce have led to increased movement of goods at a more rapid pace. This has created new demand for transportation and logistics management services. In contrast, employment in travel agencies has declined as it becomes increasingly easy for travelers to make travel arrangements over the Internet.
- **Communications:** Employment growth in cellular telephone services, paging services, as well as traditional telephone services have grown rapidly throughout the previous decade, as the demand for capacity to transmit voice and data communications grows.
- **Trade:** In wholesale trade firms, efficiencies have been introduced by data management systems. For example, junkyard operators can monitor their inventory electronically, rather than visually searching piles of used cars. Employment growth in this industry has remained relatively flat. In the retail sector, catalog and Internet sales have increased, along with employment in non-traditional retailers such as Amazon Books.
- **Financial Services:** Employment in commercial banking has declined, and back-office functions have been split off from front-office functions. Employment in securities advising, trading, and listing services has grown rapidly. This growth was most likely driven by the strong performance of the stock market in recent years. In the insurance industries, employment in health and medical plan insurance carriers grew more rapidly than employment in insurance agencies and insurance services firms. This is somewhat surprising, given that many back-office insurance functions are being spun off from insurance carriers. The trend may reflect efficiencies gained within the insurance servicing firms.
- **Computer Services:** Employment in the high-value computer services, such as software, programming, and information retrieval is outpacing growth in the data processing and computer maintenance and repair industries.
- **Business and Professional Services:** More complicated machinery and the rapid pace of technological change have increased the need for training. Vocational school employment has increased. Employment in employment agencies has increased steadily during the last decade, growing more rapidly than total employment in the U.S.

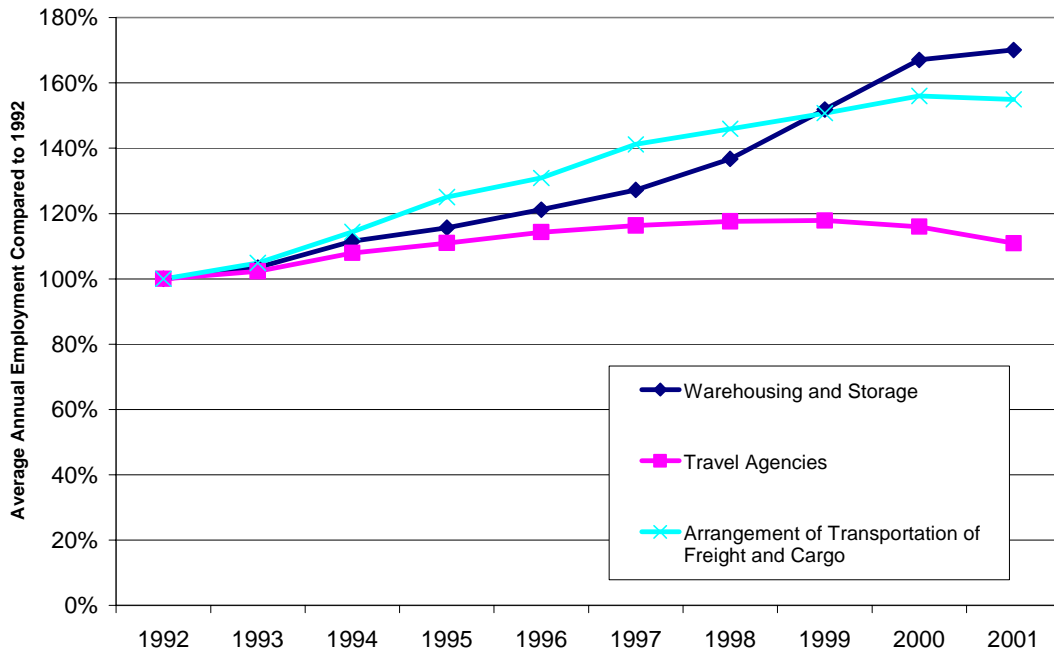
**National Employment in Printing and Publishing Industries,  
Indexed to 1992 Levels**



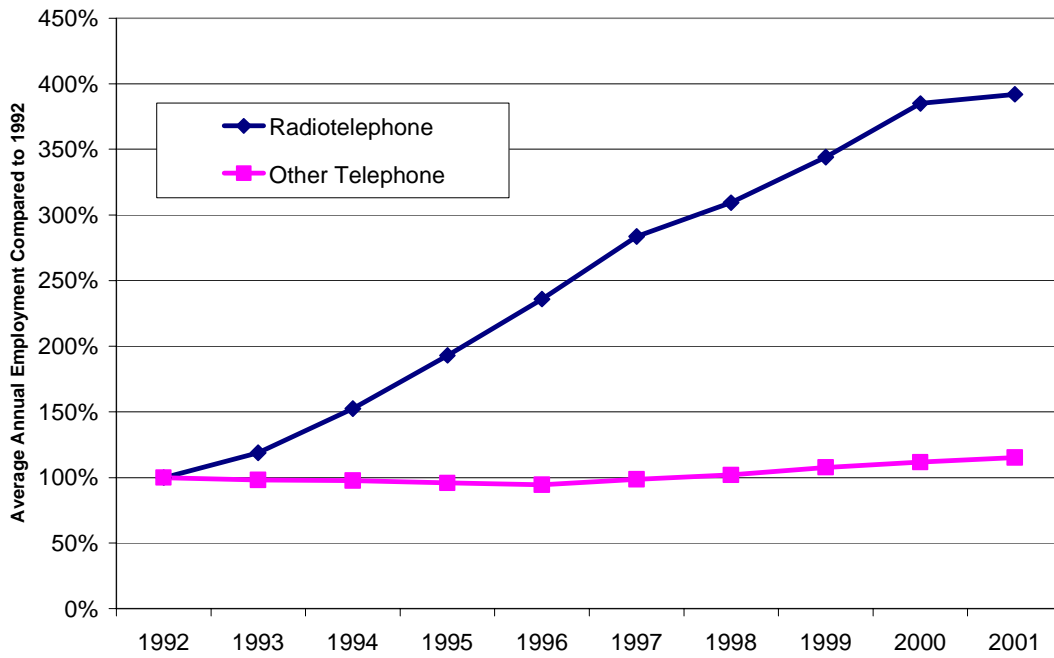
**National Employment in IT Manufacturing Industries,  
Indexed to 1992 Levels**



