



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

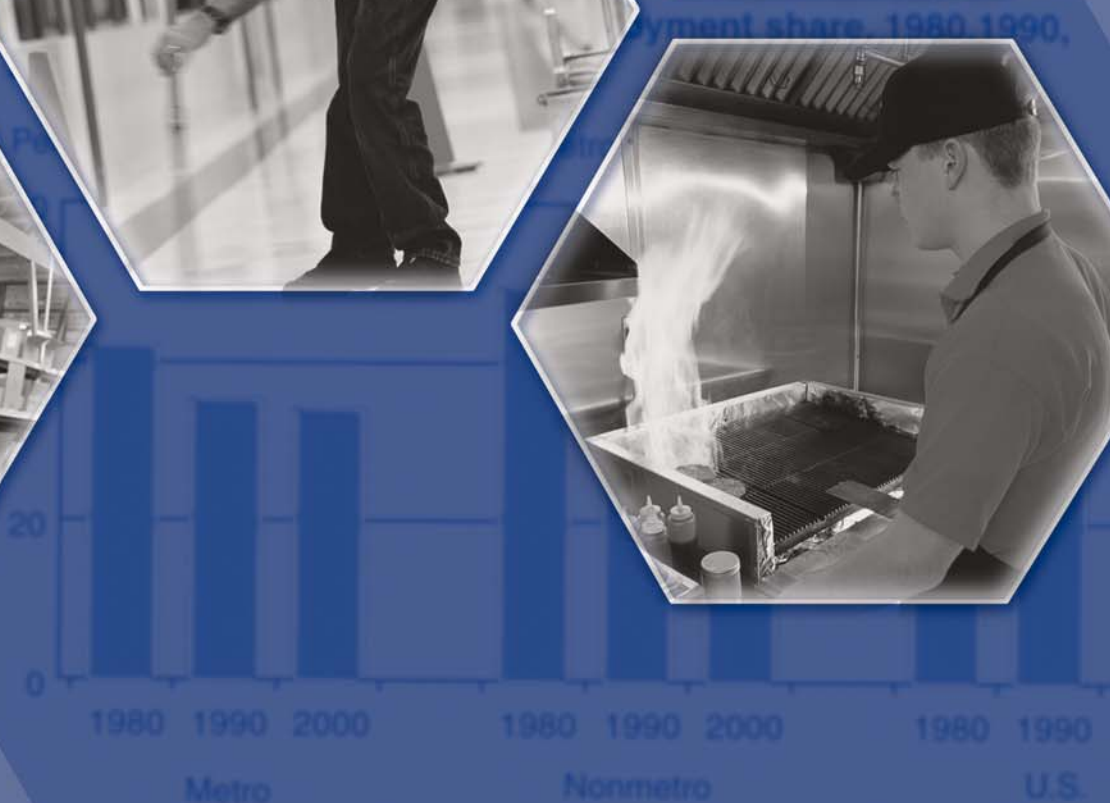
AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



Low-Skill Employment and the Changing Economy of Rural America

Robert Gibbs, Lorin Kusmin, and John Cromartie



Visit Our Website To Learn More!

Want to learn more about rural America?
Visit our website at **www.ers.usda.gov**.

You can also find additional information about ERS publications, databases, and other products at our website.

National Agricultural Library Cataloging Record:

Gibbs, Robert

Low-skill employment and the changing economy of rural America.

(Economic research report (United States. Dept. of Agriculture. Economic Research Service); no. 10)

1. Wages-Rural population-United States.
2. Wages-Skilled labor-United States.
3. Wages-Unskilled labor-United States.
4. Wages-Service industries workers.
5. Rural development-United States.

I. Kusmin, Lorin D.

II. Cromartie, John.

III. United States. Dept. of Agriculture. Economic Research Service.

IV. Title. HN90.C6

Cover photos: top right photo by Painet Stock Photos, all others by Rubberball Stock Photography.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and, where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

The USDA logo features the letters "USDA" in a bold, serif font, positioned above a stylized graphic of a field with a horizon line.

United States
Department
of Agriculture

Economic
Research
Report
Number 10

October 2005



A Report from the Economic Research Service

www.ers.usda.gov

Low-Skill Employment and the Changing Economy of Rural America

Robert Gibbs, Lorin Kusmin, and John Cromartie

Abstract

This study reports trends in rural low-skill employment in the 1990s and their impact on the rural workforce. The share of rural jobs classified as low-skill fell by 2.2 percentage points between 1990 and 2000, twice the decline of the urban low-skill employment share, but much less than the decline of the 1980s. Employment shifts from low-skill to skilled occupations within industries, rather than changes in industry mix, explain virtually all of the decline in the rural low-skill employment share. The share decline was particularly large for rural Black women, many of whom moved out of low-skill blue-collar work into service occupations, while the share of rural Hispanics who held low-skill jobs increased.

Keywords: rural labor markets, low-skill employment, job skills, human capital, industry, occupation, economic development

Acknowledgments

The authors would like to acknowledge Stephan Goetz, Pennsylvania State University; David Sears, U.S. Department of Agriculture, Rural Development; David McGranahan, Patrick Sullivan, Leslie Whitener, and Timothy Wojan, U.S. Department of Agriculture, Economic Research Service.

Table of Contents

Summary	iii
Introduction	1
Data and Methods	4
How We Measured Skill	4
Shift-Share Decomposition of Changes in Low-Skill Employment Share	5
Rural America and the Prevalence of Low-Skill Employment	6
Rural Low-Skill Employment Declines Outpace the Nation's	9
Structural Factors Driving Rural Low-Skill Employment	
Trends in the 1990s	10
Decline in Low-Skill Share During the 1990s Reflects Changes in Occupational Mix Within Industries	13
Employment Shifts Between Sectors Lowered Low-Skill Employment Share	15
Employment Shifts Between Industries Within Sectors Offset Effects on Low-Skill Share	15
How Rural Low-Skill Change in the 1990s	
Compares With the 1980s	16
Implications of Low-Skill Employment Trends for Rural Workers ..	18
Demographic Variation in Low-Skill Employment	18
Low-Skill Trends in the 1990s Vary by Subgroups	20
Decline in Low-Skill Employment Share Improved Earnings	21
Conclusions	25
References	28
Appendix: Measuring Labor Force Skills	30

Summary

Low-skill jobs have continuously been declining as a share of U.S. jobs throughout the 20th century, and rural areas are no exception. In 1900, two-thirds of all workers were employed in agriculture and manufacturing, mostly holding manual or routine jobs in the field or factory. By 2000, less than 40 percent of the U.S. workforce was employed in low-skill occupations. Today, most rural low-skill workers are employed in the growing service sector, in which a typical job demands higher skills than a typical job in goods-sector industries such as manufacturing, mining, and agriculture. In addition, new production methods in many industries are raising occupational skill demands and contributing to the decline in the low-skill share of rural employment.

The decline in the low-skill share of employment affects the well-being of rural workers and the economic development of small towns across America. Jobs requiring more skill tend to pay more and offer better benefits, leaving rural workers and their families better off and possibly reducing demand for Federal and State support services. High-skill jobs also make rural communities less vulnerable to international competition and more attractive to high-wage employers. Understanding the factors driving changes in job-skill levels could help rural areas choose more effective development strategies and ensure that all groups benefit from economic growth.

What is the Issue?

The impact of the industrial shift from goods to services in rural America has been subject to some debate. The ongoing industrial shift may be inhibiting the growth of good jobs in rural America. Although many service-sector jobs are high-skill and pay well, some observers believe rural areas may lack the density of population and infrastructure to attract those jobs. As a result, the rural service sector would generate more low-skill jobs, and because low-skill service jobs pay less on average than low-skill jobs in the goods sector, workers would be worse off economically. Others observe that, as capital investments have grown, many rural labor markets have been able to attract and retain high-skill service jobs. Further, these observers argue that occupational shifts within industries, brought on by technology and productivity change, have more impact on skill levels than does the transition to services.

ERS examined the relationship between employment trends and industrial and occupational shifts by addressing the following questions: 1) Did low-skill jobs continue to shrink as a proportion of the rural economy as quickly in the 1990s as in the past? 2) Did large-scale shifts from goods production to service provision play a decisive role in these changes, or did shifts to more skilled occupations within these industries become the key factor? 3) Did skill trends benefit rural workers economically, particularly those historically more prone to low-skill employment?

What are the Major Findings?

The nonmetro low-skill job share fell 2.2 percentage points from 1990 to 2000—from 44.4 percent to 42.2 percent—compared with a 5-percentage-point drop between 1980 and 1990. The movement of jobs from the goods sector to the services sector in the 1990s contributed to a decline in low-skill employment shares, but the largest source of decline was the shift from lower skill to higher skill occupations within both sectors.

As expected, low-skill employment rates are higher for workers who are younger and have less education, for minorities, and for men. Rural women and Blacks experienced the largest drop in low-skill employment rates during the 1990s, while Hispanics saw an increase.

Rural workers experienced real earnings growth on average during the 1990s. Despite some concerns about the implications of a shift from goods to service employment, this shift had almost no impact on earnings change. In fact, most of the gain occurred “across the board,” in numerous occupations in both the goods and service sectors, rather than because of the employment trends analyzed in this study.

The findings suggest that encouraging new technology that creates high-skill work opportunities, as well as investing in education and training, may be effective in raising skill levels of jobs in the rural economy.

How was the Study Conducted?

Data used in this report come from the earnings files of the 1980, 1990, and 2000 Current Population Survey (CPS), a national sample of 50,000-60,000 households. Information on hourly and weekly earnings, age, sex, race/ethnicity, education, labor force status, industry, and occupation is collected on every adult member of the survey household.

We identify low-skill occupations using seven skill dimensions from the Dictionary of Occupational Titles, produced by the U.S. Department of Labor. Each dimension measures a different aspect of the intellectual or physical complexity of an occupation. These seven measurements are then added to produce a single numerical index. Low-skill occupations are those that fall below the median index value for the occupations considered. Unlike commonly used measures such as educational attainment, this approach emphasizes the skills embodied in the jobs rather than the workers, who may be in jobs below or above their potential.

