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Out-of-State Exports of Hardwood Manufacturing Industries in the Northern and Central Appalachian States

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Natural resource-based economic development efforts are becoming increasingly popular. Interest focuses on industries that export from a state, in order to expand the state and local economic base. The Northern and Central Appalachian states should be ideally positioned to benefit from forest-based resources, as they have extensive hardwood forests, a favorable growth-to-drain ratio, and easily accessible national and international markets. This paper examines the export levels of several hardwood product industries and uses tobit analysis to examine establishment and location characteristics related to higher export levels.

Introduction

State economic development efforts have expanded in recent years in response to the changing structure of the national economy, declines in traditional manufacturing industries, and decreasing Federal government assistance (Clark 1986). To replace lost economic activity, high tech manufacturing and service sector industries often have been the objects of development policies. These industries, however, tend to concentrate around urban areas, excluding many regions, and particularly rural areas (Glasmeyer 1993; Testa 1992). When businesses in these industries do locate outside metro areas, the types of jobs that tend to be generated are similar to the routine, low skill jobs that have been mechanized or migrate overseas, resulting in a transitory economic base (Smith and Barkley 1988; Testa 1992). Furthermore, because of manufacturing restructuring and increased international competition, the future opportunities for nonmetropolitan areas to benefit from growth and relocation of these industries is greatly reduced (Barkley 1993; Barkley and Hirschberger 1992).

Given the continued lack of dynamism from other industrial sectors, a current policy effort in many states is a renewed emphasis on utilization of a state's natural resource base. This has been complemented since 1990 by the USDA Forest Service rural development initiative (Rural Development 1993). Correctly utilized, the hope is that such economic development may be more sustainable over the long run. Another benefit of a natural resource-based development effort is that it avoids what many think of as a zero-sum, smokestack-chasing policy.

In the Northern and Central Appalachian states¹ hardwood forest resources fill this role ideally. The forests in these states contain the largest storehouse of quality hardwood timber² of any region in the country—29 percent of the United States' total hardwood growing stock (Waddle et al. 1989). The region also offers a favorable growth-to-drain ratio, and is strategically located near major markets in the United States and southern Canada, with convenient access to ports for overseas shipping. Consumer demand factors favor the increasing use of hardwood in many categories, including flooring, millwork, residential furniture, and cabinetry. Demand for high-quality Appalachian hard-

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¹ States in the region are Connecticut, Maryland, Massachusetts, New Hampshire, New York, Ohio, Pennsylvania, Vermont, Virginia, and West Virginia.

² The predominant select hardwood species in the study region are red oak, white oak, black cherry, white ash and hard maple.

woods, therefore, is expected to continue to grow (Barrett 1989). If resource-based economic development efforts are to succeed in this region, the hardwood forests will play a major part.

Despite the region's favorable position, much of the high quality, high value hardwood is shipped out of the area with minimal processing, as logs and green lumber. The region's economy and residents, therefore, do not receive full benefit from the resource. Potential jobs, income, and tax revenues leave the region along with the raw resource. Evaluation of programs designed to encourage forest-based economic development indicates that most are simply part of an individual state's overall economic development strategy to locate and expand export base industries (Jones and Koester 1989). While a historical body of research is available for general manufacturing (Bilkey and Tesar 1977; Cavusgil et al. 1979; Rieth and Ryan 1981; Barkley 1993; Lonsdale and Seyler 1979), little information exists on the market orientation of the hardwood manufacturing industry. In addition, much of this research has focused on international exports. For state, regional and local development, however, exports which leave the state have just as important economic and policy considerations. Information is needed that can help predict the impact that specific forest-based industries may have on a state's economy, and thus determine the benefits of policies emphasizing these industries. Cavusgil (1984) maintains that such information is valuable for economic policy; that firms in categories with high export profiles can be converted into exporters. The purpose of this paper is to serve as an initial step in providing this information for hardwood manufacturers.

Conceptual Framework

The basis of natural resource-based economic development programs is export base theory. Researchers have long viewed the export sector as the most important motivating force of regional economic growth (North 1955, 1956; Tiebout 1956; Williamson 1975). The central idea of export base theory is that regional income is determined by a region's 'basic' or export activities (i.e., sales of goods and services outside the region). All other economic activity, labeled 'non-basic', serves the local market, and exists as a consequence of the income generated from 'basic' activities (Lesage and Reed 1989; Richardson 1979; Friedman and Alonso 1975; Perloff et al. 1960). Therefore, within the context of export base theory, exports

and the industries that generate them are viewed as the engine that drives an economy (Webster et al. 1990; Archer and Maser 1989; Posner 1984). The result is that the bulk of economic development efforts focus on recruiting or expanding businesses that will increase a region's or community's export base.