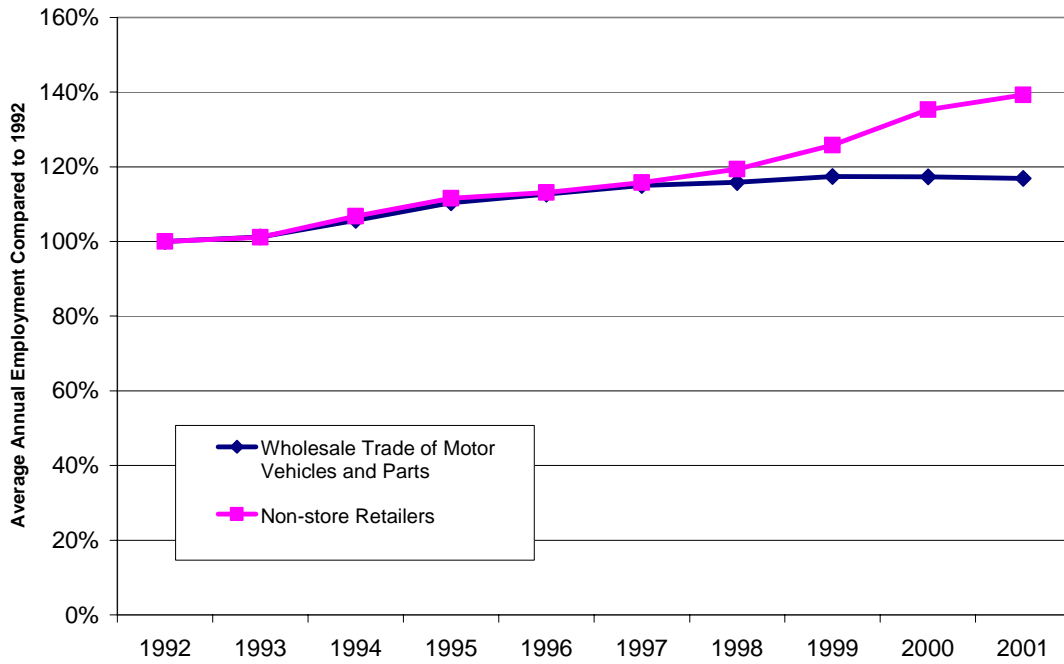
**National Employment in Transportation and Logistics Industries,  
Indexed to 1992 Levels**



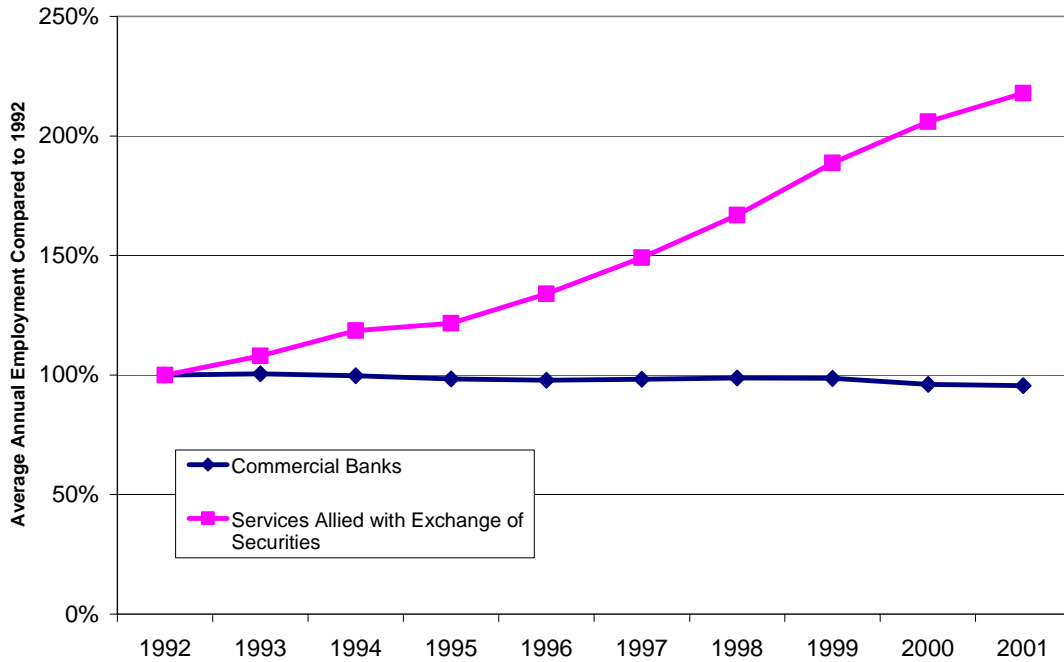
**National Employment in Telephone Communications Industries,  
Indexed to 1992 Levels**



