tion in service occupations increased wages by 8.1 percent.

One possible explanation for the vast difference between the two is that service occupations often require higher levels of basic education, such as mathematics or writing skills, than firm-specific skills. Manufacturing occupations, on average, require more amounts of firm- or industry-specific training, such as assembly-line procedure or equipment operations. This training is often provided by the firm; hence the returns to increases in formal basic education are smaller.

■ Conclusion: Rocky Road Ahead

The service sector is growing at a rapid pace, and new jobs with relatively high wages are available. However, the entry-level skills needed for such jobs tend to be higher than the skill levels previously required for jobs with similar compensation in the manufacturing sector.

Workers thus face two separate problems. First, manufacturing workers who lose their jobs will probably be unable to maintain their previous income in the service sector because their skills will be inadequate. As a result, time, effort, and money will be needed for training and job placement to give these workers specific skills that are currently in demand. Without retraining to replace obsolete firm-specific skills, some individuals will have to accept jobs below their previous skill level.

Second, people entering the labor force without an adequate level of education will no longer be assured of a job that pays a comfortable salary. Instead, they will encounter demands for basic computer literacy, math skills, and other types of advanced training that were unnecessary when jobs that emphasized firm-specific training were plentiful.

The first problem requires retraining. The second problem requires increased training investment in response to the growing returns to education, so that new workers will have mobility regardless of the industry they enter. While the first problem is transitional and should ease with time and attrition, the second problem requires some change in people's valuation of education.

As we lose jobs that provide on-the-job training, we are creating jobs that demand higher levels of basic education. To avoid a serious mismatch between jobs and skills, workers must obtain enough skills to fulfill the needs of high-paying service jobs. Current patterns suggest that these skills will have to come from increased secondary and postsecondary schooling.

■ Footnotes

1. Statistics on employment and unemployment are from the Current Population Survey, a comprehensive, current source of information on industries and occupations. Information is gathered monthly from interviews of approximately 58,000 families.

2. Table 3 represents the results of regressing the log wage of employed workers on the following variables: age, age squared, nonwhite, union coverage, sets of dummy variables for industry and occupation, and a set of industry- and occupation-education interactive variables. The table reports the coefficients on the interactive variables only. All other variables performed as expected.

John R. Swinton is a research assistant at the Federal Reserve Bank of Cleveland.
The author would like to thank Erica Groshen and Ralph Day for helpful comments.

The views stated herein are those of the author and not necessarily those of the Federal Reserve Bank of Cleveland or of the Board of Governors of the Federal Reserve System.

Federal Reserve Bank of Cleveland
Research Department
P.O. Box 6387
Cleveland, OH 44101

BULK RATE
U.S. Postage Paid
Cleveland, OH
Permit No. 385

Address Correction Requested:
Please send corrected mailing label to the Federal Reserve Bank of Cleveland, Research Department, P.O. Box 6387, Cleveland, OH 44101

ISSN 0428-1276

ECONOMIC COMMENTARY
Federal Reserve Bank of Cleveland

Service-Sector Wages: the Importance of Education

by John R. Swinton

Many of the new jobs in the rapidly growing service sector offer wages that are competitive with the best manufacturing jobs. These service jobs require relatively scarce skills, however. The current labor market demands higher levels of basic education in return for greater compensation.

Employment growth in the service-producing industries has outpaced growth in goods-producing industries since the government began collecting detailed data on the service industries in the mid-1950s. Productivity gains in the manufacturing sector and an explosion in the demand for services both share in the responsibility for this increased growth.

According to the U.S. Bureau of Labor Statistics, manufacturing has lost more than 100,000 workers in this decade. In contrast, finance, insurance, and real estate (FIRE) services have increased employment by 1.4 million, trade industries have added more than 4 million jobs, and the service industries have swelled by more than 6 million workers. Even though manufacturing industries are now regaining some of the strength they lost earlier in the decade, the service sector continues to dominate employment growth.

What kind of jobs are being created in this surge of service-sector employment? One popular image of the transition from manufacturing to services is that of the factory worker, laid off from his $20 per-hour job, accepting a minimum-wage job flipping hamburgers in order to support his family. Such a scenario is undoubtedly dismal, in terms of both underutilized human capital and lost income.