The role of the export sector is seen in the basic Keynesian macro model, $Y = C + I + G + X - M$. In the context of regional or state economic growth, however, a more descriptive model (Williamson 1975) is

$$Y = C_r + I_r + G_r + X,$$

where r = expenditures on the region's products. The latter model indicates that the local market is limited by local output and local income. Thus, for [relatively] small, open regions, export expansion is likely to be the dominant influence over time on the growth of profits, employment and income in the region (Williamson 1975). The timing and pace of a region's economic development, however, depends not only on the success of its export sector, but also on the characteristics of that sector (North 1961). And, as Shaffer (1989) points out, the export sector is not homogenous.

The export sector, X , is $\sum x_i$, where x = exports from an individual firm, and $i = 1, \dots, n$, where n is the number of firms in the region. Thus, for X to be the focus of policy, it is necessary to know what determines whether or not, or at what level, individual firms export. Each industry or firm is not likely to export at the same level, nor can each be expected to respond to the same factors, when deciding to access nonlocal markets. That is,

$$x_i = f(k_1, \dots, k_m),$$

where the k 's are the set of m factors that determine the firm's export orientation. Thus, in economic development policy, particularly at the state and local levels, dx/dk is the actual policy focus. The key questions, then, are which industries/firms are exporters, and what is the relationship of each k to a firm's exports?

The export orientation of the individual firm can be examined within the context of Cohen and Cyert's (1965) behavioral theory of the firm. This theory expands the standard profit-maximization model of the firm to also focus on questions concerning the internal decision making structure of the firm, the perspectives of the decision maker, and the constraints of the physical and social environment. It is acknowledged that the corporate enterprise is far different from the single entrepre-

neur, and that the internal organization of the firm affects the decisions that the firm makes.

The decision whether or not to market beyond the local or state area entails gaining knowledge of this export market, and assessing the expected outcomes of entering that market. The decision will encompass variables internal to the firm, such as production cost, cost of information, and goals of the firm. Other variables that enter and condition the decision are beyond the control of the firm, such as population and location of the market.

The standard theory of the firm assumes perfect knowledge and a certainty model, regardless of type of firm. However, the costs of acquiring the information to reduce uncertainty, and of making the decisions, are variables. Because of this, the alternative courses of action discovered by the firm may be narrower than the alternatives that actually exist (Cohen and Cyert 1965).

Location theory (Richardson 1979) provides a further context with which to examine characteristics of exporting firms. Industries using a raw material that loses weight during processing locate near[er] the resource. Such industries are likely to primarily engage in initial processing and thus be lower value-added, and sell the product as an intermediate input. The higher value-added industries will be more oriented to the final consumer.

The decision to enter an out-of-state market, vs. a local or in-state market, is a clear example of the influences of information, internal firm structure, and external constraints. Because it is probable that differences exist among hardwood manufacturing industries and firms in export level, three important questions are: (1) how does export orientation differ by industry; (2) what characteristics distinguish export-oriented from nonexport-oriented establishments; and (3) are there characteristics which can be used to predict levels of export orientation? The first two questions will be addressed using descriptive statistics from survey data of 642 hardwood manufacturing establishments in the ten-state Northern and Central Appalachian region (Bodenman 1991). To answer the third question, state, county, and establishment characteristics are examined by tobit regression analysis to determine factors associated with higher export levels.

With this information, policy makers can assess the extent to which hardwood manufacturing is export oriented, and begin to identify the types of hardwood manufacturing businesses which might best meet a state's and/or community's development desires. Furthermore, they will be able to anticipate the impact of new or expanded hardwood manufacturing businesses.

The Data

The wood processing industries examined are lumber and wood products (Standard Industrial Classification—SIC—24) and furniture and fixtures (SIC 25) (Table 1). In both of these groups, logs or cut lumber are the primary manufacturing inputs. The paper industry (SIC 26) was excluded from the study because industry structure, technology and related size economies, and environmental regulatory requirements limit its potential as an object of economic development efforts. The 10-state Northern and Central Appalachian region was chosen because the forests of the region are predominantly hardwoods, with similar species and forest types. Also, the states in the region compete for location of "value-added" hardwood processors, with each seeking to expand wood industry employment in-state.