Shift-share analysis is used to test whether changes in rural industrial composition or occupation mix within industries explain more of the decline in low-skill employment share in the 1980s and 1990s. The relationships between demographic attributes and the probability of low-skill employment were assessed using a logistic regression analysis.

Introduction

Rising job skill requirements were a signature feature of the U.S. economy in the 20th century. Technological change, shifts in the global geography of production, and large investments in human capital slowed or reversed the growth of jobs comprised of physical, routine tasks while prompting rapid growth in jobs requiring high levels of formal education and technical knowledge. In 1900, agriculture and manufacturing alone employed two-thirds of all workers, the great majority of them holding manual and routine jobs in field and factory. Much of the remaining workforce was engaged in similarly low-skill work in the Nation's mines, shops, and offices (Executive Office of the President, 2000). As of 2000, about 38 percent of the U.S. workforce was employed in occupations requiring only low-level academic, technical, and reasoning skills; in rural America, 42.2 percent of all jobs were in such low-skill occupations, down from 44.4 percent in 1990.¹

The long-term decline in rural low-skill jobs was historically associated with the steep decline in farm employment. Agriculture now claims too small a share of the workforce to affect large-scale patterns of change, and most of the remaining farmers are skilled owners and operators. Rural manufacturing, which has a higher concentration of low-skill jobs than agriculture, has likewise seen its share of total employment decline in recent years.

Most workers in both urban and rural labor markets today are employed in the service sector, which has higher skill requirements on average than the goods-producing sector comprised of agriculture, mining, construction, and manufacturing. Thus, the economic transformation from goods to services should reduce the share of low-skill jobs. Moreover, new ways of organizing work within an industry to accommodate new technologies and product demand are changing employers' demand for various skills, reflected in the mix of occupations needed. In short, both industry and occupation changes affect the number of low-skill jobs available in the economy.

This report examines the relationship between low-skill employment and industrial and occupational shifts by considering the following questions:

1. Did low-skill jobs continue to shrink as a proportion of the rural economy as quickly in the 1990s as in the past?
2. Did large-scale industrial shifts, such as from goods production to service provision, play a decisive role in these changes, or did shifts to more skilled occupations within these industries become the key factor?
3. Did skill trends benefit rural workers economically, particularly those historically more prone to low-skill employment?

The measure of skill in this study is based on the complexity and technical knowledge required in the worker's occupation. This measure, unlike such commonly used measures as educational attainment, emphasizes the skills embodied in a job—and by extension the economic structure of a region—rather than the skills of workers, who may be in jobs below, and occasion-

¹ In this report we use the terms “rural” and “nonmetro” interchangeably when discussing conditions in nonmetro counties, and the same is true for “urban” and “metro.” See “Data and Methods” for further explanation.

ally above, their skill potentials. The skill measure is described in greater detail in the following section.

The third question addresses the crucial link between transformation in skill demand and the well-being of the rural workforce. To some observers, the shift from goods to services has inhibited the growth of “good” jobs in rural America. According to this perspective, although many service-sector jobs demand high skill levels and pay well, rural areas lack the density of population and infrastructure to attract those jobs. As a result, the service sector has merely replaced the goods sector as the source of most rural low-skill jobs. And, because low-skill service jobs pay less on average than low-skill jobs in the goods sector, workers who take these jobs often end up worse off economically than before, widening the gap between workers at the top and bottom of the earnings scale.

Other observers, however, point out that as human capital levels and capital investments have grown in some rural labor markets, the ability to attract and retain a vibrant high-skill service sector has increased as well. They also argue (correctly, we show) that technology and productivity change within industries has a far greater effect on earnings change than does the transition to services (Albrecht et al., 2000; Galston and Baehler, 1995).

The key finding in this report is that the share of rural jobs in low-skill occupations fell between 1990 and 2000—although by less than in the 1980s—mostly as a result of rising skill requirements and higher skill occupations within industries rather than industrial restructuring. The decline in low-skill employment share was seen among nearly all demographic subsets of workers. Rural economies kept pace with the national trend toward job upskilling. In fact, the low-skill share of jobs in rural areas, though still higher than the national average, fell slightly more than in urban areas.

A second important finding is that the continuing gains in service-sector employment during the 1990s were too small to contribute much to changes in the rural skill mix. Nor did these gains prevent a real rise in earnings for either the typical rural worker or the less educated worker with less chance of moving into high-skill employment. Nonetheless, those workers who would have been employed in a low-skill goods job, but found themselves in a low-skill services job due to sectoral shifts, were likely to see real earnings declines.

Why does rural job-skill change matter? On a fundamental level, a healthy rural America depends on its ability to share in a national and global economy that increasingly relies on human capital. For individual workers, jobs requiring higher skills tend to pay more and offer better benefits, leaving them better off and possibly reducing demand for Federal and State support services. For communities, a high-skills jobs mix usually indicates an upward development track, making such places less vulnerable to international competition and more attractive to high-wage employers.

The source of rural job-skill change also matters. Shifts to more skilled occupations within industries—not industrial change—drove the decline in the low-skill share of jobs in the 1990s. Rural areas with limited resources may opt to pursue development strategies incorporating skill upgrades

within the current set of industries, including investments in education and training and encouraging new technology that creates higher skill work.

Finally, low-skill employment change can affect rural economic inequality. Women and Blacks benefited most from the decline in low-skill share, while the rising prevalence of low-skill work among Hispanics was associated with lower earnings growth. Effective labor policies will ensure that labor market differences are transitory and that better educational and career prospects are available regardless of residence.

Data and Methods

The data used in this report are drawn primarily from the 1980, 1990, and 2000 microdata earnings files of the Current Population Survey (CPS). Each file is comprised of the responses from the outgoing rotation group of each month's surveyed households. This subset is asked about the hourly and weekly earnings of working household members, typically including 150,000-180,000 respondents in total. In addition, information on age, sex, race/ethnicity, education, labor force status, industry, and occupation (where relevant) is collected on every adult member of the survey household.

Households' locations for our purpose are categorized as either "metropolitan" or "nonmetropolitan." Because metropolitan status changes over time due to changes in population and commuting flows, adjustment is required to make each pair of CPS files consistent (1980 with 1990 and 1990 with 2000) in order to chart skill change within decades. We make this adjustment using county population information from the 1980 and 1990 Census of Population.

Metropolitan (metro) and nonmetropolitan (nonmetro) counties, as defined in 1993, are used in this report to define "urban" and "rural" areas, respectively. In 1993, the Office of Management and Budget defined metro areas to include central counties with 1 or more cities of at least 50,000 residents or with an urbanized area of 50,000 or more residents and total area population of at least 100,000. Adjacent, outlying counties were also included if they were both economically tied to the central counties, as measured by daily commuting, and they displayed a level of "metropolitan character" based on population density, urbanization, and population growth. Nonmetro areas included all counties that were not part of a metro area.

The method for defining metropolitan status changed in 2003, as did the set of counties identified as metropolitan. The Current Population Survey files we analyzed, however, used earlier delineations. Although we use the terms "rural" and "nonmetro" interchangeably in this report, official definitions of urban and rural, set by the U.S. Census Bureau, are geographically different areas (Cromartie, 2000).

How We Measured Skill

The focus of this report is on job skill requirements—the knowledge and abilities necessary to perform the tasks specific to each job. The occupation associated with a job is the closest descriptive designation for which skill information is available. Researchers have employed a number of occupational classification schemes to measure the skill content of jobs, each with its distinctive set of advantages. We draw upon a set of seven skill dimensions from the Dictionary of Occupational Titles (DOT), produced by the U.S. Department of Labor, each measuring a different aspect of the intellectual or physical complexity of an occupation, or the level of specific formal knowledge required. The dimensions include three "general educational development" (GED) levels of a job with respect to math, language skills, and general reasoning; three "functional level" variables that characterize occupations in terms of the sophistication of the interactions required with

people, data, and things; and the extent of “specific vocational preparation” required for the job.

The seven dimensions are then aggregated into a single numerical skill index, allowing us to rank occupations and to identify low-skill occupations as those that fall below a median index value for the slightly more than 500 occupations, weighted by number of workers. Twenty-two of the 218 occupations below the median are not classified as “low-skill” because of the high average educational attainment of workers in those occupations, leaving a total of 196 low-skill occupations. Appendix A provides more detail about the DOT, the seven skill dimensions used, and a discussion of alternative metrics.

While our median index threshold is only one of several plausible ways to identify low-skill occupations, we find that it is closely correlated with other common measures, such as educational attainment. With the exception of the 22 occupations removed from the “low-skill” category, for example, the median index threshold accords with the distinction between occupations in which the majority of workers have no college experience and those in which they do.

Shift-Share Decomposition of Changes in Low-Skill Employment Share

One of the central questions of this report is whether changes in rural industrial composition or occupation mix explain more of the decline in low-skill employment share in the 1990s. We are especially interested in how the transition from goods production to service provision affects skill demand. In order to separate these industry and occupation effects, we use a variation of the shift-share method to decompose changes in low-skill employment share into three components:

- Changes caused by shifts in the distribution of employment between the goods and service sectors (“sectoral”).
- Changes caused by shifts in the distribution of employment across the industries within each sector (“interindustry”).
- Changes caused by shifts in the distribution of employment across occupations within each of 220 industries (“occupation mix”).

These changes are calculated and compared with one another in order to ascertain the relative importance of each effect.

The mathematics of shift-share also requires a fourth component, which captures the interaction among the other three changes. The sum of the three effects and the interaction term equals the total change in the low-skill share of employment.