The view that service jobs are uniformly low-wage and that most manufacturing jobs pay well is overly simplistic, however. A large number of high-paying service jobs are available for skilled workers. The real issue is whether displaced manufacturing workers can obtain these jobs with their current skills.

This *Economic Commentary* looks at one aspect of the difference in manufacturing- and service-sector skills by examining education levels and their effect on wage levels in both sectors. The evidence suggests that an increased investment in higher levels of schooling will be necessary in order for manufacturing workers to compete in the rapidly growing service sector.

■ What Is the Service Sector: Industry or Occupation?

The service-producing sector is an eclectic mixture of loosely connected industries. In addition to the industries that fall under the narrow Standard Industrial Classification (SIC) category of services, the sector also includes wholesale and retail trade and FIRE services. Some economists even include government workers and transportation, communication, and public utility (TCPU) workers.

Even the narrow definition of services encompasses a wide spectrum, ranging from medical to janitorial. The feature that unites these disparate industries is the lack of a tangible, storable commodity as a final product. This viewpoint, however, fails to recognize that the goods-producing sector requires many services as inputs and that the service-producing sector requires many goods as inputs.

An important observation is that occupations within industries often cross over into seemingly different

industry categories. Within any manufacturing industry, for example, are a number of occupations considered service jobs, such as nurse, lawyer, or cafeteria worker. Thus, a worker performing a service may still be classified within a manufacturing industry. In fact, roughly 38 percent of all workers in manufacturing have occupations that may be considered service-producing.[1]

Therefore, it is evident that service production has been an integral input in our economy for some time. It is equally evident that any consideration of the service sector should examine both service industries and service occupations, or should explicitly state which of the two is the topic of inquiry.

■ Wages and Wage Growth in the Service Sector

Average hourly wages in different industries have grown at different rates, as table 1 demonstrates. Within the service sector, wage growth has not followed a consistent path. Some service industries (such as private household services and personal services) maintained low average hourly wages and had sluggish wage growth over the last five years. Other services (such as FIRE services and professional and related services) had higher-than-average hourly wages and rates of wage growth. One result is that, at current rates of relative wage growth, about half of the service industries may close the gap between their mean wages and mean wages in manufacturing within the next five years.

In addition, the four highest-wage service industries (FIRE, wholesale trade, professional services, and business and repair services) currently employ almost 70 percent of the workers in the sector. Of these industries, all except wholesale trade have been growing considerably faster than the national average over the past five years.

This trend could be a positive sign for future economic growth because it implies a plentiful supply of high-paying jobs for displaced workers and new entrants. The remainder of the service jobs are noticeably lower-paying, however. Private household workers receive hourly wages barely above the current minimum wage, while personal service workers are only slightly better off.

Mean hourly wages by occupation reveal the source of current fears that service-sector jobs will dominate the economy: service-producing occupations have a wider degree of variation in wages than do goods-producing occupations. The highest mean hourly wage in service-producing occupations is for engineers, at $17.02 per hour, while the lowest mean hourly wage, $3.37 per hour, goes to private household workers.

The variation is significantly less in goods-producing occupations, where precision production, craft, and repair workers earn the highest mean wage, $10.57 hourly, while freight stock and material handlers earn the lowest wage at $7.11 per hour.

Although the service-producing occupations show a significant amount of wage variability, much attention seems to be placed on the lower end of the pay scale in the service industries. The concern is that displaced manufacturing workers who had been receiving decent hourly wages will be forced into the medium- and low-paying service jobs.

Indeed, the high end of the wage market in the service industries is held by professionals such as physicians and computer programmers, who have received advanced academic degrees or undertaken specific training programs geared toward their profession. The majority of these higher-paying service jobs are simply not open to manufacturing workers who do not possess the required skills.

■ Industry Mobility: Prospects for Smooth Transition

While some workers will be able to move easily from one sector to another, especially those with general skills that are in high demand across industries, others will have extreme difficulty matching their skills to existing opportunities.

For example, lawyers' skills transfer easily from one industry to another. Because a large number of companies are concerned with legal questions and determinations, the lawyer can readily adapt his general skills to the specific problem at hand, whether it be copyright law or equal opportunity regulations.

Consider, on the other hand, the automotive assembly-line worker. This individual has far fewer general skills but a large supply of firm- or industry-specific skills for which only a few industries have a need. When this worker loses his job, there is often only limited demand for his skills in the job market.

