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JOB-QUITTING AT APPALACHIAN SAWMILLS

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ABSTRACT

Labor turnover in hardwood sawmills of the Appalachian Region was studied by using data collected during interviews with 68 mill managers. Job-quitting was highest among young unskilled workers who had less than 6 months of service with their employers. Half of the mills surveyed had annual quit rates of more than 100 percent. Variation among mills was associated with the age of mill employees, wages and the number of paid holidays received by the workers, and the general wage level and unemployment rate in the local labor market. Lumber output per man-hour varied inversely with quit rates. In managing turnover, employers are encouraged to balance the cost of higher wages and fringe benefits with the benefits of greater labor stability.

THE WORKER WHO QUILTS

IT HAPPENS almost every day—an employee leaves, and another is hired to replace him. We call this “employee turnover”. What motivates workers to quit jobs has often puzzled employers. Was it something the foreman said?; did another firm offer a higher wage?; or was there some aspect of the job itself that was troubling the employee? Supervisors are often the last to find out, and then usually after it is too late to change the employee’s decision to leave.

As a group, workers employed in the lumber and wood-products industry quit their jobs twice as often as workers employed in other durable-goods industries. Job quitting is most prevalent among workers producing wooden containers, household furniture, lumber, and miscellaneous wood products (fig. 1). The tendency to quit is strongest during expansions

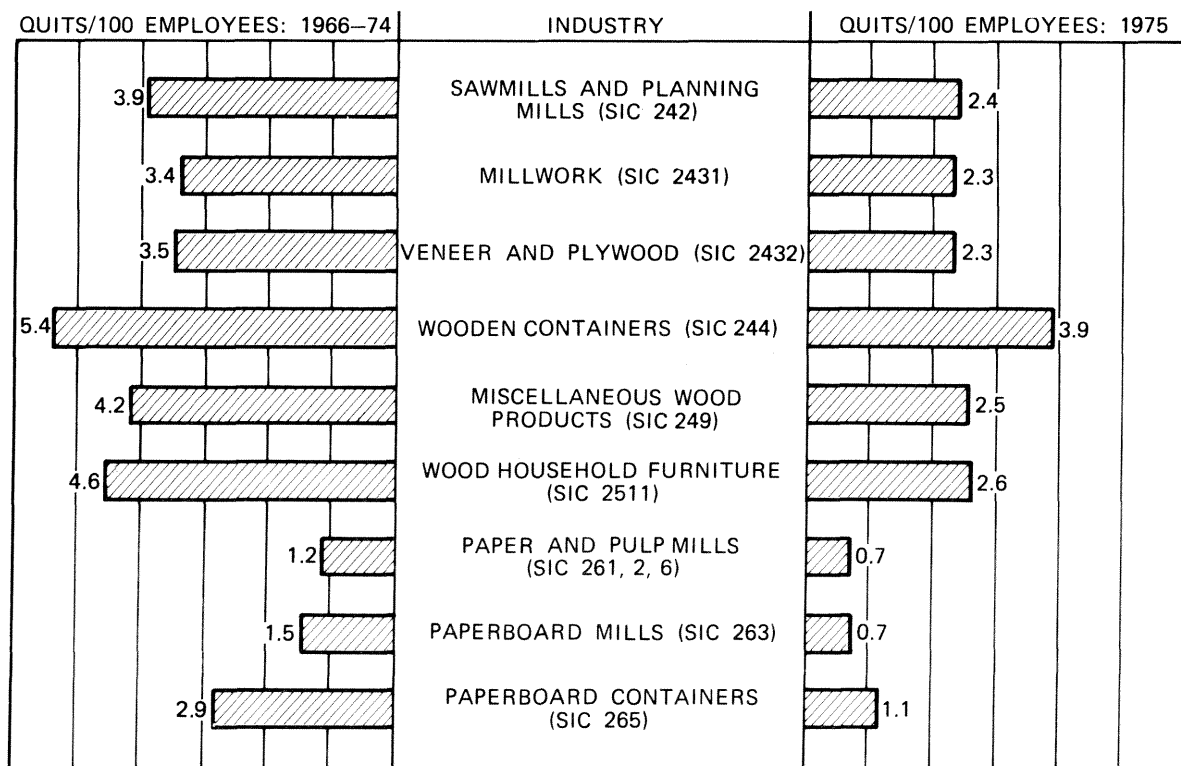
in economic activity and weakest during recessions (fig. 2).