Rural America and the Prevalence of Low-Skill Employment

There were 10.3 million workers employed in low-skill jobs in the nonmetro United States in 2000 representing 42.2 percent of the nonmetro workforce, compared with 34 percent of workers in metro areas (table 1). The higher rate in rural areas reflects historical geographic divisions in economic activity. Urban areas have traditionally driven the development of overall national economic growth in the United States (Glaeser and Mare, 1994; Rauch, 1993; Norton and Rees, 1979). Despite radical alteration of the Nation's physical infrastructure after World War II, marked by a comprehen-

Table 1

Total and low-skill employment by major sector, metro and nonmetro, 1980-2000

Sector	Unit	1980	1990	2000
Metro:				
Goods-producing sector—				
Total employment	<i>Thousands</i>	23,539	23,744	24,995
Low-skill employment	<i>Thousands</i>	11,848	10,231	10,105
Share low-skill	<i>Percent</i>	50.3	43.1	40.4
Services-providing sector—				
Total employment	<i>Thousands</i>	54,501	70,457	85,534
Low-skill employment	<i>Thousands</i>	20,858	22,863	27,462
Share low-skill	<i>Percent</i>	38.3	32.4	32.1
All sectors—				
Total employment	<i>Thousands</i>	78,041	94,202	110,529
Low-skill employment	<i>Thousands</i>	32,706	33,094	37,567
Share low-skill	<i>Percent</i>	41.9	35.1	34.0
Nonmetro:				
Goods-producing sector—				
Total employment	<i>Thousands</i>	7,978	7,759	8,240
Low-skill employment	<i>Thousands</i>	4,701	4,330	4,202
Share low-skill	<i>Percent</i>	58.9	55.8	51.0
Services-providing sector—				
Total employment	<i>Thousands</i>	11,409	13,694	16,160
Low-skill employment	<i>Thousands</i>	4,876	5,206	6,095
Share low-skill	<i>Percent</i>	42.7	38.0	37.7
All sectors—				
Total employment	<i>Thousands</i>	19,387	21,453	24,399
Low-skill employment	<i>Thousands</i>	9,577	9,536	10,298
Share low-skill	<i>Percent</i>	49.4	44.5	42.2

Note: 1980 values reported above are approximately comparable with 1990 values; 1990 and 2000 values are comparable.

Source: Economic Research Service/USDA, using Current Population Survey microdata earnings files, adjusted by the U.S. Census of Population.

sive network of interstate highways and rapidly expanding telecommunications coverage, cities still tend to be regarded as centers of innovation and skill specialization.

Conversely, rural areas were viewed as hinterlands that supplied cities with raw materials, including labor. Most farming and mining activity still takes place in rural areas. Although many jobs in these industries do not qualify as low-skill, the fact that the typical miner or hired farm laborer lives in a rural county is largely a consequence of the very definition of rurality. However, resource extraction today, whether from field or mine, employs only a small proportion of the rural population. Changes in the ways goods are produced, coupled with new transportation and communications networks, have allowed many types of manufacturing to move outward from high-cost urban centers into suburban and rural areas. The latter became particularly attractive as low-cost manufacturing sites for goods that had passed the point of intensive product development. By 1970, manufacturing employed a larger share of rural workers than of urban workers (Barkley and Hirschberger, 1992).

The rise in rural service employment has followed a similar track. As communications centers, and with large pools of highly educated and trained workers, cities remain the dominant sites for high-end business and professional services. But, the share of rural employment in the service sector has grown rapidly since the 1970s, reaching 66 percent of all rural employment by 2000. This sector is skill-diverse in rural and in urban areas. Health care and public education, two of the largest and most widespread rural industries, are primarily high- and moderate-skill employers (although the absolute size of the health care industry in particular also makes it an important source of low-skill work).

Nonetheless, rural locational attributes tend to favor a less skilled job mix in services. High-skill service establishments typically depend on access to well-developed communications networks and on physical proximity to their suppliers and customers (Porterfield and Sizer, 1994). Despite the costs associated with congestion in urban areas and some diffusion of advanced communications, rural areas continue to lag in their ability to attract such establishments.

In summary, the distinctive features associated with rurality continue to reinforce a low-skill job profile. The industry mix of rural areas in 2000 remains in large part a mirror of earlier decades (McGranahan, 1988). Rural areas have a disproportionate number of jobs in the goods sector, which includes agriculture, fishing, forestry, mining, construction, and manufacturing. In fact, all of these industry groups (except construction) claim a higher share of employment in rural than in urban areas, while employment in all major service-sector industries is concentrated in urban areas.

Many of the industries important to rural areas—manufacturing is a prime example—also employ a relatively large share of low-skill workers. But this association between low-skill goods industries and rurality can be overstated. For instance, a number of low-skill industry groups within the service sector, such as consumer services and retail trade, are disproportionately found in urban areas.

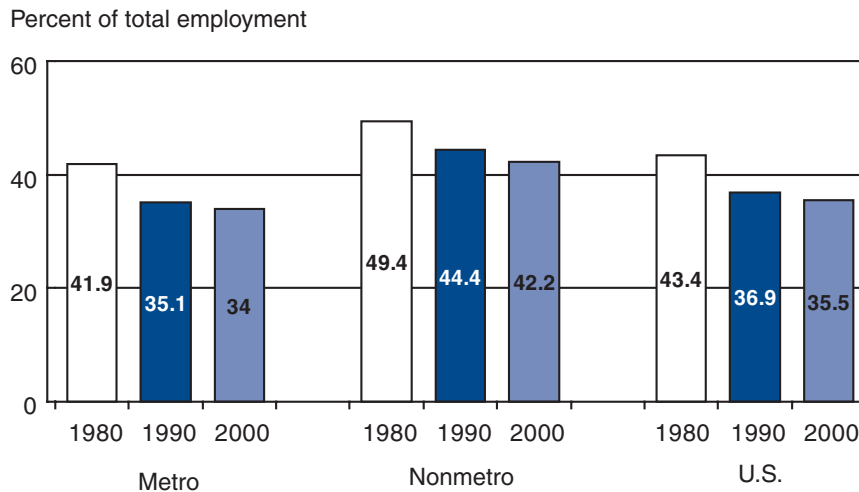
The moderate association between rural location and low-skill industry is reinforced by the tendency for an industry to employ a larger share of its workforce for low-skill jobs in a rural location than the same industry would in an urban location. In some cases, this is related to the choice of technology, while in others, it reflects the greater likelihood of managerial and professional functions being performed in urban establishments. Thus, both the location of industries and the specific labor mix within these industries reflect continuing geographic differences in labor availability, wage rates, and other input prices from one location to another. Compared with urban markets, rural markets offer cheap land, low wages, less educated workers, less access to transportation and communication nodes, and less access to the cluster of business activities that support administrative and research and development functions.

Rural Low-Skill Employment Declines Outpace the Nation's

The rural low-skill share of employment fell 2.2 percentage points during the 1990s, from 44.4 to 42.2 percent (fig. 1). Nationally, the decline in low-skill share was 1.4 percentage points, from 36.9 percent to 35.5 percent. The number of workers in low-skill jobs actually rose in the rapidly expanding economy of the 1990s, but the skilled workforce grew faster, hence the decline in share. To understand the impact of declining low-skill share, imagine that the share of low-skill rural jobs had not changed between 1990 and 2000. Given brisk employment growth overall, about 550,000 more low-skill jobs would have existed in rural areas by the end of the decade than actually did.

The decline in low-skill employment share during the 1990s appears more modest when compared with the corresponding changes during the 1980s. Nationally, the low-skill share of employment fell 6.5 percentage points in the 1980s, compared with 1.4 percentage points in the 1990s. In rural areas, a 5-percentage-point drop in the 1980s was followed by a 2.2-percentage-point drop in the 1990s.

Figure 1
Metro and nonmetro low-skill employment share, 1980, 1990, and 2000



Source: Economic Research Service/USDA, using data from the 2000 Current Population Survey.

Structural Factors Driving Rural Low-Skill Employment Trends in the 1990s

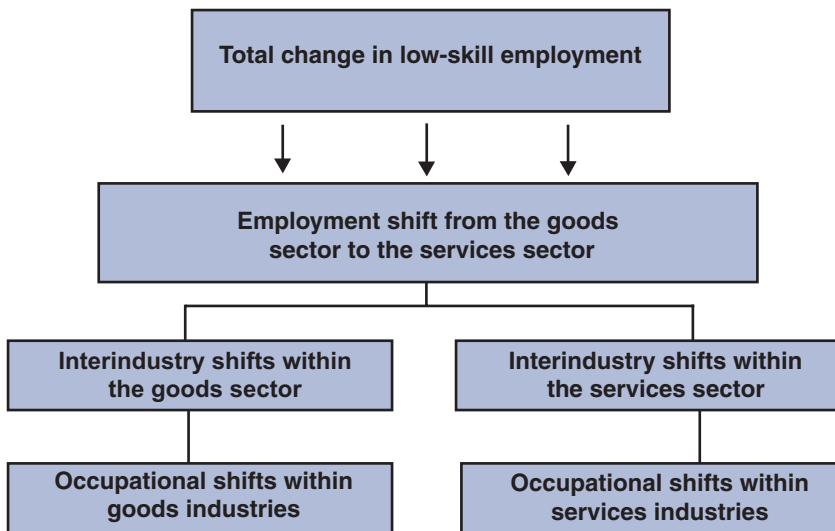
The decline in low-skill employment share reflects large-scale economic forces that are changing the nature of work in rural America, with implications for the well-being of workers, their families, and their communities (Albrecht et al., 2000; Crump and Merrett, 1998; Glasmeier, 1991; Galston and Baehler, 1995; Barkley, 1995). Increasing competition from overseas manufacturing has pressured many rural low-wage manufacturers either to become more capital intensive or to shift production to other locations. At the same time, new production technologies tend to be biased toward raising skill requirements, further shifting employment away from the low-skill workforce (Bartel and Sicherman, 1998).

Changes in production locations and technologies affect the skill composition of the rural workforce by altering both industry mix—which goods and services are produced, and in what quantity—and the occupational mix within that industry mix—how goods and services are produced. For example, the domestic textile and apparel industries shed thousands of jobs as firms moved production overseas, but blue-collar production jobs were more likely to disappear than managerial and administrative jobs, skewing the occupational mix toward higher skills. Many financial and other business services are geographically tied to domestic markets, and these industries experienced growth in all types of jobs. Rapid diffusion of computer technology, however, led to a relative decline in demand for low-skill clerical and administrative staff. In both cases, the industries became less low-skill due to occupational shifts, but the textile industry also contributed to the declining low-skill share by losing jobs overall. It is also likely that changes in skill content within occupations occurred in these industries—for example, by requiring increasing mastery of computer software by workers in clerical occupations or decreasing the computational skills needed in sales or office occupations.