The sample was drawn from the 1990 Harris Industrial Manufacturing Directory, listing wood products establishments operating in a state through 1989. Of the over 5,000 companies listed in SIC 24 and SIC 25, a sample of 2002 was chosen to insure a sufficient number of hardwood establishments. The sample was stratified by state, SIC category and employment class size to match the percentage of each grouping in the sample frame. The data were collected by a 4-stage mail survey, following the Total Design Method (Dillman 1978). All mailings occurred during the months of February and March 1990, a season of historically lower business activity for the industry.

One hundred eighty-four of the original 2002 questionnaires were returned as undeliverable, out of business and/or owner deceased, reducing the sample from 2002 to 1818. The total response rate for the 1818 surveys delivered was 56 percent, ranging from 62 percent from Pennsylvania to 42 percent from Virginia. Of the 1020 surveys returned, 37 percent (378 surveys) were returned with the comment "not in hardwood manufacturing." The majority of this group indicated that they processed softwoods, not hardwoods. Others mentioned dealing only with plastics and/or metal, or that they had ceased processing wood of any kind. Thus, a total of 642 surveys, 63 percent of the 1020 surveys returned, were coded for analysis.

To determine whether nonresponse biased the estimate of hardwood manufacturers sampled, a random sample of 50 nonrespondents was contacted by phone and asked several questions concerning employment size, type of business (SIC classification), and whether or not the business

Table 1. Export Orientation of Hardwood Manufacturing Industry Sectors

Industry Sector	N	Average Percent of Established Sales Made Out-of-State (Exports)	Export Oriented (>50% Sales Exported)		Non Export Oriented (≤50% Sales Exported)	
			Percent of Businesses	Average % Sales Exported	Percent of Businesses	Average % Sales Exported
Saw and Planing Mills (SIC 2421)	109	47.6 (35.6)	46.8	80.1 (13.8)	53.2	18.5 (19.4)
Dimension and Flooring (SIC 2426)	42	65.0 (29.3)	61.9	83.1 (14.9)	38.1	31.1 (14.5)
Millwork (SIC 2431)	84	35.8 (36.1)	32.1	82.1 (12.9)	67.9	12.2 (15.5)
Pallets and Containers (SIC 2441, 2448, 2449)	71	28.6 (34.9)	22.5	86.1 (15.4)	77.5	12.1 (16.3)
Building Materials (SIC 2435, 2439, 2452)	33	58.3 (40.3)	57.6	90.2 (13.2)	42.4	15.9 (17.9)
Wood Kitchen Cabinets (SIC 2434)	101	20.8 (29.3)	21.8	78.7 (13.9)	78.2	9.4 (15.7)
Furniture and Fixtures (SIC 2511, 2521, 2531, 2541)	99	50.1 (39.0)	50.5	85.9 (12.2)	49.5	15.6 (17.9)
Wood Products, NEC (SIC 2499)	103	52.7 (36.0)	48.5	86.2 (13.1)	51.5	18.9 (16.5)
Total	642	42.9 (37.4)	40.7	83.9 (13.7)	59.3	14.9 (17.4)
				N = 261	N = 381	

Note: Cell Structure: Mean (Standard Deviation).

used hardwood in its manufacturing process. The nonrespondents were similar to the respondents in these characteristics. In particular, of the 50 establishments surveyed, 38 percent (19) indicated that they used little or no hardwood in their manufacturing process. This closely matches the percentage of respondents (37 percent) that indicated they were "not hardwood manufacturers." The rest confirmed that they did use hardwood in their manufacturing process, which matches the percentage of respondents that returned usable surveys. Non-response, therefore, does not appear to have biased the estimate of hardwood manufacturers sampled.

Descriptive Characteristics

A state's hardwood manufacturing industry can sell output in any of several markets—in-state, other states, and foreign. For this paper, exports are defined as sales made outside the state, whether foreign or domestic.³ Admittedly, the state may not be the most appropriate unit from which to measure exports. Theoretically, defining some "functional economic area" from which to measure exports might be preferable. However, func-

tional economic areas are not likely to be identified with a particular political or administrative unit. Because the majority of development organizations and initiatives to encourage forest-based economic development are organized and administered at the state level, the state is considered the more useful unit of analysis for the purposes of this paper.

Hardwood manufacturers were grouped and analyzed by eight industry sectors based on the SIC principal product produced (Table 1).