The casual attachment between workers and their employers is also reflected in the high proportion of workers with short job tenure. A survey in January 1973 showed that nearly one of every four workers employed in the lumber and wood-products industry had worked only 6 months or less for his employer (*Hayghe 1975*).

Why workers quit, and what effect this has on operating efficiency, is of particular concern to employers in the lumber and wood-products industry. This concern was intensified by labor shortages that occurred in the late 1960s and early 1970s. Employers found that they had to hire two and even three times more new employees than usual to maintain full work crews. In some firms, plans to operate a second shift or to open a new plant were delayed by this even though the market for wood products justified an expansion in production activities.

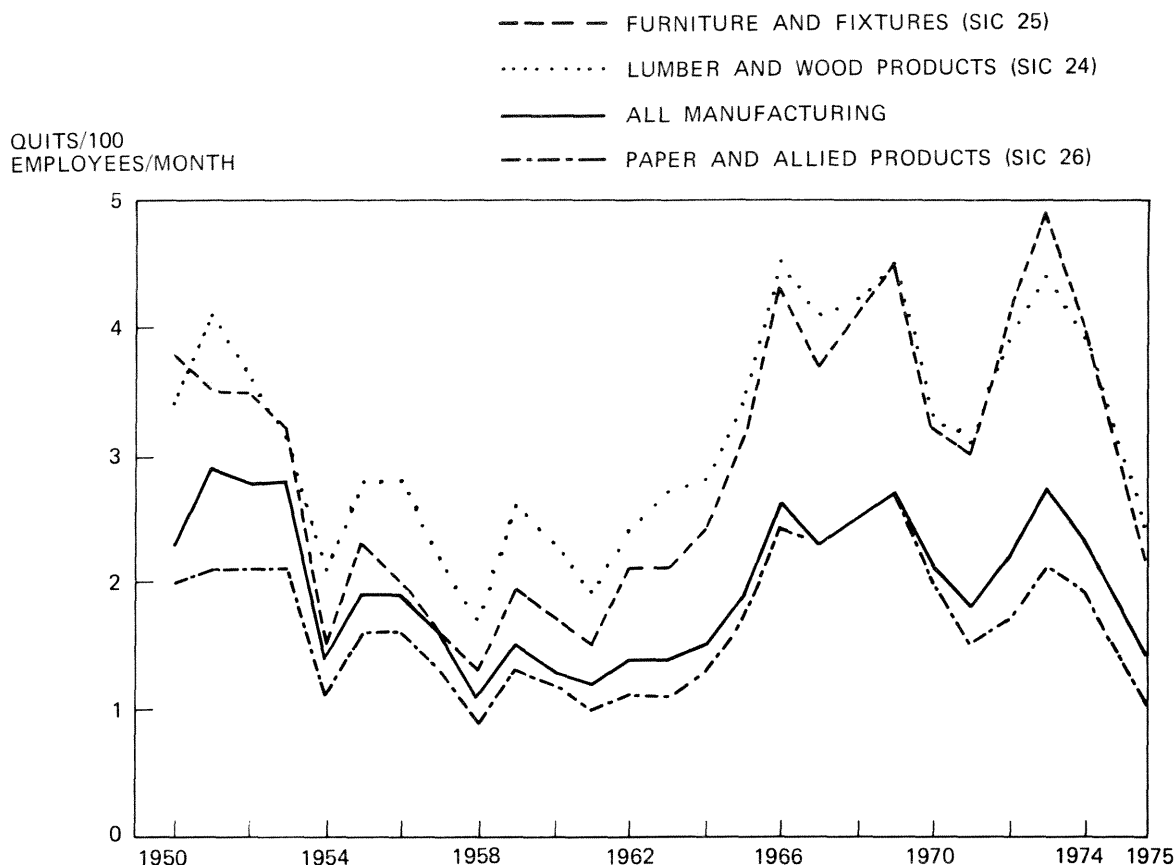
Whenever an employee quits, the investment

Figure 1.—Average monthly quit rates for selected wood-products industries, 1966-74 and 1975.



Source: Employment and Earnings (1967-76), Table D-2.

Figure 2.—Quit rates of major industry groups, 1950-75.