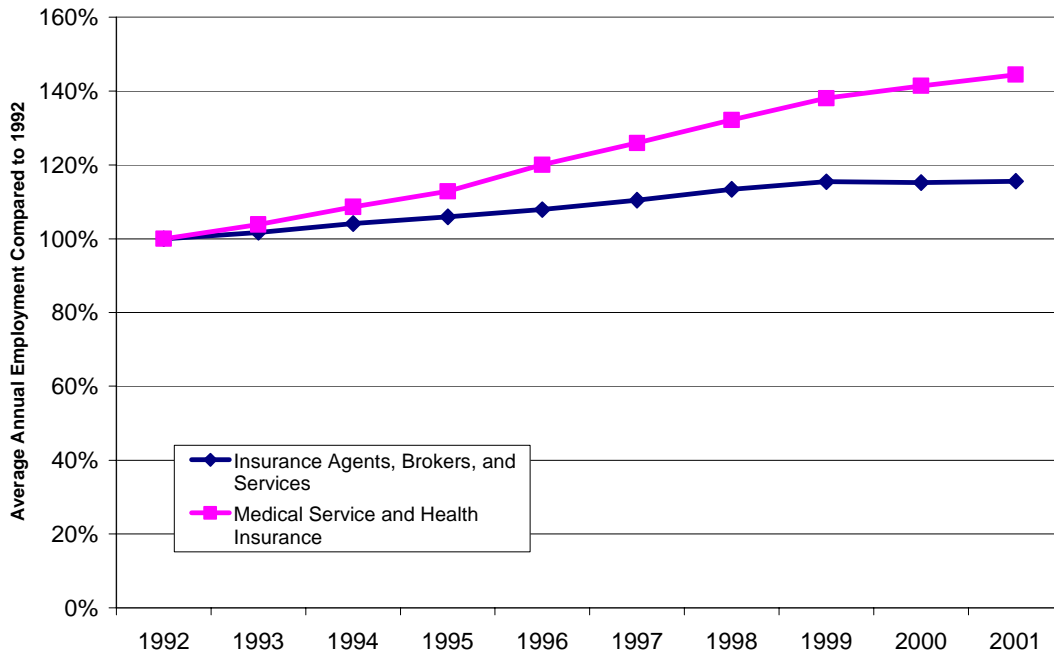
### National Employment in Trade Industries, Indexed to 1992 Levels



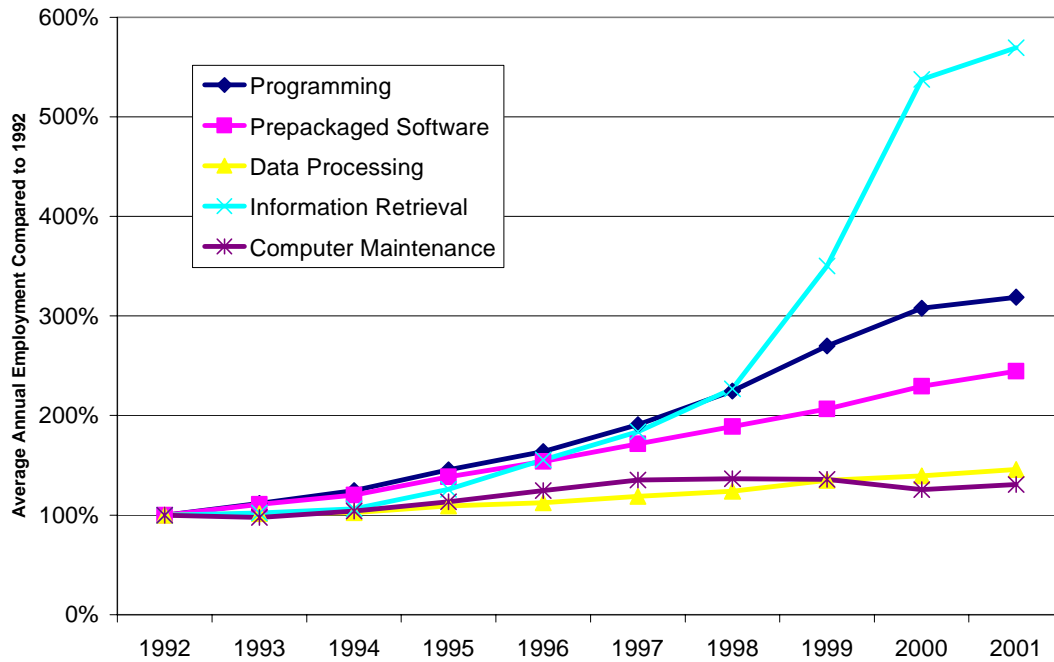
### National Employment in Financial Services Industries, Indexed to 1992 Levels



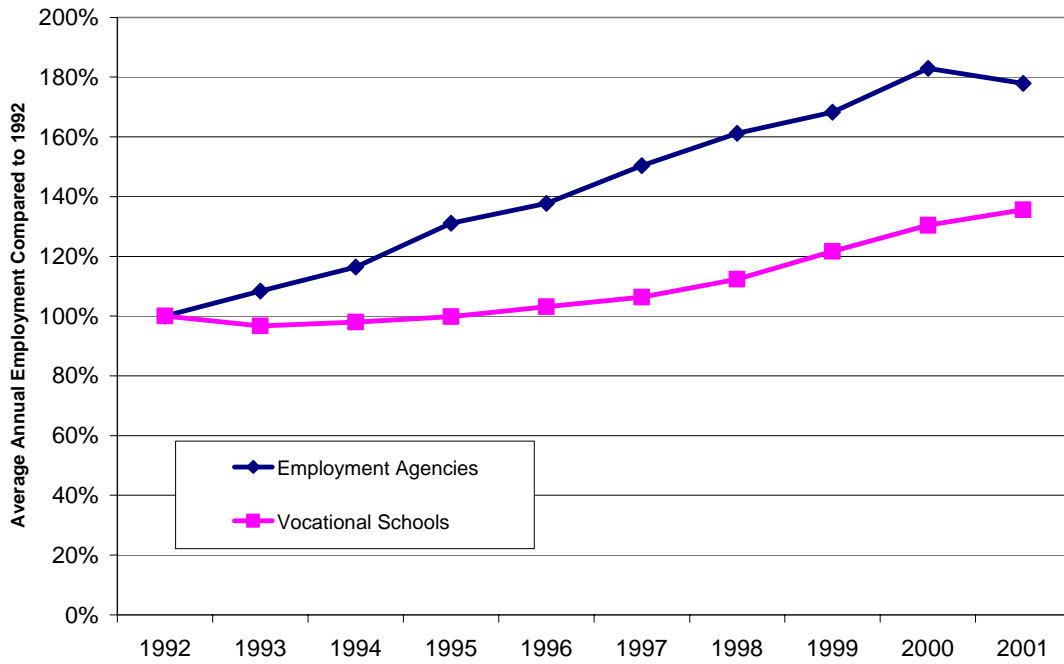
**National Employment in Insurance Industries, Indexed to 1992 Levels**