- Saw and planing mills manufacture a homogeneous set of lumber products, the major inputs being timber and labor. Classified as primary processors, sawmills are considered the least value added of the sectors examined.
- Hardwood dimension and flooring provides pre-cut wood parts to the flooring, cabinet, and furniture industries, and represents a value added stage to the milling and kiln drying of lumber.
- Millwork includes window and door units, moldings, and allied interior millwork items for residential and commercial structures.
- Pallets and containers are relatively homogeneous products, stratified into a limited number of standard sizes and grades. Assembly procedures are highly automated with the principal variable inputs being lumber and labor.

³ Out-of-country exports averaged only 3.7 percent of sales, with 79.3 percent of firms selling nothing and 2.6 percent selling 50 percent or more out of the country.

Table 2. Characteristics of Export-Oriented and Nonexport-Oriented Hardwood Manufacturing Establishments

	N	Average Number of Employees	Percent Owned by County Residents	Percent of Wood Raw Material that is Hardwood	Percent In-State Wood Raw Material Purchases
Export Oriented (>50% Sales Exported)	261	64.0* (99.7)	58.0* (48.1)	76.8* (33.1)	53.5** (37.4)
Nonexport Oriented (≤50% Sales Exported)	381	19.7* (27.9)	75.2* (41.8)	64.5* (34.9)	60.9** (39.6)
Total	642	36.3 (59.3)	67.6 (45.3)	69.9 (34.7)	58.5 (38.7)

Note: Cell Structure: Mean (Standard Deviation).

T-test significance level between export oriented and nonexport oriented means: *.01; **.05.

- Building materials are structural wood members, hardwood veneer and plywood, and pre-fabricated wood buildings.
- Wood kitchen cabinets is a relatively high value added hardwood manufacturing sector utilizing a wide array of inputs and a higher level of skill (craftsmanship) during assembly, particularly in the market for custom cabinetry.
- Furniture and fixtures is generally regarded as the highest value added of the sectors examined, using skilled labor to manufacture high quality hardwoods.
- Wood products, not elsewhere classified (NEC), consists of establishments producing a wide range of products from 'boomerangs' to 'chessboards.' This sector has the most heterogeneous product mix of the eight sectors examined.

The survey revealed that several hardwood manufacturing industry sectors in the Northern and Central Appalachian states are primarily export-oriented, defined as making more than 50 percent of sales outside the state (Table 1). An average of 43 percent of sales per establishment went to out-of-state markets, ranging from 65 percent for dimension and flooring to 21 percent for wood kitchen cabinets. Nearly 41 percent of the hardwood manufacturing establishments studied can be classified as primarily export-oriented. These firms sold an average of 84 percent of sales per establishment out of state. The range was from 79 percent for wood kitchen cabinets to 90 percent for building materials. The nonexport-oriented establishments exported an average of only 15 percent of sales out of state. Dimension and flooring was the most export-oriented industry, with 65 percent of establishments meeting the 50 percent or more export criterion. The building materials and furniture and fixtures industries also had over half the

establishments classified as out-of-state exporters. The industries with the lowest percentage of establishments classified as export-oriented were wood kitchen cabinets (21 percent) and pallet and container manufacturers (29 percent).

The difference among hardwood manufacturing industries in level of exports raises an important question. What characteristics distinguish export-oriented from nonexport-oriented establishments? The mean differences between selected characteristics of export and nonexport-oriented establishments are shown in Table 2. The results suggest that export-oriented establishments are considerably larger, have lower levels of local ownership, process a higher percentage of hardwood, and purchase a lower percentage of their wood raw material in-state than do nonexport-oriented establishments.

Given that export orientation differs by industry (Table 1), and that export-oriented establishments have several characteristics significantly different from nonexport-oriented establishments (Table 2), can these characteristics be used to predict a higher or lower level of exports (export orientation)? This question is examined in the next section.