Source: U.S. Department of Labor, Handbook of labor statistics (1975).

that was made to hire and train him is lost to his employer. Because most workers leave without warning, replacements may not be available when needed; and this results in bottlenecks along the production line and less effective planning, scheduling, and organizing. Even after vacancies are filled, new employees—while learning their jobs—are less efficient than the workers they replaced. Their inexperience can lead to increased machinery maintenance, an unnecessary waste of raw materials, a decline in the quality of workmanship, and poorer customer service. All these factors tend to push up costs and lower productivity.

This study was made to find out more about job-quitting in the lumber and wood-products industry. The scope of the study was limited to hardwood sawmills in the Appalachian Region. Answers were sought to three basic questions: (1) What is the quit rate for sawmills in this

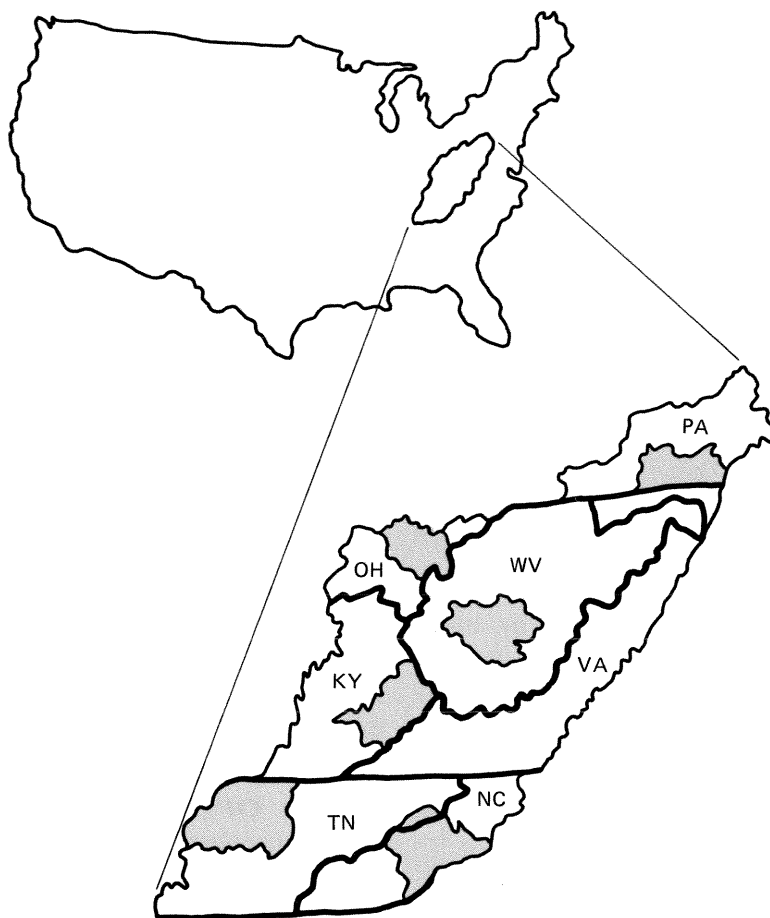
region? (2) Why do sawmill workers quit their jobs? (3) What can mill managers do to reduce employee turnover?

METHODS AND PROCEDURES

The data used to answer these questions were obtained during personal interviews with managers in a sample of Appalachian hardwood sawmills. To obtain this sample, the Appalachian Region was divided into 32 sample clusters. The clusters were roughly equal in area, and each consisted of two or more counties. Six of the clusters were selected randomly—three from the northern half of the region and three from the southern (fig. 3).

Within these six clusters, hardwood sawmills that produced 1 million board feet or more of lumber in 1972 and employed five or more non-

Figure 3.—The Appalachian study region. Shading indicates locations of sample areas.



supervisory production workers were included in the sample. Sixty-eight of the 70 sawmills that satisfied these requirements participated in the field interviews. However, the responses varied because some mill supervisors did not feel qualified to answer certain questions, and records were not available at all mills.

A structured questionnaire was used to record the interviews. Tabulations on wages and several other variables were made from company payroll, personnel, and production records. Local labor-market data were obtained from state employment security agencies and the COUNTY AND CITY DATA BOOK (*U.S. Census Bureau 1973b*).

The subjects of the study were full-time hourly production and maintenance workers holding

nonsupervisory positions in the mill and lumberyard. This group excludes loggers, clerical employees, sales personnel, truck-drivers, salaried workers, and students employed during the summer or after school hours.

