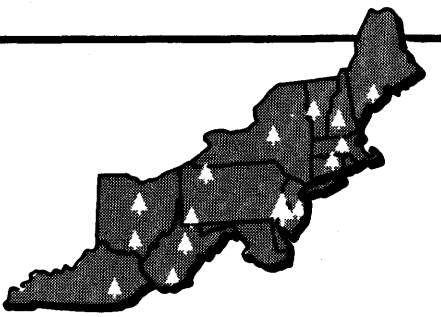
USDA FOREST SERVICE RESEARCH NOTE NE-237
1977

Northeastern Forest Experiment Station



FOREST SERVICE, U.S. DEPT. OF AGRICULTURE, 6816 MARKET STREET, UPPER DARBY, PA. 19082

UDC 962 + 832.14

WAGE DIFFERENTIALS AMONG APPALACHIAN SAWMILLS

by **CHARLES H. WOLF**
Research Forester
USDA Forest Service
Northeastern Forest Experiment Station
Forest Products Marketing Laboratory
Princeton, W. Va.

Abstract.—Wage differences among Appalachian sawmills were investigated, using multiple-regression analysis. Wages and fringe benefits were found to vary with type of product sawed, education of the work force, distance to urban areas, general wage levels, and use of collective-bargaining agreements between management and labor.

KEYWORDS: wages, wage differentials, fringe benefits, sawmill labor.

Different plants in the same industry and region often pay strikingly different wage rates. In the Appalachian sawmill industry, I found that the average wage for production workers in high-wage sawmills was a dollar per hour more than the average in low-wage mills. The number of paid holidays and vacation days provided by employers varied even more. Two-fifths of the mills in my survey did not grant any holidays or vacation time. In contrast, some employers provided as many as 14 days off with pay.

Recent studies by the Bureau of Labor Statistics showed that variation in plant wage levels is associated with several factors *(Schwenk 1974, Schwenk and Personick 1974).* These include unionization, plant and city size, value added per man-hour, product type, and geographic location. An investigation of interregional wage differentials in the wood industries suggests that labor quality and the concentration of timber resources may also be important *(Kaiser 1973).*

The objective of my study was to document and explain differences in wages and fringe benefits among Appalachian hardwood sawmills. The analysis was based upon data from 54 hardwood sawmills. These mills, selected through stratified cluster sampling, were located in Pennsylvania, Ohio, West Virginia, Kentucky, North Carolina, and Tennessee. All cut more than 1 million board feet of lumber annually and employed at least five nonsupervisory production workers.

Grade lumber was the primary product of half the sample mills. The others produced mine timbers, railroad ties, pallet lumber, and other

low-value products. The number of production workers ranged from 5 to 80, with an average of 20 men per mill *(Wolf 1975).*

Definition of Variables

Dependent variables.—Multiple-regression analysis was used to estimate three equations for predicting a sawmill's average wage, starting wage, and number of paid holidays and vacation days (days off). These variables were defined as follows:

- Average wage: The average straight-time hourly wage paid to full-time nonsupervisory production and maintenance workers.
- Starting wage: The straight-time hourly wage paid to new employees without prior training or work experience in the lumber industry.
- Days off: The total number of employer-paid holidays and vacation days provided to employees with 1 year of company service.

All wage and fringe-benefit data are based on the first payroll in July 1972. During this period, the lowest wage rate that could be paid to any employee was the federal minimum wage of a $1.60 per hour. The sample mills had average wages ranging from $1.71 to $2.81 per hour (table 1). The mean starting wage for all mills was $1.86 per hour—26 cents above the federal minimum.

Independent variables.—Eight independent variables were included in the regression equations. The first variable indicated the major product produced by the sample mill. The next two variables—headsaw type and average employment—were included to represent potential differences in technical efficiency that could affect the wage-paying ability of the plants. The education and timber-resource variables represented the quality of the labor force and the concentration of sawtimber stumpage. The last two variables pertained to the location of the plant and the general wage level in the local labor market.

The independent variables were defined as follows:

- Grade lumber: A dummy variable indicating that a majority of the mill's production was sold as grade lumber to the furniture industry.
- Headsaw type: A dummy variable indicating that the mill had a band headsaw.
- Average employment: Average quarterly employment of nonsupervisory production and maintenance workers measured in units of 10 employees.
- Union: A dummy variable indicating that a majority of the mill's production workers were covered by a labor-management contract.
- Education: The proportion of the mill's production employees who had completed high school.
- MBF per acre: The volume of sawtimber per acre of commercial forest land in the county where the mill was located.
- Distance to city: The distance from the mill to nearest city of 5,000 or larger, measured in units of 10 miles. This particular city size was chosen after examining the correlation coefficients between distance and wages for cities of 5,000, 10,000, and 25,000 population and over. Although all coefficients were statistically significant, the negative relationship between distance and wages was strongest for cities of 5,000 and greater population.
- County wage: Average hourly earnings of all workers employed in the county where the mill was located.

