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Computer Use by Rural Workers is Rapidly Increasing

The percentage of rural workers who use computers on the job doubled from 18 in 1984 to 36 in 1993, yet the percentage of urban workers using computers remains higher. Most of the difference in on-the-job computer use between urban and rural areas reflects greater use among professional, managerial, and white-collar workers who are a larger share of the urban workforce and less use among the self-employed and lower educated workers who are a larger share of the rural workforce.

COMPUTER literacy has become increasingly important in the workplace. Where once only a small minority of workers dealt directly with computers, by 1993 close to half of all workers used a computer on the job. Evidence also suggests that worker computer skills may earn a large return. One study estimated that in both 1984 and 1989, those who used computers at work received a wage premium in the range of 15 to 20 percent over noncomputer users, even after taking into account such personal characteristics as education and experience (Krueger). Workplace trends suggest that computer skills will be needed in the future for an even wider range of jobs. In this environment, the extent of computer use by rural workers relative to urban workers' computer use may be influencing differences in their current pay levels and future job growth.

Computer Use on the Job Grows in Both Urban and Rural Areas

Between 1984 and 1993, the percentage of rural workers using computers on the job doubled, while the percentage of urban workers using computers nearly doubled (fig. 1). The percentage using computers was substantially higher in urban areas in all 3 years, and the difference widened slightly by 1993, despite the slightly faster growth rate in rural areas. Computers were used on the job by 36 percent of working rural residents and 49 percent of working urban residents in 1993.

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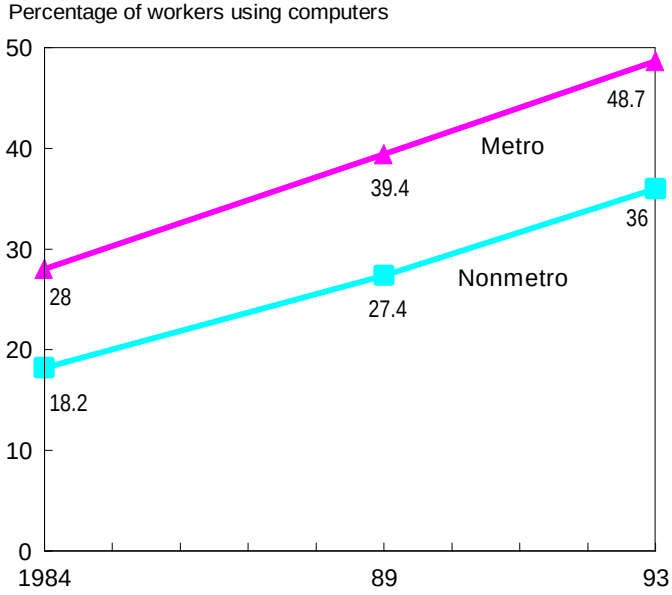
Differences Between Urban and Rural Workforces May Account for Differences in Computer Use

The rate of computer use on the job varies widely across occupations and industries. In 1993, fewer than one in four workers in service and blue-collar occupations (such as assembly-line workers or farm laborers) used a com-

Figure 1

Rate of computer use on the job

Although computer use by nonmetro workers doubled between 1984 and 1993, the metro-nonmetro gap in use increased from 10 to 13 percentage points



Source: Calculated by ERS using data from the October Current Population Surveys of 1984, 1989, and 1993.

Table 1

Share of workers using computers by occupation and industry, 1993

White-collar and professional workers are the most likely to use computers on the job

Item	United States	Nonmetro	Metro
		Percent	
Occupation:			
Managerial and clerical	74.8	71.4	75.5
Professional and technical	64.8	59.3	65.9
Sales	48.8	43.4	50.1
Blue collar	17.7	14.5	19.1
Service	14.8	10.7	16.0
Industry:			
Finance, insurance, and real estate	79.2	80.4	79.1
Public service	73.4	68.5	75.0
Professional services	71.1	61.5	72.7
Educational services	54.1	53.2	54.4
Wholesale trade	52.2	43.1	54.3
Hospital and medical services	51.0	41.5	53.4
Business services	47.0	28.8	49.6
Manufacturing	44.3	30.4	49.2
Transportation	37.3	23.7	40.4
Retail trade	33.3	31.2	33.9
Other industries	32.6	24.0	35.8
Construction	16.7	12.9	18.1

Source: Calculated by ERS using data from the October 1993 Current Population Survey.

puter on the job, while more than three in five workers in white-collar and technical occupations used computers. Similarly, more than three-fourths of all those employed in the finance, insurance, and real-estate sector used computers, while only about one in three in retail trade and fewer than one in five in construction used a computer on the job. The distribution of workers using computers across occupations and industries in rural and urban areas is similar to the national pattern, but rates of computer use for almost all occupations and industries are higher in urban and lower in rural areas (table 1).