An annual quit rate was calculated for each mill by dividing the total number of quits occurring during 1972 by the mill's average quarterly employment and multiplying by 100 to obtain a percentage. These rates are not comparable to those published by the Bureau of Labor Statistics (1975) because they are developed for a narrowly defined group of sawmill workers and are based on annual rather than monthly data. The number of quits was found by determining the total number of employee separations using the mill's payroll records and subtracting from this all layoffs,

firings, and miscellaneous separations as reported by the mill supervisor.

GENERAL FINDINGS

Job-quitting was clearly the most important form of labor turnover, accounting for 91 percent of all employee separations. Layoffs and firings accounted for only 6 percent of all separations, while the remaining 3 percent were the result of death, retirement, poor health, and other miscellaneous reasons.

The annual quit rate for the sample mills averaged 118.6 percent and ranged from zero to as high as 571 percent (table 1). When these data were weighted by average employment, the mean was 112.4 percent, indicating very little variation by mill size. Quit rates for mills in the northern half of the study region were not significantly different from those in the southern half.

The number of workers who quit in the typical mill was about equal to the mill's average employment. Most of these workers held unskilled jobs such as machine offbearer, chipper operator, and lumber handler. Because of the quick entry and exit of new workers, it was not uncommon to find four or five different individuals employed in the same job during a year. Only 8 percent of all quits involved workers who held skilled jobs: sawyers, sawfilers, edgermen, trimmermen, forklift operators, lumber graders, log scalers, and millwrights.

Despite the small proportion of skilled workers who quit, turnover was still quite serious. Eighteen percent of the mills had one or more sawyers quit, and 34 percent had at least one edgerman quit during the year (fig. 4).

Labor turnover is more detrimental to a business if it occurs among employees who have

had a long period of service with their employer. Such workers are especially valuable because they are familiar with company policies and experienced in the operation and maintenance of company equipment. In the sample, workers with at least 6 months of service comprised three-fourths of all employees, but accounted for only slightly more than one-fourth of all those who quit.

WHY WORKERS QUIT

Two approaches were used to determine why sawmill workers quit their jobs. The first approach was to question mill supervisors. It was felt that they would be able to provide insight into the causes of turnover that could not be obtained through statistical analyses. A possible drawback of this approach is that mill supervisors may not be fully aware of the reasons why their employees quit because many who do so leave without prior warning.

The second approach was to develop a series of hypotheses about factors believed to influence quit rates in sawmills. These hypotheses were tested in a regression model that predicted quit rates in the sample mills.

MANAGEMENT OPINION SURVEY

Mill managers were asked to give the major reasons why their employees quit. The most frequently given reasons were linked to the economic motives of the employees (table 2). Better jobs and higher wages accounted for 40 percent of the response, and from management's viewpoint, these appeared to be the primary reasons why workers quit.

Some managers strongly believed that turnover, absenteeism, and other labor-related problems were caused by government income-transfer programs such as food stamps, aid to

Table 1.—Labor turnover rates in the Appalachian lumber industry, 1972

Turnover rates ¹	Mean	Median	Minimum	Maximum
Quit rate	118.6	101.5	0.0	571.0
Discharge rate	9.1	0.0	0.0	133.0
Layoff rate	2.0	0.0	0.0	100.0
Miscellaneous separation rate	4.0	2.5	0.0	65.0
All separations	133.7	110.0	5.0	571.0

¹Rates indicate the number of turnover actions per 100 employees per year. Data are based on 62 sawmills.