Data on the above variables were obtained from both primary and secondary sources. Sawmill wages and employment were tabulated

Table 1.—Mean, standard deviation, and range in wages and days off for mills in the study sample, July 1972 (N = 54)

Dependent variables	Mean	Standard deviation	High	Low
Average wage	$2.19	$0.26	$2.81	$1.71
Starting wage	$1.86	$0.23	$2.50	$1.60
Days off	4.37	4.61	14	0

from company payroll records. County wage data were obtained from state employment security agencies. The sawtimber volume per acre was taken from forest-resource bulletins compiled for each state by the U.S. Forest Service. Distances from the mills to cities were determined from highway road maps. Data on the remaining variables were obtained in interviews with mill supervisors.

Results and Discussion

The most important explanatory variables in the regression equations were: (1) the major product sawed, (2) the education of the mill's labor force, (3) the distance from the mill to an urban area, and (4) the county wage (table 2). A fifth variable, unionization, was important in determining starting wages and the number of days off, but did not have a significant effect upon the average wage.

As expected, mills oriented toward sawing grade lumber paid better wages and granted more holidays and vacation time than those that cut mostly mine timbers, pallet lumber, and other low-value products. There are at least two possible explanations for this finding. First, it requires more skill and attentiveness to manufacture grade lumber than it does other wood products for which the proper thickness, length, and maximum clear surface are less critical. The higher wages and fringe benefits are likely to reflect these greater demands upon the workers.

A second possible explanation is that higher profit margins exist in the market for grade lumber than in the markets for other sawn products. Therefore, mills cutting grade lumber would be in a better position to compensate their employees.

The proportion of a sawmill's work force that completed high school indicates formal education levels and possibly the motivation and innate abilities of its workers. All other things being equal, sawmills with the greater proportion of high school graduates paid higher wages and were more liberal in granting paid holidays and vacations.

However, labor costs per thousand board feet would not necessarily be higher in mills that paid premium wages and granted extra days off in order to attract and retain a well-educated work force. If education improves labor productivity, unit labor costs in high-wage mills could be equal to or even less than unit labor costs in low-wage mills.

Wages and fringe benefits in sawmills were also influenced by their proximity to urban areas. As the distance from cities of 5,000 or more people increased, wages and the number of days off declined. The partial regression coef-

Table 2.—Regression equations for predicting the average wage, starting wage, and number of days off in Appalachian hardwood sawmills

Dependent variables	Independent variables									Sample size	Adjusted R square
	Constant	Grade lumber	Headsaw type	Average employment	Union	Education	MBF/acre	Distance to city	County wage		
Average wage	1.591	0.198** (.058)	−0.016 (.116)	0.008 (.029)	0.056 (.127)	0.719** (.117)	0.013 (.036)	−0.058** (.015)	0.121** (.040)	54	0.519
Starting wage	1.402	.148* (.064)	.096 (.126)	−.051 (.031)	.300* (.137)	.246* (.127)	.016 (.039)	−.039* (.017)	.137** (.043)	54	.281
Days off	4.863	2.897** (1.090)	−1.727 (2.239)	.040 (.556)	9.236** (2.457)	7.905** (2.284)	−1.069 (.686)	−.860** (.298)	—	54	.405

**Significant at the 1-percent level.

*Significant at the 5-percent level. Estimated errors of the estimated regression coefficients are in parentheses.

ficients showed that the average wage and starting wage declined by 6 and 4 cents per hour respectively for each 10 miles beyond urban areas.

The typical sawmill was 25 miles from the nearest urban area. A few mills were as far away as 70 miles. The lower wage scales in rural mills could reflect a greater supply of labor relative to capital and a willingness of rural people to accept lower wages to avoid commuting long distances to work.

Union mills had starting wages that were 30 cents per hour more than nonunion mills when all variables in the regression equation were considered. They also provided nine more paid holidays than nonunion mills. However, the union effect on the average wage, while positive, was not large enough to be statistically significant.