To get a better picture of the nature of low-skill employment change in the rural economy, we measured the separate components of changes in industry and occupation mix from 1990 to 2000 (fig. 2). We further decomposed the industry mix effect into the effect of employment shifts between goods production and service provision and the effect of industry shifts within the goods and services sectors. Thus we were able to assign the proportion of low-skill employment share change due to shifts between goods and services, the proportion of change due to industry shifts within these sectors, and the proportion of change due to shifts in the occupation mix within these industries.

Most of the decline in rural low-skill employment share during the 1990s resulted from changes in occupational mix within industries (fig. 3 and table 2). The movement of employment from goods to services (the “sectoral” shift) also contributed to declining low-skill employment shares, accounting for 24.1 percent of the total decline in low-skill share in metro areas, and 19 percent of the total decline in nonmetro areas (table 3).

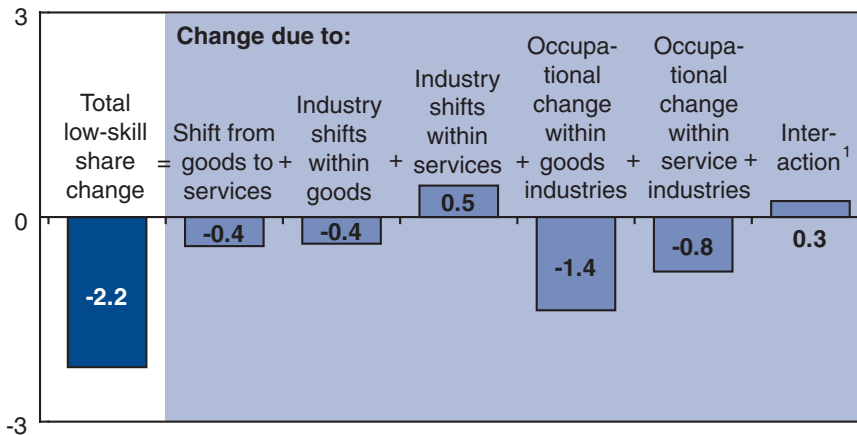
Figure 2
Components of change in low-skill employment share



Source: Economic Research Service/USDA.

Figure 3
How industry and occupational change affected nonmetro low-skill employment share, 1990-2000

Percent of total employment in 1990



¹ An interaction term captures change not attributable to a single source.

Source: Economic Research Service/USDA, using data from Current Population Survey and U.S. Census of Population.

In contrast, shifts between industries within major sectors actually increased low-skill employment share during the 1990s. Nationally, such shifts accounted for a 0.2-percentage-point increase in the low-skill employment share and a 0.1-percentage-point increase in the nonmetro share (table 2).

Table 2

How industry and occupational change contributed to the change in low-skill employment share, 1990-2000

Item	Metro	Nonmetro	U.S.
<i>Percentage-point change</i>			
Occupation mix	-0.9	-2.2	-1.2
Within goods	-0.5	-1.4	-0.7
Within services	-0.4	-0.8	-0.5
Interindustry	0.2	0.1	0.2
Within goods	0.0	-0.4	-0.1
Within services	0.2	0.5	0.3
Sectoral	-0.3	-0.4	-0.3
Residual	-0.1	0.3	0.0
Overall	-1.1	-2.2	-1.4

Source: Economic Research Service/USDA, using data from the Current Population Survey.

Table 3

Employment change due to change in low-skill share by components, 1990-2000

Item	Metro		Nonmetro		Total U.S.	
	Jobs ¹	Share ²	Jobs ¹	Share ²	Jobs ¹	Share ²
	<i>Thousands</i>	<i>Percent</i>	<i>Thousands</i>	<i>Percent</i>	<i>Thousands</i>	<i>Percent</i>
Occupation mix	-890	82.7	-473	98.2	-1,364	87.5
Within goods	-504	46.8	-298	61.8	-802	51.5
Within services	-386	35.9	-176	36.4	-562	36.0
Interindustry	182	-16.9	15	-3.0	197	-12.6
Within goods	-46	4.2	-87	18.1	-133	8.5
Within services	228	-21.1	102	-21.1	330	-21.1
Sectoral	-260	24.1	-92	19.0	-351	22.5
Residual	-109	10.1	68	-14.2	-40	2.6
Overall	-1,076	100.0	-482	100.0	-1,558	100.0

¹These values represent the changes in low-skill employment that would have occurred if total employment had not changed between 1990 and 2000, given the actual changes in employment mix between 1990 and 2000.

²Share of overall employment change.

Source: Economic Research Service/USDA, using data from the Current Population Survey.

Decline in Low-Skill Share During the 1990s Reflects Changes in Occupational Mix Within Industries

In nonmetro areas, close to 100 percent of the drop was due to shifts from low-skill to higher skill occupations within industries. Around 83 percent of the metro drop in low-skill share was due to these changes in occupation mix (table 3). Shifts from low-skill to higher skill occupations within industries were more pronounced in the goods-producing sector, lowering the overall low-skill employment share by 0.7 percentage points nationally and by 1.4 percentage points in nonmetro areas (table 2). Within the goods sector, the drop in low-skill share was largely attributable to manufacturing industries (table 4). Manufacturing is by far the largest group within the goods sector, and employment trends in individual manufacturing industries (e.g., electrical equipment, furniture) were driven by rapid technological change, especially the diffusion of computer-related production technolo-

Table 4

Low-skill employment change due to change in occupation mix by major industry, 1990-2000

Industry	Metro		Nonmetro		Total U.S.	
	Jobs ¹	Share ²	Jobs ¹	Share ²	Jobs ¹	Share ²
	<i>Thousands</i>	<i>Percent</i>	<i>Thousands</i>	<i>Percent</i>	<i>Thousands</i>	<i>Percent</i>
Goods	-504	-2.1	-298	-3.8	-802	-2.5
Agriculture	5	0.6	-37	-3.1	-32	-1.5
Other extractive	-56	-4.8	-9	-1.5	-64	-3.7
Construction	-46	-0.8	-73	-5.1	-119	-1.7
Manufacturing	-407	-2.6	-179	-3.9	-586	-2.9
Services	-386	-0.6	-176	-1.3	-562	-0.7
Transportation	25	0.6	1	0.1	26	0.5
Communications and utilities	-77	-3.0	-11	-2.2	-89	-2.9
Wholesale trade	118	2.7	-2	-0.3	116	2.3
Retail trade	118	0.7	-46	-1.3	72	0.4
Finance, insurance, and real estate	-101	-1.4	-15	-1.7	-115	-1.4
Business services	-150	-3.0	-34	-4.8	-184	-3.2
Personal services	-31	-0.8	-6	-0.7	-37	-0.8
Entertainment and recreation	5	0.3	10	5.3	14	1.0
Professional services	-342	-1.6	-53	-1.2	-395	-1.5
Public administration	49	1.1	-19	-2.0	30	0.5
Total	-890	-0.9	-473	-2.2	-1,364	-1.2

¹ Employment numbers represent the reduction or increase in low-skill jobs in each industry due solely to the change in low-skill employment share. The total change in low-skill jobs will be different due to changes in an industry's overall employment during the decade.

² Share of 1990 employment in each industry.

Source: Economic Research Service/USDA, using data from the Current Population Survey.

gies. Nonetheless, low-skill shares declined in all major goods groups, including construction, agriculture, and other extractive industries. Among the goods-producing industries that saw substantial shifts toward higher skill occupations in nonmetro areas were construction, crop agriculture, sawmills and planing mills, apparel, and motor vehicles (table 5).

In the service sector, within-industry declines in low-skill employment shares were concentrated in professional services, business services, communications and utilities, and finance, insurance, and real estate (table 4). Individual service industries that saw substantial skills upgrading in nonmetro areas included hospitals and grocery stores (table 5). Unlike a number of industries in the goods sector, such as apparel, where skill upgrades are likely to reflect the movement of low-skill jobs abroad, many of these service industries have little or no exposure to import competition, and the trends in these industries likely reflect new production technologies.

Table 5

Skill upgrading and downgrading in selected nonmetro industries, 1990-2000

Industries	Change in low-skill share due to		
	1990 employment	change in occupation mix	Jobs upskilled
	<i>Thousands</i>	<i>Percent</i>	<i>Thousands</i>
All industries	21,453	-2.2	473
All upskilling industries (142)	14,629	-5.1	744
All downskilling industries (77)	6,824	4.0	-270
Leading upskilling industries:			
Construction*	1,447	-5.1	73
Crop agriculture*	706	-6.2	44
Business services, n.e.c. ¹	144	-22.9	33
Hospitals	784	-3.2	25
Grocery stores	640	-4.0	25
Sawmills, planing mills, and millwork*	205	-10.9	22
Apparel and accessories*	325	-6.5	21
Retail trade not specified	106	-19.0	20
Motor vehicles*	235	-7.8	18
Manufacturing not specified	117	-14.1	17
Leading downskilling industries:			
Wholesale trade, groceries	137	14.8	-20
Health services, n.e.c. ¹	179	9.7	-17
Oil and gas extraction*	137	12.4	-17
Motor vehicle dealers	225	6.8	-15

*=Goods-producing industry.

¹Not elsewhere classified.

Source: Economic Research Service/USDA, using data from the Current Population Survey.

While skill upgrading was widespread across industries, many industries experienced increases in low-skill employment share—downskilling—during the 1990s. In nonmetro areas, the low-skill employment share increased in 77 of 219 industries, which together accounted for 32 percent of nonmetro employment in 2000. Industries that saw substantial increases in low-skill employment share included wholesale trade in groceries, oil and gas extraction, motor vehicle dealers, and health services not elsewhere classified (table 5).