The Model

The percentage of a firm's total sales which are exported out of state was hypothesized to be a function of eight establishment and locational characteristics. (The independent variables and their means are summarized in Table 3.) Specifically,

$$Y_i = f(\text{EMP1990, LOCOWN, BRANCH, PCTWRM, HARDWRM, STPURCH, STPOP, NONMET})$$

Table 3. Independent Variables: Mean or Percent

Description	Mean
Total 1990 Employment	36.3
Percent Owned by County Residents	67.6%
Branch Plant Operation, or not	10.6%
Percent of Wood Raw Material that is Hardwood	69.9%
Percent of Wood Raw Material Purchased In-State	58.5%
Percent Expenditures for Wood Raw Materials as a Percent of Total Operating Costs	46.6%
Total 1990 Population of State of Location (thousands)	9398.3
Percent of Establishments in Nonmetropolitan Counties	40.0%

where establishment⁴ characteristics are:

EMP1990	= total firm employment in February 1990, as a proxy for firm size;
LOCOWN	= percentage of the firm owned by county residents;
BRANCH	= a dummy variable for type of firm organization (1 = branch plant operation, and 0 = not);
PCTWRM	= percentage of expenditures made for wood raw materials as a percentage of total operating costs, as a proxy for value-added;
HARDWRM	= percentage of wood raw material processed that is hardwood; and
STPURCH	= percentage of wood raw materials inputs purchased in-state, as a proxy for resource orientation;

and characteristics of the state or county are:

STPOP	= total 1990 population of state where business is located;
NONMETRO	= a dummy variable for location in a nonmetro county (1), or metro county (0).

Establishment Characteristics

The establishment characteristics include variables to distinguish among establishments which may generate more exports, and serve as proxies to measure the effects of firm structure expected by Cohen and Cyert (1965). The first establishment characteristic examined is size (total 1990 employ-

ment), with larger establishments hypothesized to have higher export levels. Larger establishments can be expected to have the staff and financial resources to allocate to gathering more information on nonlocal markets, and to develop the market. Larger size has been found to relate positively to exports (Bilkey and Tesar 1977; Cavusgil et al. 1979; Rieth and Ryan 1981; Smith 1992; Yaprak 1985). Although total sales is also a measure of size, the two are highly correlated. Employment was chosen since it is more directly related to local economic activity. The overall average employment size of the hardwood manufacturing establishments studied was 36. The range was from an average of 22 employees for saw and planing mills, to 53 for dimension and flooring plants.

The nature of ownership and establishment type reflect the internal organizational structure of the establishments. Both also relate to experience with and exposure to nonlocal markets, which has been found to be a significant determinant of international exports (Bilkey and Tesar 1977; Cavusgil et al. 1979). Locally owned businesses typically have closer ties to local markets. They are often individually owned and operated, single-unit establishments operating where the entrepreneur has established ties and has a greater knowledge of local markets, costs and other conditions. They tend to have fewer nonlocal contacts, and thus less knowledge of nonlocal market opportunities. In contrast, a publicly held corporation comprised of out-of-state owners, typically with branch and/or subsidiary operations, will be nonlocal in orientation (Barkley 1978; Shaffer 1989; Smith 1992), and thus more likely to be export oriented.

The level of local ownership is measured by the percentage of the establishment owned by county residents (LOCOWN). Approximately 66 percent of the hardwood manufacturers sampled were primarily locally owned (greater than 50 percent owned by county residents). The highest percentage of local ownership was among saw and planing mills (78 percent) and containers and pallets (76 percent), while the dimension and flooring industry had the lowest (52 percent).

Another indicator of internal organization is establishment type. Branch plants, as opposed to single unit establishments, have the resources of a large organization to use in accessing export markets. Also, branch plants typically are located to take advantage of a resource, or cheaper input, to make the product more competitive in larger markets. Cavusgil (1984) and Smith (1984) thus found branch establishments to be positively related to exports. On the other hand, findings by Bilkey and Tesar (1977) also indicate that branches are located

⁴ Establishment characteristics are from survey data.

to take advantage of local markets. The hypothesis here is that branch and/or subsidiary wood products establishments locate in response to the former set of forces, and thus are more likely to be export oriented. About 10 percent of the surveyed establishments were branch and/or subsidiary operations. Building materials had the highest percentage of branch establishments (24 percent), while containers and pallets had the lowest (3 percent).

The percentage of an establishment's total operating costs for wood raw materials (PCTWRM) is a proxy for value-added. That is, establishments with relatively high wood raw material costs as a percent of total operating costs are generally considered to be lower value-added establishments. One stated goal of economic development programs targeted at the wood products industry is to increase the level of value-added production in-state (Jones and Koester 1989). Thus, the implicit assumption is that higher value-added establishments (and/or industries) are more likely to have higher export levels than are lower value-added establishments. The coefficient sign on this variable, therefore, is expected to be negative.

The percentage of an establishment's wood raw material that is hardwood (HARDWRM) is a measure of input specialization. This variable is used to determine if establishments which specialize in hardwoods are indeed more likely to be export oriented. The hypothesis is that "specialty" producers (processing high percentages of hardwood) are likely to have higher export levels. The coefficient on this variable, therefore, is expected to be positive.

