

ARE WE UNDERESTIMATING THE SIZE OF OUR HARDWOOD INDUSTRIES?

Stephen M. Bratkovich and Gregory R. Passewitz¹

Abstract: Sawmills and planing mills (SIC code 2421) were analyzed by comparing data from the 1987 County Business Patterns, published by the U. S. Bureau of Census, and research conducted by the Ohio Cooperative Extension Service for the same year. The Ohio study and the Bureau of Census survey were comparable in industry sector definition, data collection unit and survey instrument. The Ohio research included all known sawmills and planing mills in Ohio whereas the Bureau of Census used probability sampling based on firm size with estimates made of establishments with under five employees. The Ohio research found substantial increases in number of establishments (38 percent), number of employees (88 percent) and annual payroll (82 percent) compared to Census Bureau estimates of the Ohio sawmill and planing mill industry. Foresters, forest product specialists, economic developers and others who work with the forest products industry need to be cautious when using published Census Bureau data to describe the industry. Evidence from the Ohio study and other research suggests a substantial Census Bureau underestimation of the true size of the hardwood industry.

INTRODUCTION

The central hardwood forest, which includes parts or all of 24 states, is the largest forest region in the United States. The economic and social importance of this forest region is significant when one considers that with the exception of the Pacific Coast, eastern Canada, and central Mexico, the largest concentration of population and industry in North America is located in this region (Duffield 1982).

Historically, the central hardwood forest region has been a national leader in the production of wood and paper products. Today however many states are viewing their forests from a much broader perspective. Pennsylvania, for example, has targeted the forest products industry as part of an overall statewide economic development effort. Other states such as Ohio have not formally targeted the industry for development but have increased their economic development efforts in the forested regions of the state.

¹Assistant Professor/District Extension Specialist, Forestry, Ohio Cooperative Extension Service, P. O. Box 958, Jackson, OH, 45640 and Assistant Professor/Leader, Natural Resources and Small Business, Ohio Cooperative Extension Service, 2120 Fyffe Rd., Columbus, OH, 43210.

Statistics published by the U. S. Bureau of Census are frequently used as a starting point for studies involving economic impact and development potential. Economic developers, educators, planners, legislators, researchers and persons involved in the financial sector use Bureau of Census data for needs assessment, program planning and the like. Historically foresters, forest product specialists and forest industry officials have expressed concern that the Bureau of Census underestimates the true size of the forest products industry. Phelps and Smith (1985), in describing a Missouri study, conclude that Census Bureau data may underestimate industries that use wood as a raw material. Jones and Zinn (1986), report the number of establishments, number of employees and annual wages of West Virginia forest product industries to be roughly double those reported by the U.S. Bureau of Census.

Dempsey (1987) states that in 1982 the Census Bureau provided data on 751 commercial lumber producing sawmills and planing mills operating in Pennsylvania, Kentucky and West Virginia; state forest product industry directories, however, reported 1892 operational sawmills located within the tri-state area in 1984. Doud (1990) estimates the number of employees in the Pennsylvania kitchen cabinet industry to be nearly three times the Census Bureau estimate. Additional discrepancies in the area of hardwood lumber production have also been reported (Cardellichio and Binkley 1984, Luppold and Dempsey 1989).

Numerous reasons have been proposed to explain the discrepancies between the findings of statewide or regional studies and Bureau of Census surveys. One explanation is definition. The Census Bureau categorizes industries by the primary product shipped as determined by dollar value. Consequently, a combination logging and sawmill establishment is defined by the Census Bureau as either a logging establishment or a sawmill but not both. Based on definition, some establishments may be counted twice or omitted entirely in statewide and/or regional surveys.

A second possible explanation for the discrepancies between numbers reported by state and/or regional studies and U. S. Bureau of Census estimates could be due to the data collection unit. The Bureau of Census uses the individual establishment as the data collection unit. For example, "Company A" may be the non-manufacturing corporate headquarters for establishments X, Y and Z. The Bureau of Census would survey the X, Y and Z manufacturing establishments but not Company A, the corporate headquarters. However, if Company A mistakenly received, and responded to a survey instrument on "behalf" of the X, Y and Z establishments, then double counting would occur if the individual establishments also were surveyed.

Third, it is not uncommon for statewide and/or regional surveys to contact 100 percent of the known establishments. The Census Bureau, however, uses probability sampling based on firm size with estimates made of establishments with under five employees. Since the hardwood industry is characterized by numerous small firms (Haygreen and Bowyer 1989), the Census Bureau may not be adequately canvassing the entire industry.