Employment Shifts Between Sectors Lowered Low-Skill Employment Share

As noted earlier, shifts among major industry sectors also lowered the low-skill share of employment in both metro and nonmetro areas in the 1990s. The share of workers employed in the goods sector fell, although the total number of jobs in goods rose slightly (table 1). Because goods production is relatively low-skill on average, this reduced the low-skill share. Overall, the net effect of this intersectoral shift alone would have lowered the metro low-skill employment share by 0.3 percentage points nationally between 1990 and 2000 (table 2). In nonmetro areas, this effect was stronger, working to lower the low-skill employment share by 0.4 percentage points (table 2). The goods sector is larger relative to the service sector in nonmetro areas than in metro areas; further, the low-skill share of goods-producing employment is much higher in nonmetro than in metro areas. For both reasons, the decline of the goods sector relative to the service sector had a greater impact on low-skill employment share in nonmetro areas than it did in metro areas.

Employment Shifts Between Industries Within Sectors Offset Effects on Low-Skill Share

In rural areas, shifts between industries within the goods sector brought down the low-skill employment share. Most prominent among the declining low-skill industries in nonmetro areas were the apparel industry and the yarn, thread, and fabric mill industry. Leading the list of relatively high-skill and rapidly growing goods-producing industries in rural areas were construction and livestock agriculture.

Among the main (noninteraction) components of low-skill employment change arrayed in figure 3, only shifts between industries in the service sector tended to increase low-skill employment share. Growth in low-skill service industries generally outpaced growth in higher skill service industries. Major low-skill service industries with relatively rapid employment growth during the 1990s included trucking, department stores, lodging places, and direct selling establishments. High-skill service industries that experienced slow or negative employment growth included elementary and secondary schools, colleges and universities, banking, and insurance.

The growth of low-skill industries in the service sector was observed in both rural and urban labor markets. In the latter, where services comprised three-quarters of employment in 2000, interindustry shifts substantially dampened the upskilling trends of sectoral and occupational change by adding back the equivalent of 182,000 low-skill jobs into the urban economy (table 3).

How Rural Low-Skill Change in the 1990s Compares with the 1980s

As in the 1990s, most of the drop in low-skill share in the 1980s was due to shifts from low-skill to higher skill occupations within industries. Such shifts accounted for about 85 percent of the drop in low-skill share nationally and nearly 90 percent of the drop in nonmetro areas (table 6). However, in direct contrast with the 1990s, shifts toward higher skill occupations in services contributed much more to low-skill decline than the shift in goods, accounting for over half of the total share decline both nationally and in nonmetro areas.

Also unlike the 1990s, the employment share of the goods sector shrank much more rapidly during the 1980s, especially in agriculture and mining. As a result, the transition from goods to services contributed substantially to increasing skill levels in both metro and nonmetro areas during the 1980s. Growth in high-skill industries in the goods sector outpaced growth in low-skill industries in the 1980s, just as they would in the next decade. In urban areas, the same was true of high-skill industries in the service sector, including such industries as health and finance. Together, industrial shifts within those sectors accounted for about 12 percent of the decline in low-skill share in metro areas in the 1980s. The situation in the 1980s in rural areas, however, was akin to the pattern of the 1990s, as within-sector interindustry shifts raised low-skill employment share only slightly.

In short, rapid occupational upskilling combined with a more rapid transition from goods to services made the 1980s a decade of steep decline in the

Table 6

Employment change due to change in low-skill share by components, 1980-1990

Item	Metro		Nonmetro		Total U.S.	
	Jobs ¹	Share ²	Jobs ¹	Share ²	Jobs ¹	Share ²
	<i>Thousands</i>	<i>Percent</i>	<i>Thousands</i>	<i>Percent</i>	<i>Thousands</i>	<i>Percent</i>
Occupation mix	-4,597	85.3	-875	89.6	-5,471	85.9
Within goods	-1,629	30.2	-301	30.8	-1,930	30.3
Within services	-2,967	55.1	-574	58.8	-3,542	55.6
Interindustry	-648	12.0	16	-1.6	-633	9.9
Within goods	-280	5.2	1	-0.1	-280	4.4
Within services	-368	6.8	15	-1.5	-353	5.5
Sectoral	-458	8.5	-151	15.4	-609	9.4
Residual	-312	-5.8	33	-3.4	345	-5.4
Overall	-5,391	100.0	-977	100.0	-6,368	100.0

¹These values represent the changes in low-skill employment if total employment had not changed between 1980 and 1990, given the actual changes in employment mix between 1980 and 1990.

²Share of overall employment.

Source: Economic Research Service/USDA, using data from the Current Population Survey.

low-skill share of jobs. Why did the 1990s look so different, especially given the widespread expectation that the pace of upskilling would quicken? One possibility is that increased immigration may have made less skilled labor cheaper and therefore delayed employer decisions to shift to high-skill-biased production methods. This is consistent with the smaller decline in low-skill share in metro areas, where the immigration of less skilled workers was concentrated.

The differing character of the recessions of the early 1980s and the early 1990s may also be implicated. It was widely noted at the time that while the recession of the early 1980s was accompanied by large layoffs of blue-collar workers, white-collar workers were largely spared. In contrast, the recession of the early 1990s was associated with substantial “downsizing” of white-collar workforces. This finding is consistent with the observation of slower upskilling during the 1990s. However, a full explanation of the slowdown in upskilling would also have to address the reasons for the differing character of the two recessions.

Technological change may have dampened employers’ replacement of less skilled labor. In particular, the mix of technology changes may have shifted from more skill-intensive in the 1980s—for example, the introduction of spreadsheet programs for PCs—to less skill-intensive in the 1990s—for example, cash register icons for frequently ordered dishes at a fast food restaurant. This possibility is consistent with the observation that wage inequality stabilized in the 1990s, despite continuing advances in computer technology (Card and DiNardo, 2002).

Much of the skill upgrading in the 1990s also may not have been captured by occupation and industry mix changes but was occurring within occupations. Another way of saying this is that the DOT skill measures may have become less reliable as the skill content of occupations increased. This likelihood is discussed in Wojan (1999). However, we have no specific data to show that this was more significant in the 1990s than in the 1980s.

It is also important to note the differences across major sectors in the two decades. In particular, while within-industry skill upgrading slowed in all sectors, the slowdown was moderate in the goods sector and much sharper in the service sector. This suggests that whatever factors driving the trend were operating more powerfully in the service sector.

Implications of Low-Skill Employment Trends for Rural Workers

The discussion of trends in low-skill employment so far has emphasized shifts in the structure of jobs. But these changes also have significant implications for some demographic subgroups of workers because of their greater likelihood of low-skill employment. For example, Blacks, who are nearly twice as likely as Whites to have a low-skill job, saw a larger low-skill share decline. We find, however, that groups with higher average low-skill employment shares are not necessarily the groups that experienced the largest declines. Women, who are less likely to work in a low-skill job than men, saw a larger drop in share. Meanwhile, Hispanics, nearly half of whom work in low-skill jobs, actually increased their share during the 1990s. Central to the question of well-being is whether these trends contributed to higher earnings. Overall the answer appears to be “yes,” despite lower average earnings in the growing service sector.

Demographic Variation in Low-Skill Employment

Education, age, ethnicity, and gender are all predictive of low-skill work. A worker’s level of education—the single most important measure of human capital—is a powerful predictor of the likelihood of employment in a low-skill career track. Occupation choice (recall that occupation is the essential measure of skill in this report) is shaped and constrained in large degree by the level and type of formal education acquired, although occupation/skill level certainly varies substantially among workers with an identical number of years spent in school.

Age is also strongly and positively related to low-skill employment, in large part because age reinforces the human capital effects of formal education. An important implication of standard human capital theory is that workers become more skilled as they age, primarily because they continue to acquire new skills and improve existing ones over the course of their careers. Older workers, then, tend to be more skilled—and have a lower incidence of low-skill employment—and this trend should continue with increasing age, at least to a point. Investment in new skills eventually slows down for the average worker, and skill investment reaches a plateau in the last years of a person’s career.

In addition to human capital, factors not directly related to a worker’s productivity also affect the likelihood of low-skill employment. A legacy of hiring discrimination and occupational segregation in the United States continues to shape the present distribution of women and racial and ethnic minorities across occupations and, by extension, the skill requirements of their jobs. Individual preferences for occupations may differ across demographic groups as well. The effects of segregation by race and sex, however, are somewhat different. In the case of race and ethnicity, segregation usually meant that the most menial, physically laborious tasks fell to minority workers; these jobs typically score very low on skill metrics. Women’s jobs were clearly different from men’s in the nature of the tasks and often in work environment as well, but the implications for skill are less clear. Historically,

segregation largely excluded women from high-level managerial roles, and they were effectively barred from many professions. Yet women have a long history of employment in clerical jobs, teaching, and other occupations requiring significant intellectual ability and formal schooling.

The relationships between demographic attributes and the probability of low-skill employment are evident from a logistic regression analysis of employed persons age 16 and older, using data from the 2000 Current Population Survey’s microdata earnings files (table 7). Logistic regression can be used to estimate the separate effects of independent factors on the probability of an event or condition—in this case, the probability of being employed in a low-skill job. The independent factors in our model included all the demographic attributes discussed in this section—education, age, sex, and race and ethnicity—plus controls for industry of employment. The worker’s industry is included because it may be correlated with demographic attributes.

Table 7
Factors affecting the likelihood of low-skill employment, 2000

Factors	Parameter estimate	Odds ratio
Intercept	-4.0904	NA
Less than high school	3.6922	40.134
High school diploma	2.6678	14.408
Some college	1.1194	3.063
Age 16-24	0.5907	1.805
Age 25-34	0.0207 ¹	1.021
Age 35-44	-0.135	0.874
Age 45-54	-0.1503	0.86
Male	0.0573	1.059
Black	0.6633	1.941
Hispanic	0.527	1.694
American Indian	0.3185	1.375
Nonmetro residence	0.1939	1.214
Agriculture, forestry, and fishing	0.7844	2.191
Mining	1.2158	3.373
Construction	0.4952	1.641
Manufacturing	1.1986	3.373
Transportation, communications, and utilities	1.2503	3.491
Wholesale trade	0.5178	1.678
Retail trade	1.2713	3.565
Finance, insurance, and real estate	-0.8486	0.428
Services	0.6375	1.892

NA=Not applicable.