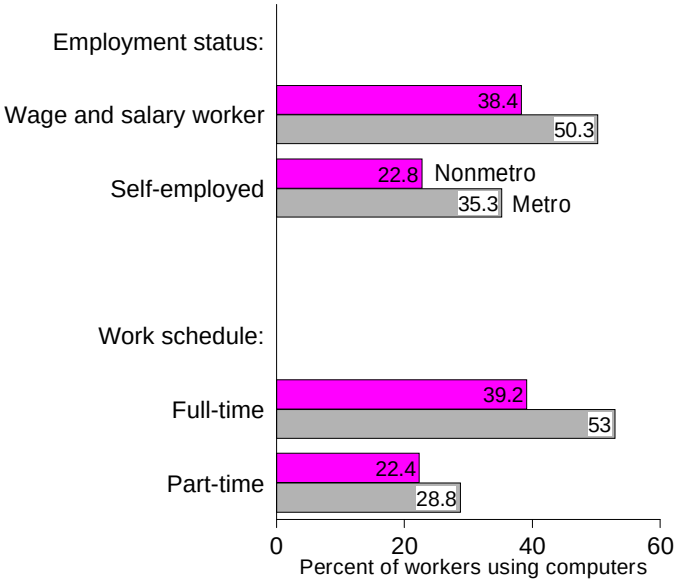
Other job characteristics also relate to computer use. Wage and salary workers are more likely to use a computer, while the self-employed use computers less frequently. This was true for nearly all major occupational categories. It may be that computer use is disseminated more rapidly within firms, where employers may require workers to develop their computer skills and where employees work closely with others. In contrast, self-employed people, who generally work less closely with others and are less subject to pressure to upgrade their skills, may adopt computers more slowly. Also, full-time workers are much more likely to use computers on the job than part-time workers. These relationships hold in both rural and urban areas (fig. 2).

More educated workers were far more likely to work with computers; rates of on-the-job computer use ranged from

Figure 2

Share of workers using computers by employment status and work schedule, 1993

Computer use is higher among wage and salary workers and full-time workers than among self-employed and part-time workers



Source: Calculated by ERS using data from the October 1993 Current Population Survey.

Table 2

Share of workers using computers by education completed, 1993

More highly educated workers are much more likely to be computer users

Education level	United States	Nonmetro	Metro
		Percent	
College graduates and advanced degree holders	69.1	64.0	69.9
Completed some college	52.7	46.5	54.2
High school graduates	34.3	28.0	36.7
Did not graduate from high school	9.9	7.4	10.8

Source: Calculated by ERS using data from the October 1993 Current Population Survey.

about 1 in 10 for high school dropouts to 7 in 10 for college graduates. For each level of education, workers in urban areas were somewhat more likely to work with computers than workers in rural areas. The gap between urban and rural workers was widest for those who had graduated from high school but had no college experience (table 2).

Age, gender, race, and ethnicity also correlate with computer use. Prime-aged workers, female workers, White workers, and Asian workers are more likely than others to use computers at work. The youngest and oldest workers are somewhat less likely to use computers, as are male, Black, and Hispanic workers. These patterns hold for both urban and rural areas (fig. 3).