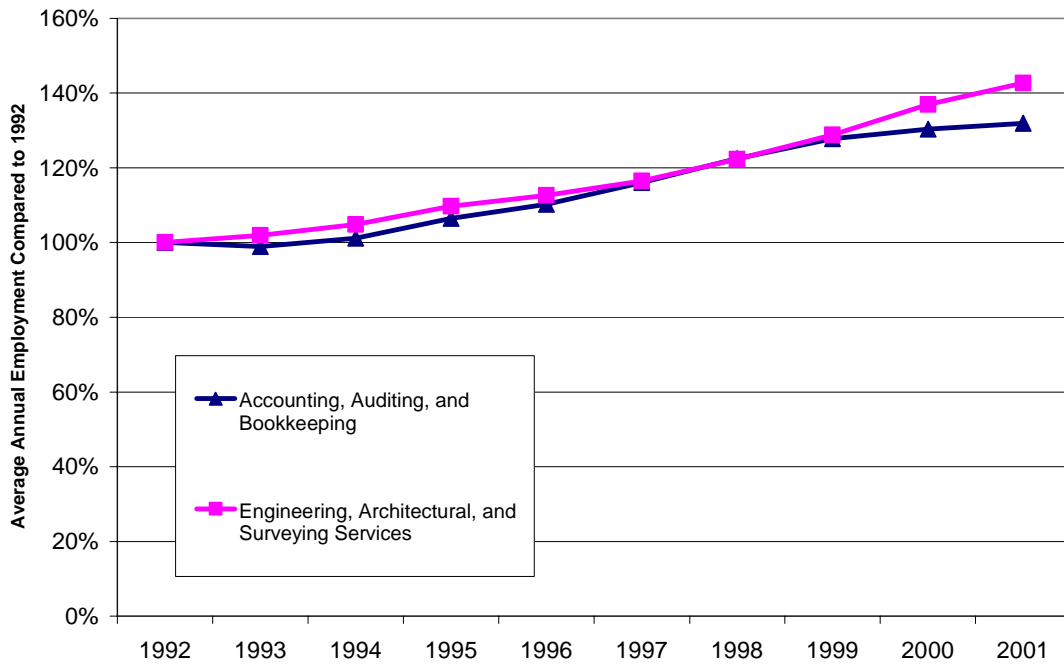
**National Employment in Computer Service Industries, Indexed to 1992 Levels**