¹Not significantly different from zero at 0.01.

Note: The omitted categories are college graduates, age 55 and older, female, White, metro, and government.

Source: Economic Research Service/USDA, using data from the 2000 Current Population Survey.

For example, a typical manufacturing job is more likely to be low-skill than the typical service job. Blacks are more likely to be employed in manufacturing than the workforce as a whole. Thus, we would expect part of the association between being Black and having a low-skill job to be attributable to the greater probability of working in manufacturing.

The results of the logistic regression indicate that, even when industry effects are “netted out,” low-skill employment rates are higher for workers who are younger and have less education, for minorities, and for men. In the second column of table 7, the strength of each factor’s independent effect is measured by reference to the multiplicative effect on the odds ratio, which is the ratio of the likelihood of low-skill employment if the worker possesses the characteristic to the likelihood if he or she does not. The multiplicative effect is easily interpreted. If the effect is exactly 1, the effect of a characteristic on the odds of low-skill employment would be no different from the effect of the comparison characteristic—such as women compared with men. The multiplicative effect is greater than 1 where the characteristic makes the person more likely to be employed in a low-skill

job, and less than 1 where the characteristic makes the person less likely to be employed in a low-skill job.

Education has the largest effect on the likelihood of low-skill employment. The odds of holding a low-skill job are 40 times higher for workers without high school diplomas as for college graduates, consistent with the fact that nearly half of workers in low-skill jobs did not complete high school. Workers younger than 25 are nearly twice as likely to have low-skill employment than workers older than 55, while those in the midlife of their careers have slightly lower odds than older workers. Blacks have higher odds of low-skill employment than either Hispanics or American Indians, and about twice that of non-Hispanic Whites. Their higher odds compared with Hispanics seem surprising, given Blacks' longer history of integration into the American economic mainstream, but may be related to the residential concentration of Blacks in the rural South, where low-skill employment is more common than in other regions. Compared with race, gender contributes relatively weakly to the odds of low-skill employment—men are about 6 percent more likely to be employed in a low-skill job than women once education, age, race/ethnicity, and industry are controlled.

Minority workers' greater likelihood of low-skill employment cannot be explained by their being "crowded" into low-skill industries. The findings suggest that minority workers' occupational profiles within industries may go further to explain racial and ethnic differences in low-skill employment. If so, then the types of changes driving the decline in low-skill employment share in the 1990s may have been particularly significant for Black, Hispanic, and Native American workers.

We also included nonmetro residence as an independent factor in the model. After controlling for demographic attributes and industry, nonmetro workers are about 21 percent more likely to have low-skill employment than metro workers, only slightly lower than without such adjustments. The small difference in the rural odds with and without demographic controls is due in part to the countervailing forces of ethnicity and education. Rural areas overall have lower shares of minority workers, but higher shares of less educated workers.

Low-Skill Trends in the 1990s Vary by Subgroups

Did the decline in low-skill employment share affect all workers equally? We have already observed that industry and occupation of employment differed across worker subgroups, making equal participation in the share decline unlikely. This is demonstrated in table 8, which shows the change in nonmetro low-skill share from 1990 to 2000 by demographic characteristics. The decline in low-skill employment share was largest among nonmetro women (-4.3 percentage points) and Blacks (-5.2 percentage points). When demographic categories are broken down by race and gender simultaneously, the largest declines in low-skill employment share occurred among Black women (-7.3 percentage points) and, to a lesser extent, White women (-4.9 percentage points), while declines for most other groups were near the overall nonmetro share decline of 2.2 percentage points. The low-skill share

Table 8

Nonmetro low-skill employment shares by selected characteristics, 1990 and 2000

Characteristic	1990	2000	Change
	<i>Percentage</i>		
	<i>---Percent---</i>		
	<i>points</i>		
White	42.0	39.0	-3.0
Male	42.6	41.2	-1.4
Female	41.3	36.4	-4.9
Black	69.2	64.0	-5.2
Male	71.6	69.3	-2.3
Female	66.5	59.2	-7.3
Hispanic	64.6	67.1	2.5
Male	67.5	70.8	3.3
Female	59.5	61.6	2.1
Other	47.3	44.2	-3.1
Male	48.9	46.2	-2.7
Female	45.7	42.3	-3.4
All male	45.4	44.6	-0.8
All female	43.7	39.4	-4.3
Total	44.4	42.2	-2.2

Source: Economic Research Service/USDA, using data from the Current Population Survey.

rose for Hispanics, however, including an increase of 3.3 percentage points for Hispanic men.

A few key employment shifts accounted for much of this change. First, the share of nonmetro women in managerial and professional occupations, none of which are low-skill, grew by nearly half during the 1990s, from 21 percent to 30 percent (table 9). Employment share grew in these occupations for women of all racial/ethnic groups. The corresponding occupations with declining share, however, differed by race. For White and Hispanic women, the shift was most noticeable out of the sales, clerical, and administrative support occupation group. However, other blue-collar jobs, nearly all of which are low-skill, led the decline among nonmetro Black women, falling from 30 to 18 percent of Black women's employment. By comparison, other blue-collar occupational employment among Hispanic women remained

steady over the decade and was 17 percent of their overall employment in 2000. Unlike other women, Black women saw large employment gains in the service occupations. Because three-quarters of service jobs held by nonmetro Black women are low-skill, a somewhat lower share than for blue-collar jobs, the movement from blue-collar work to services helped to reduce their share of employment in low-skill occupations.

The increase in low-skill employment among nonmetro Hispanic men is similar in that its source is largely a shift between two occupation groups with high shares of low-skill employment. The largest employment shift in the 1990s for these workers was out of farming jobs and into blue-collar (mostly manufacturing) work.

Decline in Low-Skill Employment Share Improved Earnings

With skill level and wages closely associated, we might expect that earnings rose in the 1990s along with the rural low-skill share decline. One component of that decline, the shift from goods to service employment, countered the overall trend because wages in the goods sector are higher on average than wages in the service sector for jobs with similar skill requirements. Thus, the sectoral shift alone would have prompted low-wage job growth. But the higher average skill levels required in service-sector jobs, more rapid growth in higher skill occupations compared with low-skill occupa-

Table 9

Nonmetro employment by occupation, sex, and race/ethnicity, 1990-2000

Item	Managers and professionals		Sales, clerical, and administrative support		Service		Precision production, craft, and repair		Other blue-collar		Farming, fishing, and forestry	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
	<i>Percent</i>											
Male	18.2	21.1	14.3	12.7	8.2	8.9	21.4	22.9	26.6	26.2	11.2	8.2
Black	7.3	8.8	6.2	8.4	12.8	14.0	16.9	19.3	47.2	43.8	9.7	5.8
Hispanic	8.2	7.1	8.7	7.6	8.5	10.9	21.8	24.0	29.4	37.7	23.4	12.8
White	19.3	22.8	15.2	13.4	7.8	8.4	21.8	23.1	25.1	24.2	10.9	8.1
Female	20.7	29.9	39.4	33.7	21.5	20.7	2.8	3.0	13.1	10.1	2.4	2.7
Black	13.0	18.8	22.1	22.9	29.7	34.6	4.5	4.9	29.8	18.3	1.0	0.5
Hispanic	10.3	16.7	34.9	27.3	30.0	29.1	5.1	7.2	14.9	16.7	5.1	3.1
White	21.7	31.6	41.2	35.0	20.4	18.9	2.5	2.6	11.6	9.0	2.6	2.9
Total	19.3	25.2	25.5	22.5	14.2	14.4	13.1	13.6	20.6	18.7	7.3	5.6

Source: Economic Research Service/USDA, using data from the Current Population Survey.

Table 10

Average weekly earnings of nonmetro full-time workers by sector and low-skill status, 1990 and 2000

Item	1990	2000	Change, 1990-2000
	<i>---Dollars---</i>		<i>Percent</i>
Low-skill employment:			
Goods	443	496	12.0
Services	388	436	12.4
Total	418	466	11.5
Goods/services ratio	1.14	1.14	NA
Higher skill employment:			
Goods	663	712	7.4
Services	589	644	9.3
Total	610	662	8.5
Goods/services ratio	1.13	1.11	NA
All employment:			
Goods	526	586	11.4
Services	521	575	10.4
Total	523	579	8.5
Goods/services ratio	1.01	1.02	NA

Note: Values are in 2000 dollars.

NA=Not applicable.

Source: Economic Research Service/USDA, using data from the Current Population Survey.

tions, and real earnings growth across the occupational spectrum more than compensated for the shift to service employment in the 1990s.

On average, service jobs pay less than goods jobs with similar education and training requirements. Wage data for both low-skill and higher skill workers in the goods and service sectors confirm that, both within skill levels and overall, average weekly earnings for full-time workers were lower in the service sector (table 10). Thus, if the shift from goods to services had not

been accompanied by other skill or productivity changes, the resulting drop in low-skill employment share would have likely led to a drop in earnings. In fact, this happened in eight rural counties in which a real earnings decline occurred solely because of the shift from goods production to services.

Overall, however, job skills rose due to a changing mix of occupations from 1990 to 2000, leading to a better paid workforce that was more highly skilled within industries. Workers in many goods-sector industries, for instance, earned more in 2000 than in 1990, as did those in many service-sector industries. The upward pressure on earnings as a result of within-industry occupational change was reinforced by a general productivity-driven rise in earnings in the 1990s. Even workers in low-skill occupations were therefore likely to have experienced an increase in earnings. Over the decade, real earnings rose 12 percent among rural low-skill goods workers and 12.5 percent among rural low-skill service workers. Workers in higher skilled occupations experienced somewhat lower increases, 6.8 and 7.7 percent growth in real earnings in goods and services, respectively (table 11).

But there is a more serious challenge to the argument that sectoral shifts were benign. While the earnings growth suggests that full-time workers as a whole were better off at the end of the decade than at the beginning, it does not necessarily reflect the outcomes faced by workers most likely to be employed in low-skill jobs (table 12). Rural areas now have proportionately more financial planners and proportionately fewer textile machine operators. From the standpoint of a high school graduate with no college experience, however, this may still lead to worse economic prospects if fewer well-paying jobs are available for which he or she is qualified.