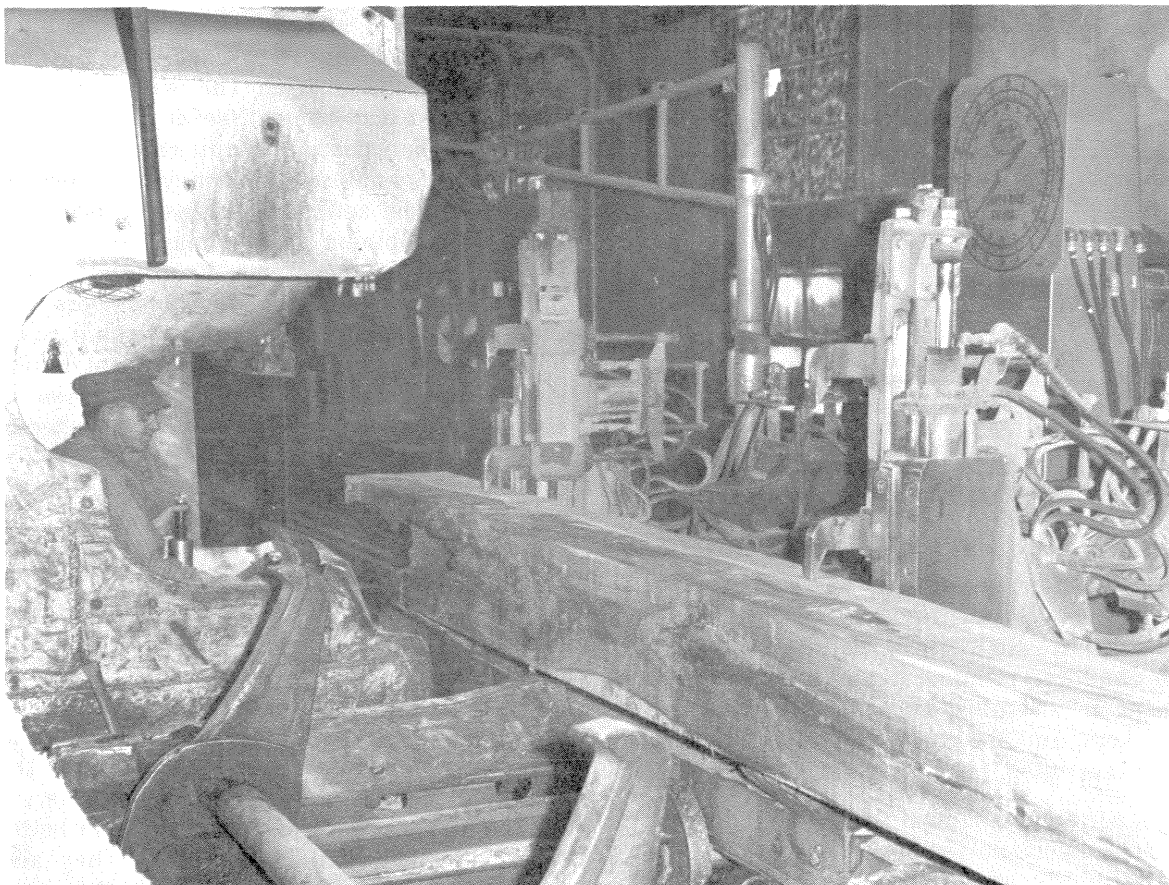


Figure 4.—Sawyers are key production workers who are hard to replace. Their loss can disrupt and even halt lumber production.

families with dependent children, and unemployment insurance. Many sawmill workers qualify to participate in one or more of these programs. In 1969, 12.9 percent of the male family heads employed in the industry had a total family income that was below the federal poverty level (*U.S. Census Bureau 1973a*.)

A congressional study of these programs supports management's view that they are a contributing factor to the high rate of turnover (*Lerman 1972*). The study found that some programs are structured in such a way that they actually inhibit stable employment and encourage workers to concentrate their earnings over short periods.

Another aspect of these programs is that, by creating an artificial income floor, they substantially reduce the risk involved in changing jobs. This is especially true for low-wage earners

whose incomes are only slightly above the benefit levels established by the programs.

The strenuous nature of sawmill work was also mentioned as a reason for workers' quitting. Mill managers felt that workers wanted easier, less physically-demanding work than was available in the sawmill industry. Other reasons given for quitting were laziness, employee-supervisor disagreements over pay and job assignments, working conditions, transportation problems, and alcoholism.

REGRESSION ANALYSIS

Explanatory Variables

In previous studies, a large number of factors have been identified that seem to be associated with variation in the quit rate. Based on a review of these studies and discussions with in-

Table 2.—Major reasons why employees quit, as reported by mill supervisors¹

Reason for quitting	Number of mentions	Percent of total
Better job	24	22.2
Higher wages	19	17.6
Welfare programs	16	14.8
Laziness	16	14.8
Work too strenuous	10	9.3
Conflict with supervisor	7	6.5
Working conditions	2	1.8
Other reasons ²	14	13.0
Total	108	100.0

¹Sixty-five supervisors responded to the question. Some reported more than one reason why their employees quit.

²Includes reasons related to transportation, job safety, alcoholism, and family circumstances.

dividuals familiar with the sawmill industry, 15 variables were identified as possible predictors of the quit rate (table 3). These variables relate to employee remuneration, the work environment in sawmills, the characteristics of the workers, and the conditions within local labor markets (*Wolf 1975*).