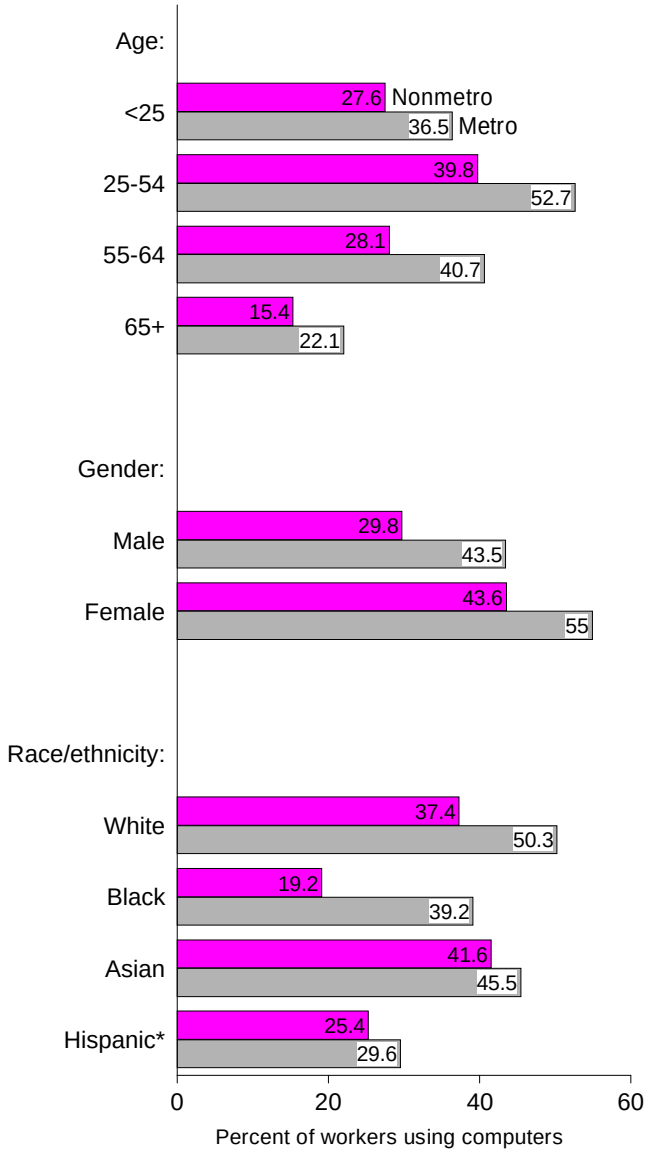
These variations may play an important role in accounting for the urban-rural gap in computer use on the job. Along with the effects of the differences in computer use between rural and urban workers within the job and personal characteristics shown above, the distributions of rural and urban workers among the characteristics also differ. For example, technical and professional jobs account for nearly 34 percent of urban workers, while only about 23 percent of rural workers are in these occupations. On the other hand, more than 39 percent of rural workers are in blue-collar jobs, compared with only about 25 percent of urban workers. Similarly, urban areas have higher concentrations of employment in some of the industries where computer use is most prevalent, including finance, insurance, and real estate and professional services. Urban area workers are also somewhat more likely to be in wage and salary positions rather than to be self-employed.

Further, workers with higher levels of education are more likely to live in urban areas, and as noted such workers are far more likely to use computers on the job. In 1993, more than 28 percent of urban workers had completed at least 4 years of college, while fewer than 17 percent of rural workers had done so. In contrast, high school dropouts made up close to 14 percent of the rural workforce, but only about 10 percent of the urban workforce.

Figure 3

Share of workers using computers by age, gender, and race/ethnicity, 1993

Computer usage is higher among workers 25-54 years old than younger or older workers, higher among women than men, and higher among Whites and Asians than Blacks or Hispanics



However, urban area populations also include larger proportions of racial and ethnic minorities who are less often found using computers on the job. Eleven percent of surveyed workers in urban areas were Black and 9 percent were Hispanic, while the corresponding values for rural areas were 7 and 3 percent.

Occupation Is the Most Powerful Predictor of Computer Use

Which of these factors plays the most important role in accounting for urban-rural differences in computer use? From estimating a statistical model (linear probability regression) that relates the probability of on-the-job computer use to various job and personal characteristics, I found that differences in job characteristics such as occupation and industry account for more than half of the urban-rural difference (table 3).

In particular, the concentration of managerial, professional, technical and clerical workers in urban areas plays a large role in explaining the urban-rural utilization gap. Rural workers, in contrast, are more likely than urban workers to be in those service, blue-collar, or agricultural occupations that are less likely to involve on-the-job computer use.

The concentration in urban areas of some industries with high computer utilization rates—such as professional services and communications—plays a significant but much smaller role in explaining the utilization gap. The higher frequency of self-employment in rural areas also explains some of the gap. Since the incidence of part-time work varies little between urban and rural workers, lower computer utilization rates by part-time workers explain little of the gap.

Table 3

Urban-rural gap in computer use at work, 1993

Occupation accounts for the largest share of the difference in computer use, but accounting for personal and job characteristics still leaves urban workers more likely to use computers than rural workers

Characteristic	Difference accounted for by characteristic
	Percentage points
Total gap	12.7
Job characteristics	7.4
Occupational mix	5.8
Industrial mix	1.0
Other job characteristics[1]	.6
Personal characteristics	1.9
Education level	2.6
Racial and ethnic background	-.9
Other personal characteristics[2]	.2
Urban residence	3.2

[1]Self-employment and full-time status.