Table 11

Average weekly earnings of nonmetro full-time workers by sector and low-skill status, 1990 and 2000¹

Item	1990	2000	Change, 1990-2000
	----Dollars----		Percent
Low-skill employment:			
Goods	440	493	12.0
Services	384	432	12.5
Total	416	463	11.3
Goods-services ratio	1.15	1.14	NA
Higher skill employment:			
Goods	615	657	6.8
Services	506	545	7.7
Total	542	581	7.2
Goods-services ratio	1.22	1.21	NA
All employment:			
Goods	501	556	11.0
Services	455	497	9.2
Total	475	522	9.9
Goods-services ratio	1.10	1.12	NA

Note: Values are in 2000 dollars.

NA=Not applicable.

¹Nonmetro full-time workers age 18-64 with no college experience.

Source: Economic Research Service/USDA, using data from the Current Population Survey.

To examine the effects of industry and occupational shifts on less educated workers only, we narrow our focus to the set of workers age 25-64 who have never attended college and are therefore less likely to participate in the growing high-skill labor market in rural areas. The wage patterns for this group are quite similar to those of the total labor force. Low-skill jobs in the goods sector typically paid about 15 percent more than those in the service sector in 2000, and higher skill goods-sector jobs paid 21 percent more than comparable service-sector jobs (table 11). Moreover, less educated workers experienced a real earnings gain similar to other workers during the 1990s, in spite of the shift from goods to services, due to within-sector occupation shifts and productivity-driven earnings growth.

To measure more precisely the relative effects of sectoral change, within-sector skill change, and other real earnings growth on 1990-2000 earnings change, we calculated what the 2000 earnings would have been for rural workers in the absence of each type of change (table 12). Average weekly earnings rose 8.5 percent after adjusting for inflation, from \$523 to \$579, for nonmetro full-time workers. Without real earnings growth in each of the four skill-sector groups (low-skill/higher skill and goods/service sector), earnings would have risen just \$4 to \$527. If the mix of low-skill and higher skill occupations had remained the same over the decade, but group-specific earnings and sectoral mix had changed, average weekly earnings would have risen to a level just slightly below the actual, to \$574. Similarly, if the sectoral job mix had stayed constant, earnings would have been \$1 greater than the actual.

The pattern of change for less educated full-time workers mimics that of all full-time workers (table 12). The actual weekly earnings of \$522 would have been slightly lower (\$519) if the skill-mix within sectors had remained

Table 12

Nonmetro average weekly earnings compared across alternative change scenarios

Item	All full-time workers	Full-time with no college experience
---Dollars---		
Actual earnings, 1990	523	475
Actual earnings, 2000	579	522
Earnings assuming no change in:		
Real earnings within sector/skill group	527	476
Low-skill/higher skill occupation mix	574	519
Goods/services sector mix	580	524

Note: Values are in 2000 dollars.

Source: Economic Research Service/USDA, using data from the Current Population Survey.

unchanged, and slightly higher (\$524) without a shift toward service-sector employment. Therefore, the dampening effect of sectoral change on earnings was slight and easily compensated for by skill- and productivity-related change. Moreover, the drop in employment share in low-skill goods was largely absorbed by a gain in higher skill services, with the latter paying 11 percent more on average among less-educated workers than the former. Our findings, then, are consistent with a positive link between skill and wage, and thus support the view that skill trends in the 1990s benefited rural workers.

Conclusions

The share of nonmetro employment in low-skill occupations fell 2.2 percentage points from 1990 to 2000, to 42.2 percent. The magnitude of this decline is surprising in two ways. First, it was markedly smaller than the 5-percentage-point share decline in the 1980s, despite the rapid introduction and diffusion of new production technologies, a marked rise in labor productivity, and a changing mix of industries. Second, the nonmetro decline was larger than in metro areas, despite other evidence of a continuing bias toward higher skill job growth in urban areas.

The rural decline in low-skill employment share was almost completely a product of occupational change within industries—partly a result of capital-labor substitution, particularly in manufacturing, that dampened demand for workers in low-skill jobs, and partly a result of rising demand for workers with managerial, professional, and technical skills. The latter shift is consistent with indications that the spread of transportation and communications networks, along with exurbanization, has allowed some rural places to overcome isolation and attract more high-skill activities. Alternatively, the change could be partly associated with faster productivity growth on the shop floor and increasing demand for coordination as establishments move from mass production to flexible specialization.

The relative decline in the number of low-skill workers, meanwhile, is a consequence of the adoption of information and other computer-related technologies and management practices, along with increasing competition from international producers. Total manufacturing jobs in nonmetro areas fell between 1990 and 2000, but low-skill jobs accounted for virtually all of the loss. Low-skill employment also fell in absolute terms in business services, health care, and public administration, even as total employment in those industries grew. Thus, we believe that capital-labor substitution, new methods of workplace organization, and sometimes diminished domestic production were all significant factors in the decline in rural low-skill employment share.

Two aspects of these findings are at odds with the conventional wisdom about rural skill change. First, rural areas were not placed at a disadvantage relative to urban areas by geographic redistributions of skill demand, since the nonmetro low-skill employment share fell more rapidly than the metro share. Thus, the assumption that economic forces driving urban skill concentration in the 1980s continued into the 1990s appears to be incorrect.

Second, our findings take issue with the claim that sectoral change largely explains rural skill trends. Changes in skill requirements due to sectoral shifts were dwarfed by the effects of occupation change within industries. Furthermore, this report shows that one cannot equate a rural service economy with a low-skill economy. Service occupations are less likely to be low-skill than are goods occupations, and hence the loss of goods jobs is not necessarily an indication of skill downgrading in a local economy.

As a note of caution, in the first decade of the 21st century, intersectoral change appears to be playing a larger role in skill mix, with more serious

implications for wages. Recent manufacturing job losses may further dampen low-skill local economies in some parts of rural America, particularly in the South. The shift from goods to services, then, is unlikely to be as benign as it was in the 1990s.

Successful rural development policies will be sensitive to the differences between industry and occupation effects. On the whole, rural areas with limited resources may opt to pursue development strategies incorporating skill upgrades within the current mix of industries rather than attempting a significant shift in the industries employing the local labor force. Investing in education and training and encouraging new technology adoption that creates higher skill work are two such critical rural strategies.

A dilemma for local governments is that human capital investment is often managed most efficiently at a larger scale of governance, given the substantial startup costs of high-quality programs and a mobile labor force. Some counties will be unable to create higher skill employment regardless of their commitment if other employment-attracting factors, such as proximity to inputs and markets and a threshold labor force size, are absent. In these cases, the reduction of low-skill employment share will likely reflect the loss of employment opportunities for less skilled, less educated workers rather than following from relatively rapid growth of higher skill jobs. Put simply, policy and program responses to changing industry mix and skill requirements should be carefully matched to the underlying economic trends of local areas.

The relative decline of low-skill employment is likely to have mixed effects on workers as well. Rural workers overall benefited from the decline in low-skill employment through rising average weekly earnings. The increase was especially notable among some demographic subgroups with historically high rates of low-skill employment, such as Blacks, who also experienced some of the largest declines in low-skill employment share. The rise in low-skill employment share and slower wage growth among Hispanics, however, is of concern and deserves further exploration.

Our analysis shows that a more skilled workforce is now in place in rural areas and that even those without college experience benefited from the shift toward higher skill jobs in the 1990s. Many of the less educated workers who would have entered goods-sector jobs in previous decades moved into service-sector jobs, which have higher skill levels on average. Workers who took low-skill jobs in services rather than in goods tended to earn lower wages, but many other less educated workers were able to take advantage of the expansion of *higher skill* service jobs. Our calculations, for example, show that wages were 11 percent higher among nonmetro workers with at most a high school diploma who held more skilled service jobs than among nonmetro workers in low-skill goods-sector jobs.

Where declining low-skill employment is unmatched by a growth in the jobs for which less educated rural workers can be trained, it is important that workers receive the additional training needed to move up the occupational ladder. Inevitably, some of these less educated rural workers, for a variety of reasons, will not follow the upward shift in occupational mix. As in the past decade, these workers will continue to bear a disproportionate share of the

cost of lost low-skill jobs in the goods sector, and will face greater job insecurity and lower wage mobility. In fact, rising average earnings may mask the employment effects of these trends—some workers with limited skills will be forced out of the formal labor market altogether. They will continue to depend on a combination of their own resourcefulness and the social safety net to get by. The task ahead is to minimize the number of workers who find themselves in this position by making continuing education and training opportunities widely accessible and by encouraging the growth of firms committed to drawing from the considerable, if latent, talents of the rural population.

References

- Albrecht, Don E., Carol Mulford Albrecht, and Stan L. Albrecht. 2000. "Poverty in Nonmetropolitan America: Impacts of Industry, Employment, and Family Structure Variables," *Rural Sociology* 65(1):87-103.
- Autor, David H., Frank Levy, and Richard J. Murnane. 2001. *The Skill Content of Recent Technological Change: An Empirical Exploration*. Department of Economics Working Paper. Boston, MA: Massachusetts Institute of Technology.
- Barkley, David L. 1995. "The Economics of Change in Rural America," *American Journal of Agricultural Economics* 77:1252-58.
- Barkley, David L., and S.R. Hirschberger. 1992. "Industrial Restructuring: Implications for the Decentralization of Manufacturing to Nonmetropolitan Areas," *Economic Development Quarterly* 6:64-79.
- Bartel, Ann P., and Nachum Sicherman. 1998. "Technological Change and the Skill Acquisition of Young Workers," *Journal of Labor Economics* 16(4):718-55.
- Card, David, and John E. DiNardo. 2002. "Skill-Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles," *Journal of Labor Economics* 20(4):733-83.
- Colclough, Glenna. 1988. "Uneven Development and Racial Composition in the Deep South: 1970-1980," *Rural Sociology* 53:73-86.
- Cromartie, John B. 2000. "Measuring Rurality: What is Rural?" Briefing Room of the Economic Research Service, U.S. Department of Agriculture. <http://www.ers.usda.gov/briefing/Rurality/WhatisRural/>.
- Crump, Jeff R., and Christopher D. Merrett. 1998. "Scales of Struggle: Economic Restructuring in the U.S. Midwest," *Annals of the Association of American Geographers* 38(3):496-515.
- Executive Office of the President, Council of Economic Advisors. *Economic Report of the President*. 2000.
- Galston, William A., and Karen J. Baehler. 1995. *Rural Development in the United States: Connecting Theory, Practice, and Possibilities*. Washington, DC: Island Press.
- Gibbs, Robert. 2002. "Rural Labor Markets in an Era of Welfare Reform," in *Rural Dimensions of Welfare Reform*, Bruce A. Weber, Gregory J. Duncan, and Leslie A. Whitener, editors. Kalamazoo, MI: W.E. Upjohn Institute, pp. 51-76.
- Glaeser, Edward L., and David C. Mare. 1994. *Cities and Skills*. Working Paper No. 4728, National Bureau of Economics Research.