Table 2 illustrates the differences in general skills between a selected number of occupations and the hourly wage associated with the occupation by looking at average education levels before workers entered the job market. Clearly, strong postsecondary education is associated with higher wages.

■ How Important Is Education?

As noted in table 1, manufacturing workers, on average, tend to earn more per hour than service workers. Many factors play a role in the wage difference, including unionization rates, gender, and ethnic makeup of the sectors.

In a competitive labor market, however, firms pay individuals according to their marginal productivity: the more productive a worker, the higher his wage.

TABLE 1 GROWTH OF AVERAGE HOURLY WAGES BY INDUSTRY

Industry	Average Hourly Wage 1983	Average Hourly Wage 1987	Average Annual Growth Rate 1983-87	Percent of Sample 1987
Average	$8.58	$9.97	3.8%	--
Entertainment	6.98	8.50	5.0	0.9%
FIRE[a]	8.72	10.56	4.9	7.7
Professional services	8.39	10.11	4.8	20.4
Business and repair services	8.31	9.75	4.1	5.0
Nondurable manufacturing	8.20	9.58	4.0	9.5
Public administration	9.97	11.59	4.0	6.1
Retail trade	6.19	7.19	3.8	13.0
Private household	3.26	3.77	3.7	0.5
Wholesale trade	8.93	10.23	3.5	4.5
Durable manufacturing	9.52	10.86	3.3	14.7
Personal services	5.80	6.57	3.2	2.1
TCPU[b]	10.43	11.72	3.0	8.5

a. Finance, insurance, and real estate.
b. Transportation, communication, and public utilities.
SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Survey.

TABLE 2 OCCUPATION WAGES AND YEARS OF EDUCATION BEFORE ENTERING THE WORK FORCE--1987

Occupation	Average Years of Education	Average Hourly Wage
Lawyer	18	$16.59
Natural scientist	17	14.95
Engineer	16	17.02
Management-related	15	12.62
Health technologist	14	9.14
Secretary	13	7.94
Food service	12	4.96
Machine operator except precision	11	7.71
Private household	11	3.37

SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Survey.

TABLE 3 PERCENT WAGE INCREASE WITH A ONE-YEAR INCREASE IN EDUCATION

Industry or Occupation	1983	1987
Total	6.44%	7.36%
Industry		
Manufacturing	7.75	8.42
Durable	7.75	8.37
Nondurable	7.74	8.45
Trade	6.03	6.93
Wholesale	7.18	7.74
Retail	4.87	5.96
Professional services	6.26	7.18
FIRE	7.68	7.86
Other professional	6.48	7.60
Business and repair services	8.41	9.48
Occupation		
Service	7.17	8.08
Manufacturing	4.50	4.55

NOTE: All estimates are highly significant.
SOURCE: Regression by author also controlling for age, race, sex, and union affiliation. Data from U.S. Department of Commerce, Bureau of the Census, Current Population Survey.

People increase their productivity by investing in human capital. Therefore, wages depend positively on the amount of human capital investment a worker undertakes. For example, an individual will enter a Ph.D. program if his expectations of higher future wages exeeed the foregone earnings of entering the work force immediately.

Table 3 examines the return to education among different industries and between manufacturing and service occupations.[2] The first overriding observation is that returns to education have been growing. A one-year increase in education in 1987 would have increased wages by 7.4 percent at the mean across all workers, compared with 6.4 percent in 1983.

The value of education may vary among industries. The service industries show considerable variation in the extent to which they reward education. Within business and repair services, for example, a one-year increase in schooling in 1987 increased wages by 9.5 percent. Within retail services, in contrast, wages changed much less with respect to education at the mean (6.0 percent).

Wages within both durable and nondurable manufacturing industries responded strongly to increases in education (8.4 percent and 8.5 percent, respectively). Thus, while manufacturing industries may offer higher wages to people with relatively lower levels of education, they also reward those who reach higher levels of learning.

The starkest contrast emerges between manufacturing and service *occupations* rather than industries. Within manufacturing occupations, years of schooling play less of a role in determining hourly wages than in service occupations. A one-year increase in education in manufacturing occupations increased wages by 4.6 percent at the mean. The same increase in educa-