[2]Age, gender, region, and whether person responded to survey for self or someone else answered for him/her.

Source: Estimated by ERS using a linear probability regression model and data from the October 1993 Current Population Survey.

Differences in Personal Characteristics Account for a Small Part of Rural-Urban Difference in On-the-job Computer Use

How far do differences in personal characteristics such as age and education account for computer utilization differences, when considered together with differences in jobs? When on-the-job utilization rates are directly compared across workers with different personal characteristics, some large differences are observed, especially for education. However, personal characteristics such as education are closely associated with the likelihood of belonging to particular occupational groups. I found that an individual's educational level is associated with computer use on the job largely because it helps to predict an individual's occupation. That is, college graduates are more likely to use computers on the job in large measure because they are much more likely to be in professional or managerial occupations where computer use is common.

Nonetheless, even after controlling for occupation, age, and other characteristics, college graduates were 18 to 20 percentage points more likely to use computers on the job in 1993 than were high school graduates with no college. Since urban residents are more likely than rural residents to hold college or advanced degrees, education plays a substantial role in accounting for the difference in the rate of computer use between urban and rural areas (table 3).

On the other hand, the higher rate of on-the-job computer utilization in urban areas occurs despite the lower rates of computer utilization associated with several racial and ethnic groups concentrated in urban areas. Regression analysis shows that Black, Hispanic, and Asian workers were 6 to 9 percentage points less likely to use computers on the job than comparable White workers. However, the concentration of these minority groups in urban areas is not great enough to substantially offset the other factors that lead to higher computer utilization rates in urban areas. Other personal characteristics such as age and gender appear to have little or no role in accounting for differences in computer utilization between urban and rural areas once the other job and personal characteristics are taken into account.

Unexplained Rural-Urban Differences in On-the-job Computer Use Are Modest

A difference of 3.2 percentage points between urban and rural rates of on-the-job computer use remains that is not accounted for by the job and personal characteristics.

While this difference is not trivial, it is not dramatic relative to an overall rate of on-the-job computer use of more than 45 percent in 1993.

This difference may reflect slower diffusion of computer skills or computer-based ways of working into rural areas. Firms in urban areas may have more opportunity to observe and imitate the adoption of computer technology by suppliers, customers, or competing firms. The gap may also reflect differences between urban and rural areas in the detailed mix of jobs and/or in personal characteristics not taken into account. For example, many laborers in rural areas are farmworkers, and only 3 percent of farmworkers used computers on the job; on the other hand, many laborers in urban areas are freight handlers, and nearly 15 percent of freight handlers used computers on the job.

Rural-Urban Differences in Job and Personal Characteristics Account for Growth in Computer Utilization Gap

The unexplained portion of the computer utilization gap between urban and rural areas has remained relatively modest over time. While the total gap between urban and rural computer utilization on the job has grown (see fig. 1), the portion not explained by differences in occupational concentrations and other job or personal characteristics remained between 3 and 4 percent between 1984 and 1993.

On the other hand, the portion of the urban-rural utilization gap that is explained by job and personal characteristics rose from about 6 percent in 1984 to more than 9 percent in 1993. This explained portion of the gap increased primarily because on-the-job computer utilization rates increased more quickly for groups that are more heavily represented in urban areas—those with more education, those in white-collar occupations, and those in professional service and business service industries—while rising more slowly for less educated workers and for the blue-collar and agricultural jobs that are more heavily represented in rural areas.

Moreover, urban and rural job and personal characteristics changed over time in a way that favored more rapid growth of computer use in urban areas. In particular, managerial and professional employment grew more rapidly in urban areas than in rural, while the share of employment in blue-collar occupations fell more slowly in rural areas than in urban.

Rural Lag in Computer Utilization Is Greatest in the South and Midwest

As many authors have noted, rural America is an extremely diverse domain. The question then arises as to whether the difference in computer usage between rural and urban workers nationwide exists in all or only some regions? To assess regional conditions, I estimated a statistical model that allows the effect of rurality to vary by Census region.

The regional results show no significant difference in the West or Northeast between urban and rural workers' use of a computer at work after controlling for other job and personal characteristics (table 4). In the Northeast, urban workers are somewhat less likely to use a computer at work than urban workers in other regions—the difference is close to 4 percentage points. That difference may help to explain the lack of an urban-rural gap in the Northeast. In the West, relatively rapid nonmetro growth in recent years may have created an environment where new technologies are adopted more quickly. In the Midwest and South, on the other hand, there were unexplained urban-rural gaps of 3 and 5 percentage points. Both Black and White rural workers in the South lagged their urban counterparts' computer use by about 5 percentage points.