Fourth, Census Bureau data is often compared with studies where the survey time period is different. While the time period difference may not always be a problem in itself, when

coupled with one or more of the previous explanations could contribute to the discrepancies between statewide and/or regional and Census Bureau survey estimates.

PURPOSE

The purpose of this study was to: 1) identify the discrepancy (if any) between statistics published by the U. S. Bureau of Census and a statewide study on selected variables for the 1987 Ohio sawmill and planing mill sector (SIC code 2421) and 2) quantify the extent of the discrepancy.

METHODS

Research Design

This study was descriptive in nature and utilized mail questionnaires for data collection. To have a meaningful comparison between Bureau of Census data and the Ohio survey research data, a common definition of the industry sector was used (Anon. 1987). The Bureau of Census defines sawmills and planing mills (SIC code 2421) as: 1) those establishments primarily engaged in sawing rough lumber and timber from logs and bolts, or resawing cants and flitches into lumber, including box lumber and softwood cut stock, 2) planing mills combined with sawmills, and 3) separately operated planing mills which are engaged primarily in producing surfaced lumber and standard workings or patterns of lumber. Dry kilns and mills producing railroad ties, chips and studs are also included in the Bureau of Census definition.

Since many establishments are integrated operations such as logging, sawmilling and secondary manufacturing, the Bureau of Census classification of an establishment is based upon the dollar value of the primary product shipped. As an example, a combination sawmill/pallet mill which annually sells a higher dollar value of pallets than lumber in a given year would fall into the industry sector of "wood pallets and skids" (SIC code 2448) and would not be reported in the results of this study. If the combination mill sold a higher dollar value of lumber as compared to pallets, then the mill would fit the Bureau of Census definition of a sawmill and planing mill.

Sample Population

The sample population consisted of all known Ohio establishments which potentially would fit the Bureau of Census definition of a sawmill and planing mill. The names of the establishments were compiled from a base list published in directory form by the Ohio

Department of Natural Resources, Division of Forestry (Long 1988). This directory was supplemented with additional establishments compiled from lists by the Ohio Forestry Association/Timber Industry Council, Ohio service foresters and Ohio extension agents. These sources represented the best available lists of sawmills and planing mills in the state of Ohio. The sample size, after eliminating known duplications, was 389 establishments.

Survey Instrument

A questionnaire was designed that sought information for 1987 regarding employees, payroll, capital expenditures and the quantity and value of products produced. Value is the dollar amount of products shipped and services performed at the net selling value, f.o.b. plant, to the customer, i.e., after discounts and allowances and exclusive of freight charges and excise taxes (U. S. Department of Commerce 1987).

In developing the instrument the authors selected questions from the 1987 Census of Manufactures questionnaire (U. S. Department of Commerce 1987). The instructions, questions and format used in the Ohio survey instrument were as identical as possible to the Bureau of Census instrument.

The Ohio survey omitted some questions included on the Bureau of Census questionnaire. Only those questions relevant to the Ohio study were chosen. In addition, questions that required calculations by respondents were also omitted from the Ohio study, i.e., average employment for the year (divide line b by 4; omit fractions). The reason "calculation questions" were omitted was respondent convenience, survey brevity and possible inaccurate calculations by the respondent. In summary, the Ohio survey instrument replicated selected questions and instructions from the Census Bureau questionnaire so as not to misidentify any firms in the sawmill and planing mill sector or inaccurately record data.

Data Collection and Analysis

The questionnaire, along with a cover letter and a postage paid return envelope, was mailed to each of the 389 establishments. Approximately four weeks following the initial mailing, a second letter and questionnaire were sent to those establishments who had not responded. One month following the second mailing there were 102 responses, or a return rate of 25.6 percent. Nine questionnaires were non-deliverable.

Of the 278 non-respondents, 55 or 19.7 percent were contacted by telephone (random sample) as a follow-up with with an additional seven having wrong or changed phone numbers or disconnected phones. A check for non-response bias was conducted by comparing respondents with non-respondents (Miller and Smith 1983). The comparison was done on the key variables of number of employees, annual payroll, capital expenditures and product value. The t-test indicated no significant difference between respondents and non-respondents at the

alpha level of .05. Thus, the results of the study were generalized to the target population under study. The analyses used were frequency distribution and percentages.