Wages are commonly felt to be one of the most important factors affecting quit rates. Interindustry studies show that low-wage industries have higher quit rates than high-wage industries (*Armknicht and Early 1972, Pencavel 1970, Stoikov and Raimon 1968*). This inverse relationship was also expected to hold true for sawmills within the lumber industry. Wage supplements such as paid vacations and hospitalization and life insurance are likely to influence quit rates in a similar manner.

The relationship between quit rates and mill size is not very clear. It could be argued that small mills would have lower quit rates than large ones because, the smaller the work group, the less conflict there is likely to be between the individual and the organization. Nepotism is also likely to be more prevalent in small mills. Conversely, small mills may have higher quit rates because they provide fewer opportunities for advancement and are generally less capable of handling personnel functions such as employee selection, training, and counseling.

Working conditions are determined by such things as the adequacy of ventilation, lighting, and heating; the availability of washroom and

eating facilities; and the amount of manual loading and stacking. These conditions, plus the danger associated with the work and the steadiness of employment, seem likely to contribute to the variation in quit rates.

A worker's impulse to quit may be influenced heavily by the actions of his supervisor. The Leadership Opinion Questionnaire devised by Fleishman (*1960*) contains 40 multiple-choice questions that indicate how supervisors feel they should behave in their leadership roles. Scores are developed on two independent dimensions of supervision that are labeled *consideration* and *structure*. Quit rates were expected to be lowest in sawmills where supervisors scored high in consideration and low in structure.

A positive relationship was expected to exist between the proportion of workers less than 30 years old and the quit rate. This would be consistent with other studies in which it has been found that the tendency to quit decreases with age.

High school graduates were believed to change employers more often than non-graduates because they can satisfy the minimum education requirements of a larger number of employers, and they tend to be better informed about job opportunities. They also have proportionately less training that is specific to the sawmill industry and to individual employers.

Unions tend to inhibit job-quitting by emphasizing internal promotions and by fostering seniority protection, pension rights, and other benefits that accrue with length of service. They are partly responsible for grievance procedures that minimize the need to change employers to obtain relief from real or imagined injustices.

The local unemployment rate and the average manufacturing wage were thought to reflect the opportunities and financial incentives that might impel dissatisfied sawmill workers to change employers. Mills located in labor markets with low unemployment and high manufacturing wages were expected to have higher-than-average quit rates.

Sawmill workers living in urban labor markets were expected to have higher quit rates than those living in rural ones. This is because the cost of job search is lower in urban areas as a result of more employment alternatives, greater exposure to help-wanted advertising,

Table 3.—Description, expected sign, and correlation coefficients of independent variables used to predict the quit rate

Description of variable	Symbol used in analysis	Expected effect of an increase in variable on the quit rate	Simple correlation with quit rate	Significance level	Sample size
Employee remuneration:					
1. Average wage for production workers	AW	Negative	- .189	0.071	62
2. Number of paid holidays and vacation days provided to employees with 1 year of service	H	Negative	- .228	.037	62
3. Employer-paid hospitalization and life insurance (1=paid; 0=not paid)	I	Negative	- .271	.016	62
Work environment:					
4. Average employment	EMP	Uncertain	- .011	.467	62
5. Operating days per year	DAY	Negative	.139	.140	62
6. Working conditions score	WC	Negative	- .153	.119	61
7. Accident frequency rate	AFR	Positive	.175	.089	61
8. Leadership style (consideration score)	LCS	Negative	- .059	.345	48
9. Leadership style (structure score)	LSS	Positive	.043	.385	48
Employee characteristics:					
10. Proportion of workers less than 30 years of age	AGE	Positive	.546	.001	62
11. Proportion of workers completing high school	ED	Positive	- .287	.020	52
12. Union membership (1=union; 0=nonunion)	UN	Negative	- .118	.180	62
Local labor market:					
13. County unemployment rate	UEM	Negative	- .216	.046	62
14. County manufacturing wage	MW	Positive	.404	.001	62
15. Proportion of county residents living in urban areas	URB	Positive	.383	.001	62

and better access to public and private employment agencies. A change of employers in urban areas is also less likely to involve the monetary and psychological costs of moving to a new community.

Results

Multiple-regression analysis was used to test these hypotheses and to determine how well the explanatory variables predicted the quit rate. After several exploratory regression equations were examined, it became apparent that some variables contributed little, if anything, to the prediction of quit rates. For this reason, average employment, number of operating days, and leadership style were dropped from the analysis. The proportion of workers who had graduated from high school was tested in regression equations separate from those presented in order to conserve degrees of freedom.