### National Employment in Employment Agencies and Vocational Schools, Indexed to 1992 Levels



### National Employment in Engineering & Architectural Services and Accounting Services, Indexed to 1992 Levels

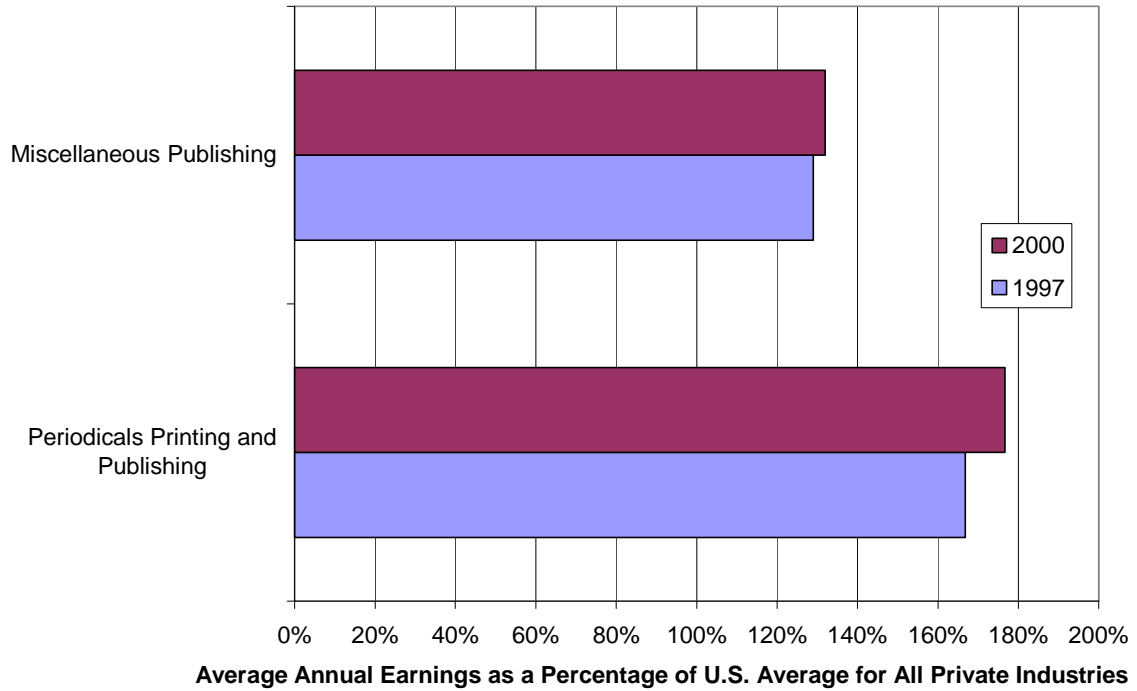


## Appendix 5. Average Earnings in Selected Industry Pairs

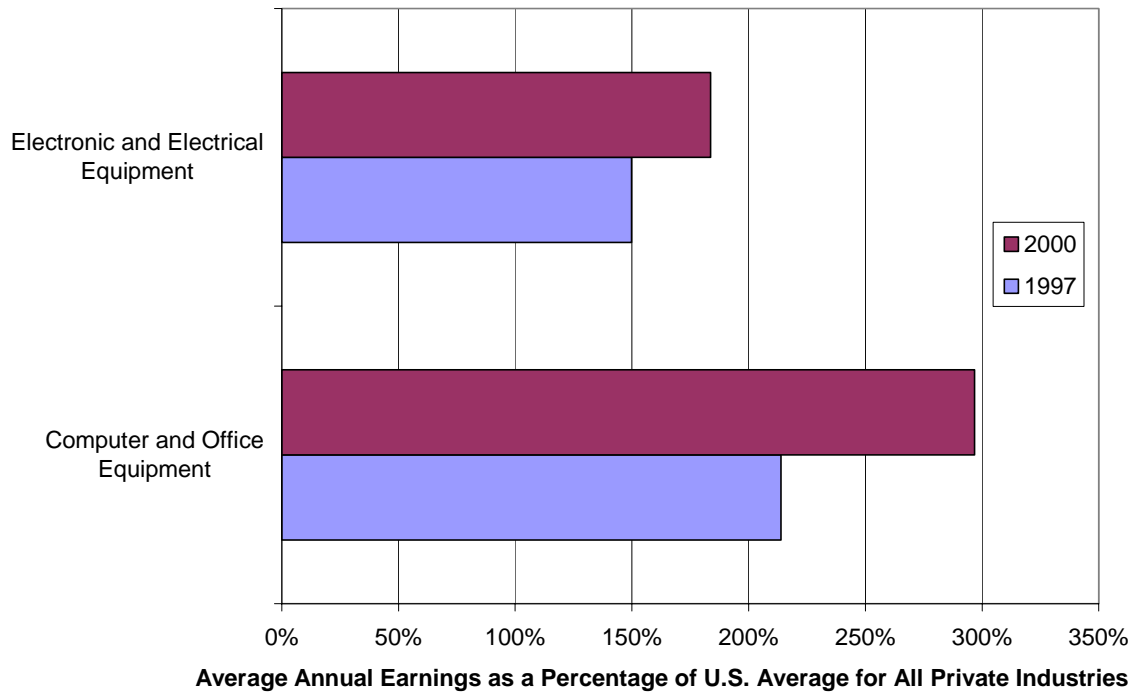
The charts in this section show changes in average earnings, indexed to the national average for all industries, in 1997 and 2000.

- Average earnings in the periodicals printing & publishing and miscellaneous publishing industries exceed the national average for all industries, and both have increased since 1997.
- Average earnings in the IT equipment manufacturing categories also exceed the national average for all industries. The average earnings in computer and office equipment rose sharply relative to the national average.
- Average earnings in the general warehousing were below the all-industry average, and they eroded slightly between 1997 and 2000. Earnings in the arrangement of transportation of freight and cargo also eroded slightly, although average earnings in this industry still about 17 percent higher than the average for all industries.
- In 1997, average earnings in radiotelephone communications were lower than other telecommunications, but they were just about equal by 2000. Both industries were about 70 percent higher than the average for all industries in 2000.
- In the financial services industries, commercial bank earnings remained about 20 percent higher than the average for all industries. Functions related to depository banking were almost 40 percent higher than the average for all industries.
- Computer programming industry earnings rose sharply relative to national averages between 1997 and 2000, while data processing earnings remained steady at about 50 percent higher than the all-industry average.
- Average earnings in employment agencies climbed from 83 percent of the average to almost 90 percent. Earnings in engineering services remained about 60 percent higher than the average for all industries.