- Glasmeier, Amy. 1991. *The High-Tech Potential*. New Brunswick, NJ: Center for Urban Policy Research.
- McGranahan, David A. 1988. "Rural Workers in the National Economy," In *Rural Economic Development in the 1990's: Prospects for the Future*, David L. Brown, J. Norman Reid, Herman Bluestone, David A. McGranahan, and Sara M. Mazie, editors. Rural Development Research Report No. 69. U.S. Department of Agriculture, Economic Research Service, pp. 29-48.
- McGranahan, David A. 1999. "The Geography of New Manufacturing Technology: Implications for the Nonmetropolitan South," *Southern Rural Sociology* 15:85-104.
- McGranahan, David A. 2001. "New Economy Meets Old Economy: Education Policy in the Rural South," *Rural America* 15(4):19-27.
- McGranahan, David S., and Linda S. Ghelfi. 1998. "Current Trends in the Supply and Demand for Education in Rural and Urban Areas," in *Rural Education and Training in the New Economy: The Myth of the Rural Skills Gap*, Robert M. Gibbs, Paul L. Swaim, and Ruy Teixeira, editors. Ames, IA: Iowa State University Press.
- Norton, R.D., and J. Rees. 1979. "The Product Cycle and the Spatial Decentralization of American Manufacturing," *Regional Studies* 13:141-51.
- Porterfield, Shirley L., and Molly Sizer. 1994. "Producer Services Growing Quickly in Rural Areas, But Still Concentrated in Urban Areas," *Rural Development Perspectives* 10(1):2-8.
- Rauch, James E. 1993. "Productivity Gains from Geographic Concentration of Human Capital: Evidence from the Cities," *Journal of Urban Economics* 34:380-400.
- Teixeira, Ruy, and Paul L. Swaim. 1991. "Skill Demand and Supply in the New Economy: Issues for Rural Areas," in *Education and Rural Economic Development: Strategies for the 1990s*. ERS Staff Report No. AGES-9153. U.S. Department of Agriculture, Economic Research Service, pp. 13-39.
- Tolbert, Charles M., and Molly Sizer. 1996. *U.S. Commuting Zones and Labor Market Areas: A 1990 Update*. ERS Staff Report No. AGES-9614. U.S. Department of Agriculture, Economic Research Service.
- Wojan, Timothy R. 1999. "Functional Skill Requirements of Manufacturing Employment in the Rural South," *Southern Rural Sociology* 15:104-38.
- Wojan, Timothy R. 2000. "The Composition of Rural Employment Growth in the 'New Economy,'" *American Journal of Agricultural Economics* 82:594-605.

Appendix: Measuring Labor Force Skills

Small-area (e.g., county) measures of job skills usually rely on broad measures of human capital or economic characteristics. Social scientists have most often used the mean or distribution of educational attainment among the adult population as an indicator of general skill levels, despite a significant body of criticism. Critics charge that while education levels provide a reliable guide to formal academic skills, they are too broad to correspond to specific job skills, and thus are limited in their skill information (McGranahan and Ghelfi, 1998; Teixeira and Swaim, 1991).

Small-area industry mix has been used as a measure of skill requirements in a number of studies, nearly always assuming constant skill requirements within a given industry (Colclough, 1988). In fact, the skills mix differs widely by location for many industries. For each industry, this variation can be decomposed into a varying occupation mix and a varying skill content within occupations. While we have demonstrated the first factor, we can only guess at the second. We are fairly confident, however, that the first factor alone casts doubt on these measures as sufficiently reliable to capture geographic skills differences.

A third set of skill measures can be derived from small-area occupational structure, and this is the metric we have chosen for this report. Occupational categories hold an advantage over education levels in that they are more directly related to the requirements of specific jobs and thus can be identified with a well-defined set of skills. Although their specific skill content is likely to vary somewhat from place to place, the use of detailed occupational categories available from the U.S. Census Bureau limits the measurement error caused by assuming constant skill content regardless of place.

Unlike education levels, for example, occupational classifications generally do not follow a strict rank ordering in terms of skills, a fact implied by their descriptive coding. Thus, in order to be useful for the purpose of assigning skill levels, occupations must be linked to a set of descriptors that more or less quantify the skill content of each occupation. The U.S. Department of Labor has developed a number of occupational-skill classification systems, at least two of which have been used in recent years in analyses of workforce quality and economic change. The Dictionary of Occupational Titles (DOT) was developed after World War II as a means of placing unemployed workers and targeting training efforts by matching worker skills and job requirements. The DOT uses a set of 30 scores to describe the skill requirements of each detailed occupation, although there is no explicit division into low and high skill categories.

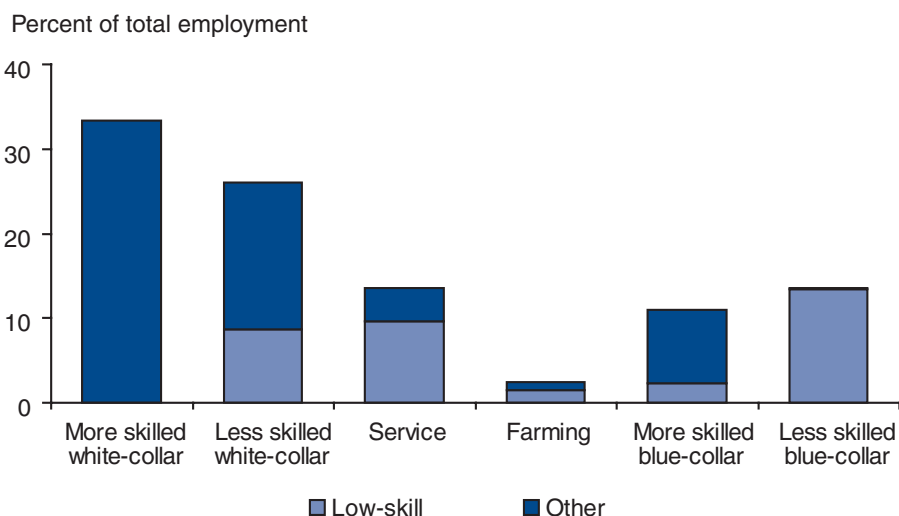
The DOT has recently been replaced by a new set of occupational descriptions known as O*NET, which (among other things) describes an occupation according to the minimal training and/or education requirements of most jobs held by workers in that occupation. Closely associated with O*NET descriptions is an 11-code system used by the Bureau of Labor Statistics to describe the skill content of occupations and occupational groups.

We use a simplified version of the DOT skill indices in this report due to its closer relationship to occupational tasks rather than formal education and on-the-job training requirements. Seven of the 30 skill dimensions were chosen to represent the “substantive complexity” of each occupation, with a mean composite skill index of 22. We defined low-skill occupations as those with below-average skill indices. However, we excluded 22 occupations from the low-skill designation whose proportion of workers with college experience exceeded the national average of 48 percent.

To provide a better sense of the kinds of occupations that qualify as “low-skill” in this study, we compared our categories against the major occupational groupings in the Standard Occupational Classification system produced in 1987 (SOC). For instance, we identified low-skill occupations in the SOC groupings once commonly labeled “white-collar,” and computed their share of total employment in these groupings. We performed a similar computation for six broad categories: managers, professional, and technical workers (more skilled white-collar); sales, clerical, and administrative support workers (less skilled white-collar); farmers, forestry workers, and fishermen (resource-related); service workers; precision production, craft, and repair workers (more skilled blue-collar); and operators, fabricators, transportation and material movers, helpers, and laborers (less skilled blue-collar).

As would be expected with jobs conducted primarily in offices, classrooms, and laboratories, the more skilled white-collar group includes no occupations that qualify as low-skill by our measure (appendix fig. 1). The group with the next lowest share of workers in low-skill occupations, 21 percent, is the more skilled blue-collar occupations. Although these occupations are held by workers with lower average education than those in the less skilled white-collar group, they score relatively high on task complexity. Low-skill occupations in this group are typically found in manufacturing, mining,

Appendix figure 1
Nonmetro employment by occupation group, 2000



Source: Economic Research Service/USDA, using data from the 2000 Current Population Survey.

construction and business services, and include such occupations as machine maintenance workers, painters, roofers, pavers, and brickmasons.

The less-skilled white-collar and farming groups are intermediate in terms of their share of low-skill occupations. About a third of employment among sales, clerical and administrative support occupations is low-skill.

Cashiering is the most common low-skill occupation in this group, but also counted as low-skill are most clerical jobs and many occupations in wholesale and retail sales. Sixty percent of resource-related jobs are low-skill, including most occupations in forestry, fishing, and mining. Farming is distinctive in that its employment is divided between high-skill farm owners, operators and managers (the majority of farming employment), and low-skill farm laborers.

Service and less skilled blue-collar occupations are overwhelmingly low skill, employing over half of all workers in low-skill jobs and including many of the most common individual low-skill occupations. Among them are janitors and house cleaners, garbage collectors, security and prison guards, waiters, nursing aides and orderlies, truck drivers, helpers and laborers, and most machine operators.