For the purpose of this paper, 1987 sawmills and planing mills was the industry sector studied. A sawmill and planing mill is defined as one which was in business during the 1987 year. This definition excludes non-sawmills and out-of-business establishments. Of the 102 mail respondents, 54 (52.9 percent) were current sawmills or planing mills. In the non-respondent follow-up group of 55, there were 28 sawmills and planing mills (50.9 percent). This leads to an estimate that the number of 1987 sawmill and planing mills from the original sampling frame of 389 was actually 200 ($54 + .509 \times (389 - 102)$). Therefore, the response rate for 1987 sawmill and planing mills is 41 percent $((54 + 28)/200)$.

RESULTS AND DISCUSSION

The Ohio survey, as noted above, estimates the 1987 sawmill and planing mill sector to be comprised of approximately 200 establishments as compared to the Bureau of Census estimate of 145 establishments (U.S. Department of Commerce 1989). A second estimate of Ohio sawmill and planing mill establishments was computed via a "weighting" formula where non-responding establishments randomly selected for telephone follow-ups represented more than their own establishment. For example, a firm selected in a 20 percent random sample is essentially representing 4 firms in addition to itself and carries a "weight" of 5 ($100/20 = 5$). The weighting method, when applied to the Ohio survey data, resulted in an estimate of 198 sawmill and planing mill establishments. Therefore the authors are confident that 200 is a reliable point estimate of this industry sector in Ohio. This is a 38 percent increase of the figure reported by the Bureau of Census $((200-145)/145)$.

The Ohio survey estimated nearly double (88 percent) the number of sawmill and planing mill employees compared to the Census Bureau estimate (Figure 1). Regarding annual payroll, a similar increase (82 percent) was found in the Ohio survey (Figure 2). These rather substantial increases of 88 percent for employees and 82 percent for annual payroll clearly depict the Census Bureau underestimate.

The Bureau of Census underestimated the number of establishments in all employee size classes. The Ohio survey found a greater percentage of establishments in the larger employment size classes, especially in the 20-49 employee size class (Table 1). The larger employee size classes had the greatest underestimation. This explains how a 38 percent increase in establishments translates to a 88 and 82 percent increase in employees and payroll.

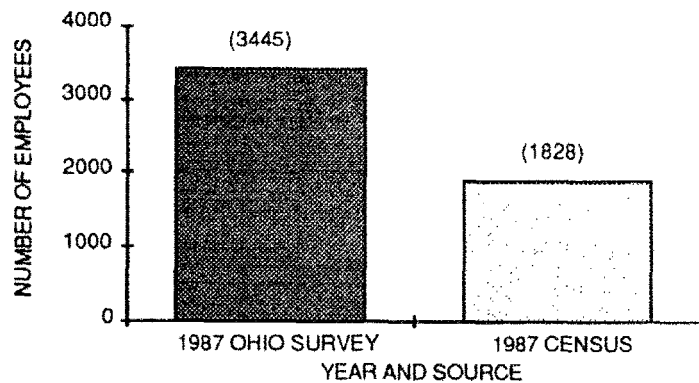


Figure 1. Estimates of sawmill and planing mill employees.

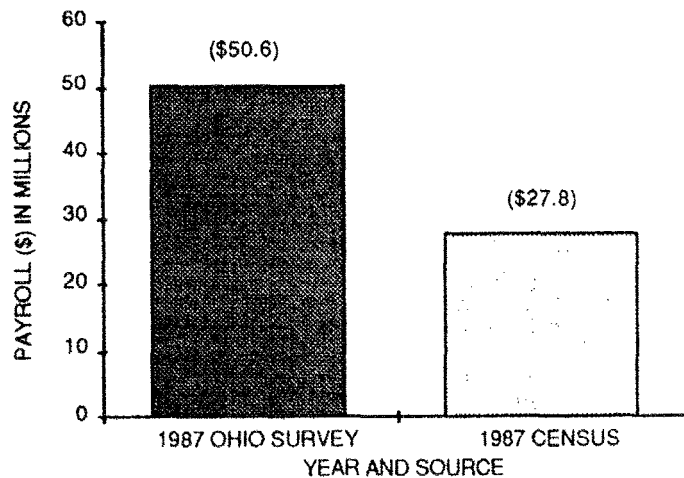


Figure 2. Estimates of sawmill and planing mill annual payroll.

Table 1.--U.S. Bureau of Census and Ohio Survey Estimates of Number of Establishments and Percentage by Employment-Size Class, 1987.