These results strongly suggest that the probability of on-the-job computer utilization depends not only on an individual's personal and job characteristics, but also on the environment around him or her. Future research may provide evidence regarding the regional characteristics that contribute to differences in on-the-job computer utilization.

Conclusions

The urban-rural gap in computer use is substantial and has increased over time. Most of the gap can be explained, however, by differences between the kinds of workers and particularly the kinds of jobs found in urban and rural areas.

Table 4

Effects of rural residence on likelihood of using a computer at work by region, 1993

Northeast and West show no sign of a rural-urban gap in computer usage

Region	Effect of being in a rural rather than an urban area
	Percentage points
Northeast	0.4*
Midwest	-3.1
South	-5.3
West	-1.3*

*Not a statistically significant difference.

Source: Estimated by ERS using linear probability regression models and data from the October 1993 Current Population Survey.

The growth in the rural-urban computer utilization gap between 1984 and 1993 reflects more rapid increases in utilization by occupational, industrial, and educational groups that tend to be concentrated in urban areas. It also reflects, to a lesser extent, changes in the occupational composition of the urban and rural workforces.

A modest portion of the urban-rural gap in computer utilization, on the order of 3 to 4 percentage points, is not explained by readily measured job and worker characteristics. This unexplained portion of the gap, which changed little between 1984 and 1993, may reflect impediments to the diffusion of computer skills and technology into less densely settled areas or differences between rural and urban areas in more detailed job characteristics. The South and Midwest are where the unexplained rural-urban computer utilization gap exists, suggesting a need for more in-depth study of the jobs and workers in those regions.

Given increasing demand for the use of computer skills on the job, differences between rural and urban areas in the diffusion of computer skills may well have some effect on wage and employment growth rates in the future. However, the differences primarily reflect structural differences between rural and urban job markets and populations. These may not be readily changed by policies that focus on the diffusion of computer skills or computer usage per se. Rather, efforts to attract higher skill jobs and retain higher skill workers, if successful, should lead to a narrowing of the computer utilization gap. Diffusion-oriented policies may still have a supporting role, however, in regions such as the South and Midwest, where the urban-rural utilization gap is relatively large even when structural differences are taken into account.

For Further Reading

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U.S. Department of Commerce, Bureau of the Census. *Computer Use in the United States: 1989*, Current Population Reports, Special Studies, Series P-23, No. 171, 1991.

U.S. Department of Commerce, Bureau of the Census. *Computer Use in the United States: October 1993*, Population Paper PPL-22, Education and Social Stratification Branch, Population Division, 1994.

Data and Methods

Data for this analysis have been taken from responses to the Current Population Survey (CPS). The CPS is conducted monthly by the Census Bureau to collect data on employment and unemployment. Data are collected from a sample of approximately 57,000 households, chosen to represent the civilian noninstitutional population of the United States. Data on the use of computers on the job is available from selected rounds of the Current Population Survey (CPS). In October 1984, October 1989, and October 1993, questions about the use of computers at home, at school, and on the job were included in the CPS as part of the annual October supplement on schooling and related topics.

In this article, "urban" refers to metro areas while "rural" refers to nonmetro areas. In the 3 years surveyed, the metro-nonmetro designation of residences in the CPS was based on population and commuting patterns from the 1980 Census of Population.

Complete data on variables of interest were available for approximately 61,000 employed adults in the October 1993 file, with comparable numbers for 1984 and 1989. All statistics reported in this article reflect data for these individuals, weighted to reflect CPS observation weights.

For each household, data on all members are normally collected from a single respondent; reporting may be less accurate for some variables (such as whether a computer is used on the job) when reported by one household member on behalf of another. Therefore, the analysis reported here includes a variable reflecting whether an individual observation is self-reported or reported on behalf of another individual.

The statistical model used to assess the relationships between personal and job characteristics and use of a computer on the job is a linear probability regression model. This is formally identical to other multivariate linear regression models, where each "independent" variable is assumed to have a consistent effect on the level of the outcome variable of interest, independent of the effects of any other variables in the model. However, the outcome variable in the linear probability regression can only take on the values of zero and one, depending on whether or not the condition of interest (here, use of a computer on the job) is observed. In this context, the estimated effects of the independent variables are interpreted not as shifting the expected value of the outcome variable, but rather as shifting the probability that the outcome will be observed.