### U.S. Average Annual Earnings in Selected Printing Industries

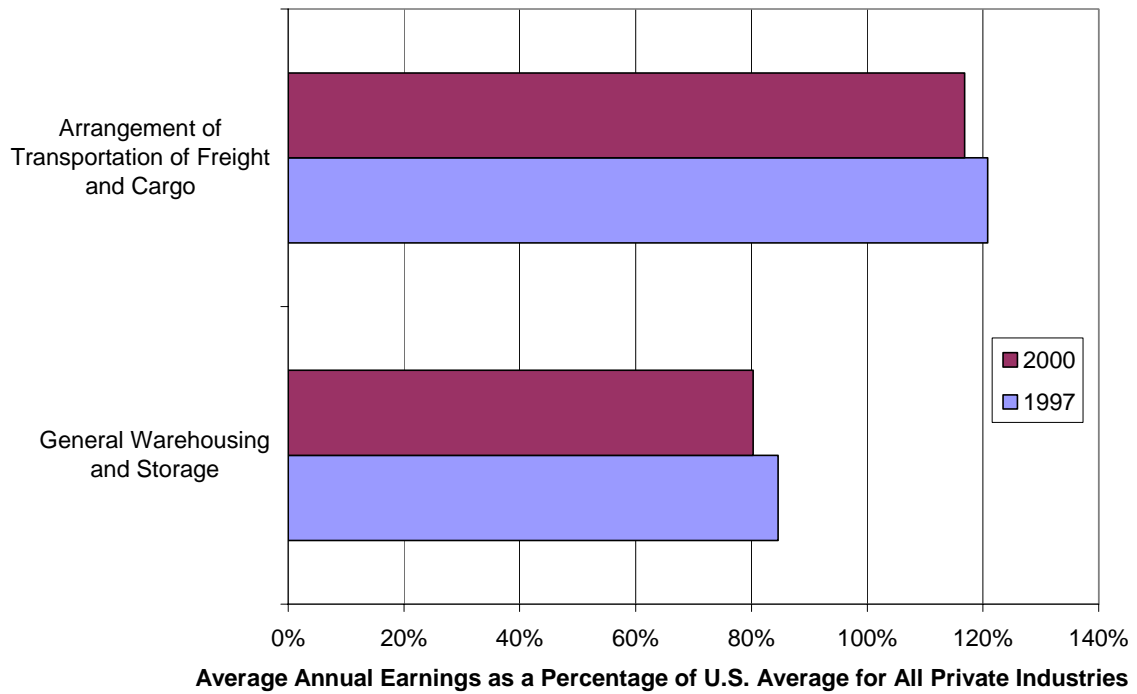


### U.S. Average Annual Earnings in Selected Manufacturing Industries

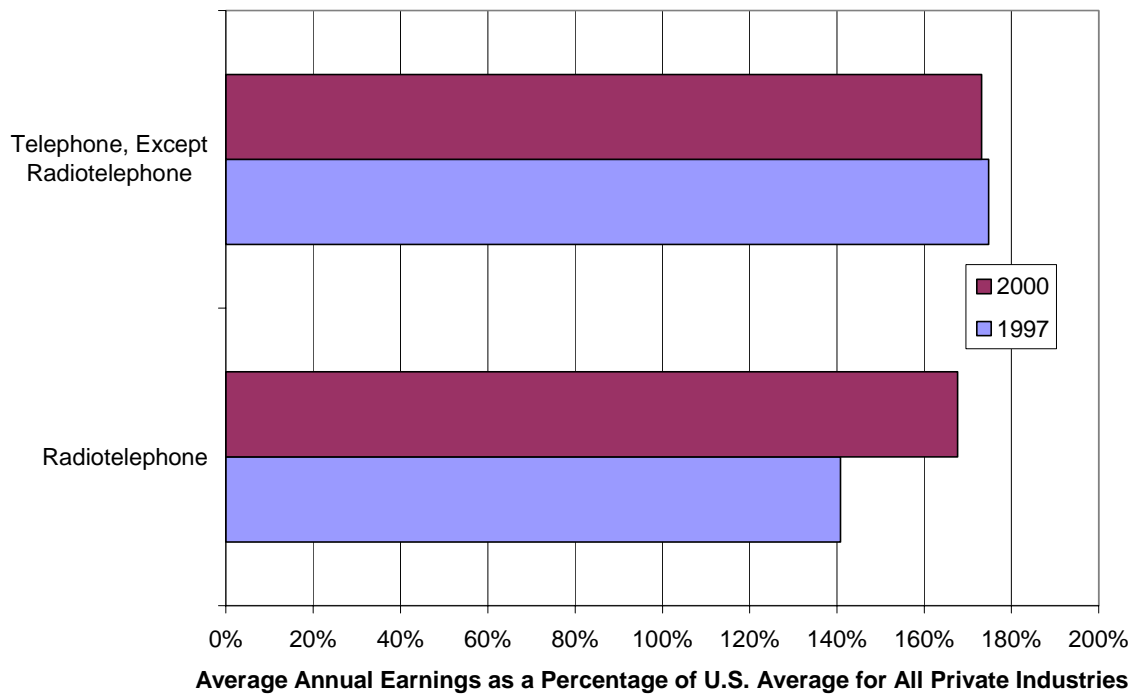




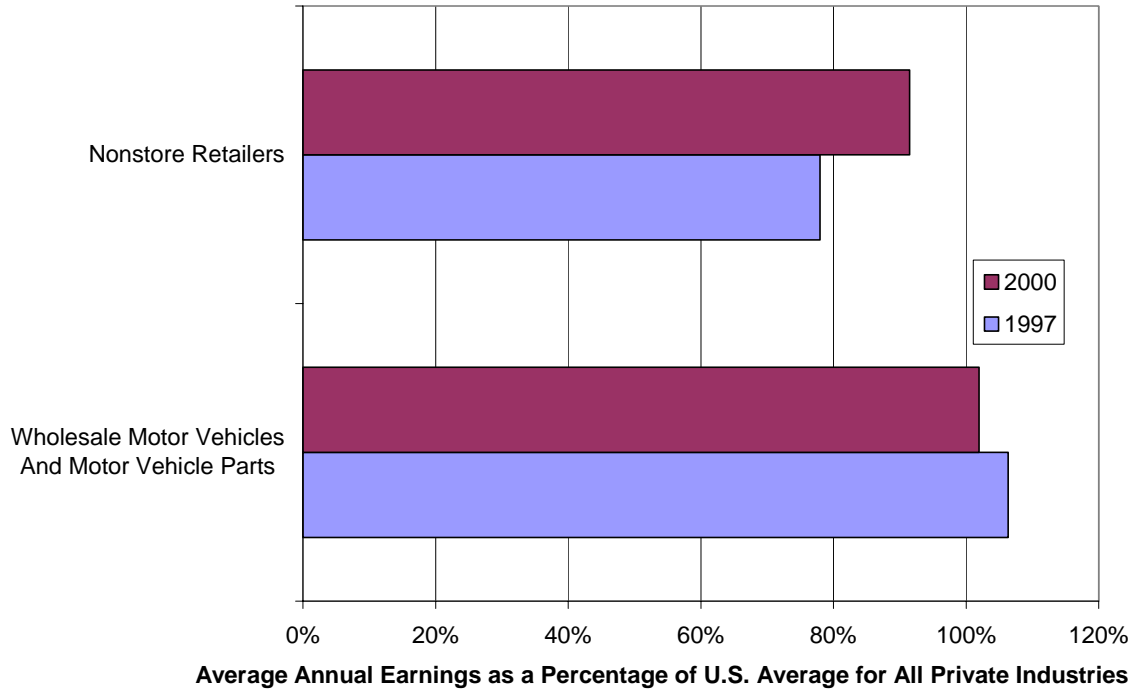
### U.S. Average Annual Earnings in Selected Transportation Industries