The remaining variables were included in the following regression equation.

$$\begin{aligned}
 \hat{Q}_i = & 200.94 - 93.75AW - 8.10H - 0.04I \\
 & (48.76)^* \quad (3.32)^{**} \quad (27.01) \\
 & + 3.79WC + 0.49AFR + 2.38AGE - 9.92UN \\
 & (5.98) \quad (0.64) \quad (0.53)^{**} \quad (48.53) \\
 & - 6.45UEM + 0.11URB + 30.45MW \\
 & (3.00)^* \quad (0.80) \quad (18.83) \\
 N = & 60 \quad \bar{Q} = 120.8 \\
 R^2 = & 0.56 \quad SEE = 77.6
 \end{aligned}$$

Here $\hat{Q}_i$ denotes the estimated annual quit rate in the i^{th} sawmill, and the symbols representing the explanatory variables are defined in table 3. Standard errors are shown in parentheses below the partial regression coefficients above. The 0.01 and 0.05 significance levels are indicated by ** and * respectively.

In this equation there were four statistically significant variables—the average wage (AW), the number of paid holidays and vacation days (H), the proportion of employees under 30 years old (AGE), and the county unemployment rate (UEM). An examination of the remaining variables showed that the county manufacturing wage (MW) and the proportion of the

county's population that was urban (URB) had a relatively high correlation ($r = 0.634$), which could explain why neither was significant.

A final and "best" regression equation with only five explanatory variables was estimated as follows:

$$\hat{Q}_i = 208.56 - 89.63AW - 7.28H + 2.29AGE$$

(41.24)* (2.32)** (0.45)**

$$= 6.70UEM + 33.05MW$$

(2.68)** (12.18)**

$$N = 62 \quad \bar{Q} = 118.6$$

$$R^2 = 0.55 \quad SEE = 74.5$$

The five independent variables explained 55 percent of the intermill variation in quit rates or about the same as in the previous regression equation.

In theory, the relationship between many of the independent variables and the quit rate is nonlinear. For instance, successively higher wages rates and greater vacation time could be expected to lead to smaller incremental declines in the quit rate. Several transformations—log-log, semilog, and reciprocal—were used to modify the data so they would satisfy these theoretical considerations. However, all models using transformed data explained about the same or slightly less variation than the ones presented.

To summarize, the regression analysis showed that five variables—the age of the work force, the average wage, the number of holidays and vacation days, and the manufacturing wage and unemployment rate in the local labor market—were statistically significant predictors of the quit rate. A comparison of the normalized regression coefficients of these variables showed that the age of the work force was clearly the most important predictor. Holidays and vacation days was second, and the average wage was third.

Discussion

The relationship between age and labor mobility has been well documented in other studies. Thus it is not surprising to find that the age distribution of the work force is one of the key determinants of job-quitting in Appalachian sawmills. In the sample mills, 39 percent of the workers were under 30 years of age. However,

this age group accounted for 70 percent of the workers who quit.

Human capital theory offers an explanation of why young workers change jobs more often than older workers (*Becker 1964*). In this theory, changing employers is viewed as an investment that is associated with certain costs (job search, moving expenses) and returns (higher wages) that are discounted over an individual's expected span of employment. For similar investments, the shorter the expected span of employment, the lower the rate of return to the individual. Consequently, a young person is likely to have more to gain from changing employers than an older person whose working life is about to end. Institutional factors such as seniority rights, restrictive pension plans, wage increases based on length of service, and age discrimination in hiring also help to explain why the tendency to change jobs declines with age.

The importance of wages in the regression analysis supports the observations by mill managers that many workers had quit to take higher-paying jobs in other firms. During 1972, the average wage paid by the sample firms was \$2.17 per hour for nonsupervisory production and maintenance workers.

The wage rates of other firms in the labor market are as important as those in the sawmill industry in determining the quit rate. An employer may be paying high wages by lumber-industry standards only to find that his quit rate is also high because he is located in a high-wage labor market.

The importance of employer-paid holidays and vacation time as a predictor of the quit rate points out that workers are not only aware of, but also respond to differences in the level of nonwage compensation. Fifty-six percent of the sample firms did not provide any paid holidays, and 54 percent did not provide any paid vacations to employees with 1 year of service. The average number of paid holidays and vacation days given annually by the sample firms was 4.3. Employers in the sawmill industry seem to have underestimated the significance of such fringe benefits as a means of attracting and retaining qualified personnel.