Why should unionization result in significantly higher starting wages and number of days off but have little effect on average wages? A possible explanation is that employers of union labor are less resistant to union demands for increases in starting wages and days off because these concessions are less costly than general wage increases, and they benefit the firm by making it easier to recruit new employees. Furthermore, because all mills sell in the same product markets, competitive forces would operate against the creation of large differences in overall labor costs between unionized and nonunionized mills.

The final variable that influenced sawmill wages was the general level of wages in the counties where the mills were located. This variable showed that, to attract and retain a sufficient number of workers, sawmills must adjust their pay scales to the prevailing wage level in their local area. Mills in low-wage labor markets have an advantage so far as labor costs are concerned.

Differences in technical efficiency resulting from the type of headsaw and economies of scale, as indicated by the average number of employees, had no appreciable effect on wages or number of days off. There was also no evidence to suggest that the timber resource influenced wages in the Appalachian sawmill industry.

Overall, the predictor variables explained about half of the variation in average wages ($\overline{R}^2$ = 0.52) and somewhat less for starting wages and days off. Log-linear functional forms of the regression equations were estimated but failed to improve the results.

The unexplained variation may be attributed to several factors that were beyond the scope of this study. First, many sawmills are vertically integrated with furniture plants, dimension plants, and pallet manufacturing facilities. Integrated plants may have paid better wages than those that were operated independently. Second, some plants were expanding their employment while others were laying off workers. And third, there were also differences in managerial abilities, capital/labor ratios, and the degree and combination of skills employed.

Related Findings

It has been argued by some mill managers that total weekly earnings are more important to sawmill workers than hourly wage rates. Therefore, wage differences could occur because some workers maximize their weekly paychecks by accepting employment at less than the prevailing wage if given an opportunity to work overtime. An inverse association between wages and overtime would support this argument.

For the sawmills in the sample, overtime per employee had a positive correlation with the average wage (r = 0.383). The starting wage and the number of days off also showed statistically significant positive correlations with overtime. Thus the opposite appears to be true. High-wage mills generally provide more overtime work than low-wage mills.

Hourly wage rates are not necessarily true indicators of the relative levels of employee compensation among plants. A low-wage mill may compensate its employees to the same degree as a high-wage mill by offering a greater number of paid holidays and better working conditions. However, this was not the situation in the sample mills. The average hourly wage showed significant positive correlations with days off (r = 0.389) and working conditions (r = 0.223).

Conclusion

There clearly seems to be a range in the types of plants in the Appalachian sawmill industry. High wages, good working conditions, and liberal fringe benefits characterize some sawmills whereas the opposite extreme is represented by others.

Several key factors associated with this variation were identified. These included: (1) product type, (2) education of the work force, (3) distance to urban areas, (4) local wage levels, and (5) the use of collective-bargaining agreements between management and labor. Wages and fringe benefits for sawmills in other regions of the United States are likely to be influenced by these same factors.

There was no evidence of a relationship between the forest resource (sawtimber volume per acre) and the wages of sawmill workers. This finding differed from that obtained in a study of interregional wage differentials *(Kaiser 1973)*. Because of its importance, the association between these two variables should receive further study.

Both the interregional analysis and this study were in agreement about the importance of education as a factor in wage determination in the sawmill industry. A greater investment in education, training, and possibly other forms of human capital should lead to higher earnings for sawmill workers.

Data limitations precluded the use of labor productivity as an explanatory variable and the estimation of wages by occupation. Wage equations by occupation would have permitted a more comprehensive analysis and would have helped to control variation caused by differences in skill mix. It also would have been desirable to have had a single measure of compensation per man-hour that included wage and nonwage benefits such as hospitalization and life insurance, holiday and vacation pay, and employer contributions to pension plans. These considerations should be taken into account in future studies.

Literature Cited

Kaiser, H. F., Jr.
1973. **Interregional wage differentials in forest products industries.** For. Prod. J. 23(7): 12-16, illus.

Schwenk, Albert E.
1974. **Earnings differences in machinery manufacturing.** Mon. Labor Rev. 97(7): 38-47, illus.

Schwenk, Albert E., and Martin E. Personick.
1974. **Analyzing earnings differentials in industry wage surveys.** Mon. Labor Rev. 97(6): 56-59, illus.

Wolf, Charles H.
1975. **Labor turnover in the Appalachian lumber industry.** Ph.D. dissertation, Univ. Mass., Amherst. 156 p., illus.

MANUSCRIPT RECEIVED FOR PUBLICATION 3 NOVEMBER 1976

*U.S. GOVERNMENT PRINTING OFFICE: 1977-703-078/21