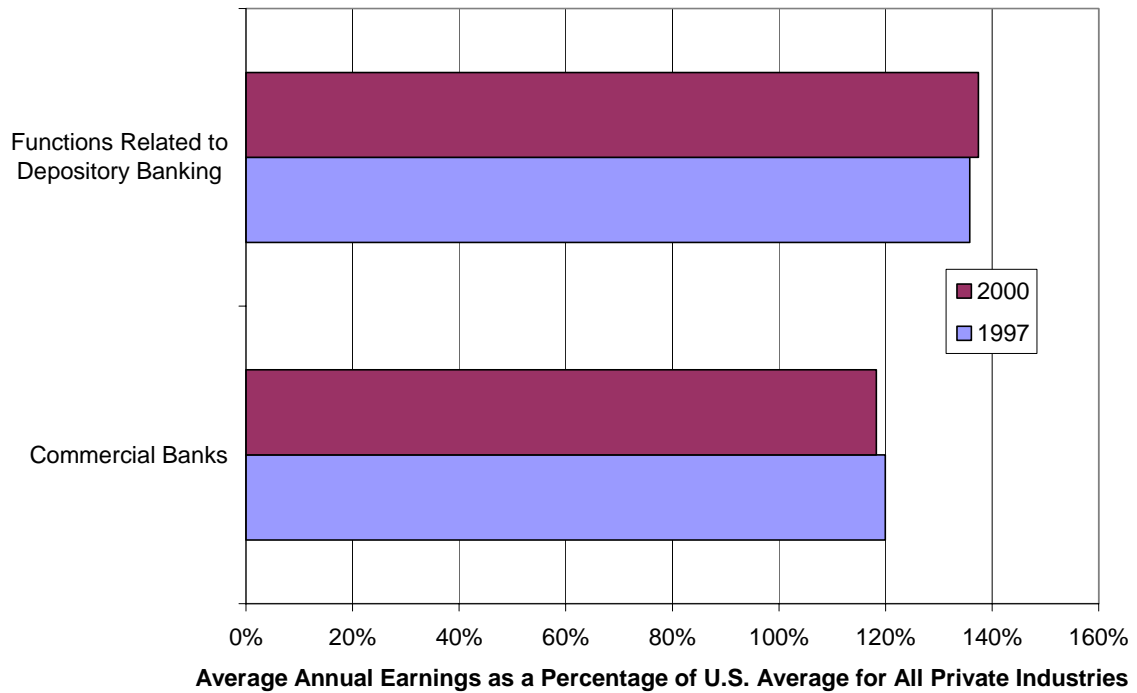
### U.S. Average Annual Earnings in Selected Communications Industries



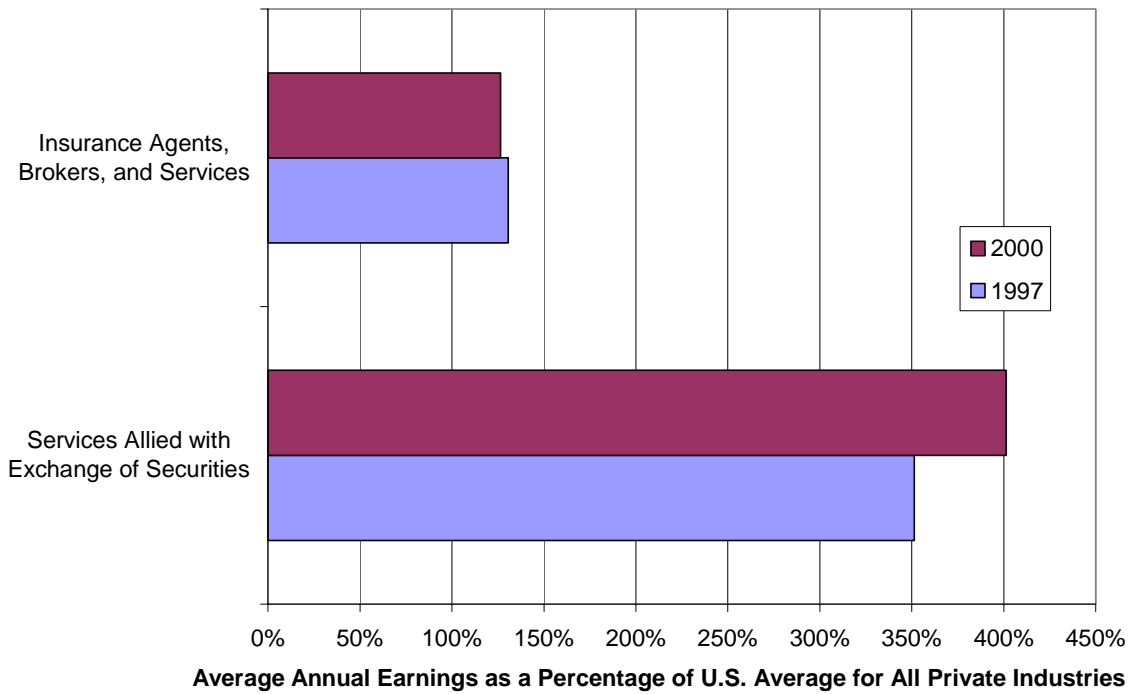
### U.S. Average Annual Earnings in Selected Trade Industries