The country unemployment rate was the other local labor-market variable that influenced the quit rate. A low unemployment rate denotes a tight labor market, where the opportunity to obtain another job is very good;

whereas a high unemployment rate indicates situations in which workers stay with their employers even though certain aspects of their jobs (wages, supervision) may not be agreeable. They stay rather than quit and take the risk of not being able to find other work.

Mill size, as measured by average employment, was not found to be related to job-quitting. Therefore, it appears that large mills in the lumber industry are affected by employee turnover to the same degree as small ones.

There are several possible reasons why the other variables previously thought to influence turnover did not prove useful in predicting the quit rate. For example, because working conditions and supervisory style are very difficult to quantify, there may have been errors in measurement that affected the results. Other means of quantifying these variables should be devised and tested to confirm or reject the findings of this study.

The two binary variables (union membership and employer-paid insurance) might have shown a stronger relationship with the quit rate if the scale of measurement had reflected more of the qualitative aspects of the variables. The number of days that mills operated did not influence quit rates because nearly all mills in the sample operated 250 or more days per year.

TURNOVER AND PRODUCTIVITY

Many, but not all, of the benefits attributable to labor stability appear as improvements in productivity. To measure these benefits, a production function was estimated that included the annual quit rate as an independent variable. Annual production measured in thousands of board feet was estimated as a function of man-hours worked per year, average number of kilowatt hours of electrical energy used per 8-hour shift, and the annual quit rate. The electrical energy consumed per shift was included as a proxy for capital investment.

Data for estimating this equation were collected at only 15 sample mills. Many mills either did not keep production records or had a product mix that included mine timbers, railroad ties, and wood products other than hardwood lumber. Despite the small sample, the analysis was continued to gain further insight

into the relationship between labor turnover and productivity.

A two-tailed t-test showed that there was no significant difference in the mean employment and quit rate of the mills used in estimating the production function and the others included as part of the larger industry sample.

The regression coefficient for the quit rate in the log-log form of the production function had a negative sign, indicating that, as job-quitting increased, production declined. The coefficient, statistically significant at the 0.05 level, indicated that a 10-percent decrease in the annual quit rate would be associated with a 6/10-percent increase in annual production.

This finding becomes more meaningful when expressed in units of production. To illustrate: average annual production in the sample mills was 4.289 million board feet, and the average annual quit rate was 118.6. If the number of quits were reduced to 30 per 100 employees, annual output in the average firm would be expected to increase by 4.7 percent or about 202 thousand board feet.

This additional output would have a market value of about \$30,000. After deducting the cost of raw material, the financial gain from reducing the quit rate would be about \$17,000.

This attempt to quantify the effect of job-quitting on sawmill production was mainly exploratory. It nevertheless provided evidence that an unstable labor force will result in lower lumber production. This finding seems reasonable; however, there may be some disagreement over the exact magnitude of the effect. A stronger relationship between production and quit rates would be expected where a higher proportion of quits involves skilled workers.

SUMMARY AND CONCLUSIONS

The Appalachian lumber industry was found to have very high quit rates. In the typical hardwood sawmill, the number of employees who quit was about equal annually to the mill's average employment. The majority of those who quit their jobs were under 30 years of age, did unskilled work, and had less than 6 months of service with their employers.

The study showed that mill managers in the Appalachian sawmill industry could exercise at

least three options to reduce voluntary turnover. They could (1) increase wages, (2) grant additional paid holidays and vacation time, or (3) increase the proportion of older employees through changes in recruiting and hiring practices. Local unemployment rates and manufacturing wage levels were also found to influence quit rates; however, mill managers have no control over these variables.

In deciding which option or combination of options to follow, the mill manager must answer two questions. First, what benefits can the firm expect to achieve by lowering the quit rate? Second, will these benefits be greater than the higher payroll and other expenses necessary to achieve them?

It should be recognized that an increase in employee compensation will result in greater labor stability. This stability will lead to additional lumber production and lower training and hiring costs. An employer's objective should be to balance the cost of higher employee compensation with the benefits of greater labor stability. Because these costs and benefits will not be the same throughout the industry, each employer must evaluate his own situation to decide what course of action is best for his firm.

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