Source	Employment-size class														Total
	1 to 4		5 to 9		10 to 19		20 to 49		50 to 99		100+				
Census	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Bureau	54	37	29	20	35	24	19	13	7	5	1	1	145	100	
Ohio	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Survey	70	35	35	18	40	20	40	20	13	6	2	1	200	100	

The Ohio survey documented capital expenditures for new machinery, equipment and buildings of \$18.9 million and a 1987 sawmill and planing mill product value of \$355 million. As of October 1990 however, 1987 Census Bureau estimates on these two variables were not yet available. While the Census Bureau has published comparison data for 1982, to be consistent in our comparisons, 1987 data must be available. Further analysis will be done at a later date.

Based on number of establishments, number of employees, and annual payroll, the Ohio survey clearly documents a significant difference with the data published by the Census Bureau. The Ohio survey found substantial increases in number of establishments (38 percent), number of employees (88 percent) and annual payroll (82 percent) (Figure 3).

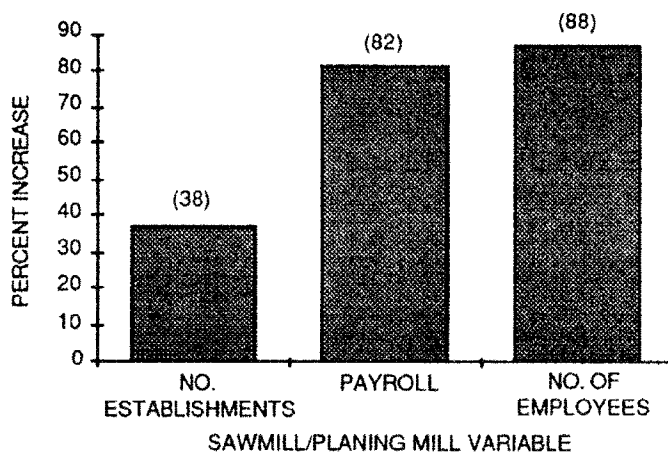


Figure 3. Percent increase of Ohio survey estimates over Census Bureau estimates.

IMPLICATIONS

Foresters, forest product specialists, economic developers and others who work with the forest products industry need to be cautious when using published Census Bureau data to describe the hardwood industry. Results from this research document that a specific industry sector in Ohio, sawmills and planing mills, is substantially larger than published Bureau of Census estimates. Consequently, economic development strategies and economic impact studies could be grossly inaccurate if based on Bureau of Census data.

In certain instances the Census Bureau underestimation could result in specific forest product industry sectors being viewed as "unimportant" from a statewide or regional perspective. Ultimately, this might cause public and private resources (dollars, personnel, etc.) to be allocated to "larger and more important" non-forest industries.

Another implication of underestimation, according to Luppold and Dempsey (1989), is the undervaluation of potential returns from quality northern forest sites. They conclude that an erroneous prediction of lower future hardwood stumpage values would discourage forest investment and ironically, could result in even higher long-term prices.

The results presented in this paper suggest that other central hardwood states could use the Ohio example as a beginning point for more accurately reporting sawmill and planing mill sector Census Bureau data. For example, the Ohio survey estimate of 200 sawmill and planing mill establishments versus the Census Bureau estimate of 145 establishments implies an "expansion factor" of 1.38 (200/145). The expansion factors for number of employees and annual payroll are 1.88 and 1.82, respectively.

While the authors feel the expansion factors might be accurate in Ohio for other primary manufacturing forest industry sectors such as logging camps and logging contractors (SIC code 241), the authors believe the expansion factors would not hold for various secondary manufacturers. In Ohio, for example, there are only three pulp mills. These mills would not "fall through the cracks" in an industry-wide canvass whereas many small sawmills are overlooked in surveys. Likewise, the expansion factors should be used with caution in other states.

The authors are hopeful that researchers in other central hardwood states would replicate the Ohio study. Other primary manufacturing industries, in addition to the sawmill and planing mill sector, need to be studied to determine if the Ohio results hold in other states and for other industry sectors.

A final comment on methodology is appropriate. Even though the results of the Ohio study support the general conclusion that others have made, ie., the Bureau of Census underestimates the size of forest product industries, the Ohio research is different. The Ohio study and the Bureau of Census survey used the same definition of "sawmills and planing mills" (SIC code 2421), surveyed the same data collection unit (individual establishments), used a comparable data collection instrument, and collected data during the same time period (1987). Consequently, the Ohio and Census Bureau data comparison is an "apples to apples" comparison.

In conclusion, no intent to discredit the U.S. Department of Commerce, Bureau of Census, is implied. The authors compliment the Census Bureau for continually providing valuable and useful data in industry sectors where accurate information is difficult to obtain.

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