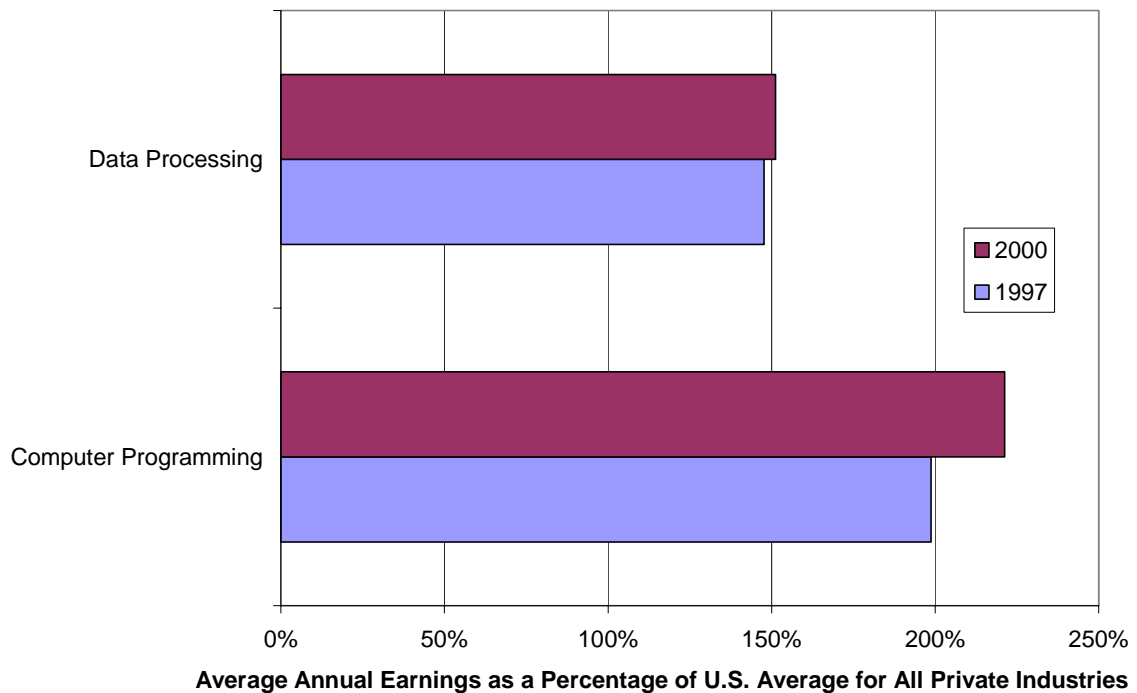
### U.S. Average Annual Earnings in Selected Financial Services Industries



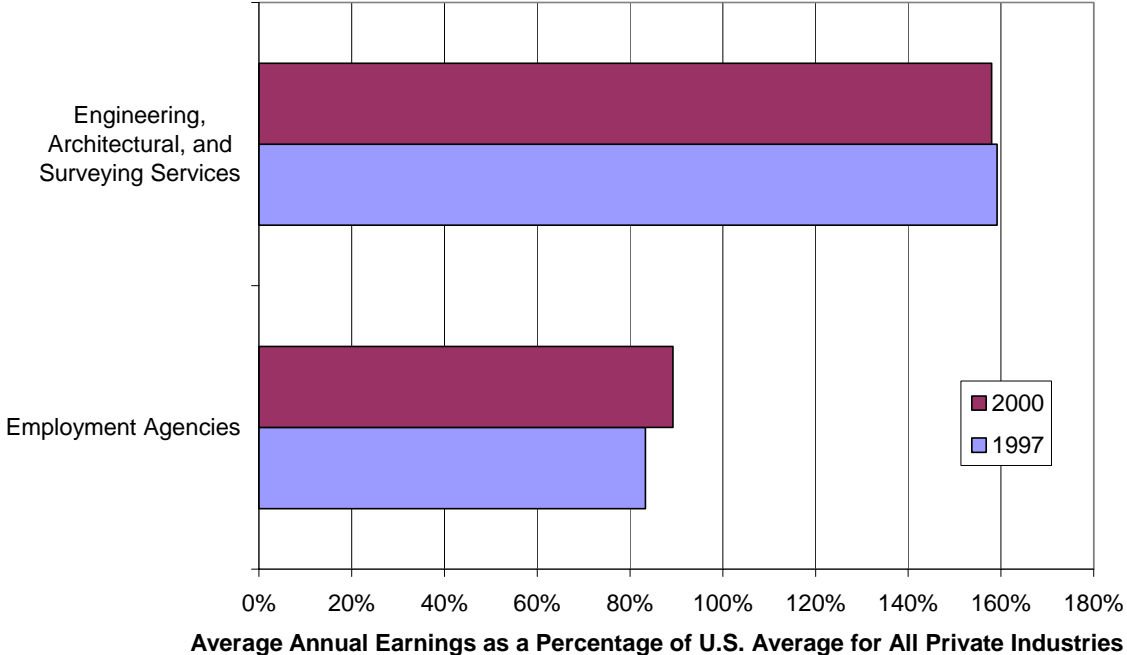
### U.S. Average Annual Earnings in Selected Financial Services Industries



### U.S. Average Annual Earnings in Selected Computer Service Industries



**U.S. Average Annual Earnings in Selected Business & Professional Service Industries**



Iowa State University does not discriminate on the basis of race, color, age, religion, national origin, sexual orientation, gender identity, sex, marital status, disability, or status as a U.S. veteran. Inquiries can be directed to the Director of Equal Opportunity and Diversity, 3680 Beardshear Hall, (515) 294-7612.