The percentage of in-state wood raw material purchases (STPURCH) measures whether out-of-state sales are related to an establishment's level of in-state wood raw material purchases, and thus resource orientation. Location theory (Richardson 1979) indicates that industries that are more resource oriented are likely to primarily engage in initial processing, with the output sold as an intermediate input. The hypothesis is that these sales would be in-state, and thus the coefficient sign on this variable is expected to be negative. That is, as in-state purchases of wood raw materials increase (greater resource orientation), the level of exports will decrease. This result would also indicate that such industries may not meet another criterion for contribution to local economic development—high[er] levels of local linkages, or a high[er] multiplier.

Locational Characteristics

State and county characteristics were chosen to examine the relationship between market size and

export orientation. Two measures of market size are total 1990 population of the state in which the business is located (STPOP), and metropolitan or nonmetropolitan status of the county in which the business is located (NONMET). These variables fall into Cohen and Cyert's (1965) classification of factors beyond the control of the firm. A larger state population should negatively affect export levels, as establishments with larger local markets have less need to export. Several studies of general manufacturing industries and levels of foreign exports have found that firms with large domestic markets export less, both internationally and from local areas (Yaprak 1985; Czinkota and Johnston 1983; Reid 1981; Cavusgil et al. 1979; Kale and Lonsdale 1979). In addition, there is the particular rural economic concern of whether or not certain industries can be expected to export from smaller, more remote counties.

The model is estimated with a two-limit tobit procedure (Maddala 1983) using the LIMDEP package. The model underlying tobit is expressed as follows:

$$Y_i = \begin{cases} 0, & \text{if } \beta X_i + \epsilon_i \leq 0 \\ \beta X_i + \epsilon_i, & \text{if } 0 < \beta X_i + \epsilon_i < 100 \\ 100, & \text{if } \beta X_i + \epsilon_i \geq 100, \end{cases}$$

where 0 and 100 are the lower and upper limits on the dependent variable Y_i , β the vector of coefficients, X_i the vector of independent variables, and ϵ_i , the independently normally distributed error with zero mean and constant variance σ^2 . The model assumes that $\beta X_i + \epsilon_i$ is a latent variable, observed only when it falls between the limits.

The tobit procedure is more appropriate than an OLS estimation, as the dependent variable is a percentage with limits at 0 and 100, thus giving a censored regression. Estimation with OLS leads to biased and inefficient estimators when a number of values of the dependent variable are at the limits. The percent of dependent variable values at either zero or 100 range from 9.5 percent to 43.6 percent for the eight industry categories (Table 4).

Results

The tobit regression results are reported in Table 4 for individual hardwood manufacturing industries. The results show that, indeed, there are considerable differences among industries in the factors influencing export level. While the equations are all statistically significant, the chi-square and pseudo R-square statistics indicate that the explanatory power of the model is better for some industries than others.

Table 4. Tobit Analysis of Hardwood Manufacturing Establishment Out-of-State Exports

Variable	Saw & Planing Mills	Dimension & Flooring	Millwork	Containers & Pallets	Building Materials	Kitchen Cabinets	Furniture & Fixtures	Hardwood Products, NEC
EMP1990	0.3463 (1.76)***	0.0617 (1.33)	0.3373 (3.88)*	0.5134 (1.76)***	0.6112 (3.51)*	0.1819 (3.90)*	0.1514 (1.65)***	0.0455 (0.55)
LOCOWN	0.0206 (0.16)	-0.1580 (1.81)***	-0.1572 (1.38)	-0.2916 (1.73)***	0.1038 (0.64)	-0.0428 (0.43)	-0.1048 (0.88)	-0.1007 (1.16)
BRANCH	14.007 (0.76)	20.881 (1.91)***	43.065 (2.85)*	13.723 (0.26)	-35.566 (1.76)***	46.905 (2.38)**	21.121 (1.09)	9.107 (0.75)
PCTWRM	-0.2827 (1.39)	0.0242 (0.16)	-0.0336 (0.18)	-0.1315 (0.45)	-0.2789 (0.91)	-0.3766 (1.92)**	-0.2864 (1.28)	0.0875 (0.58)
HARDWRM	0.4642 (2.41)**	0.1073 (0.35)	0.1974 (1.39)	-0.1423 (0.66)	0.8957 (3.83)*	0.0743 (0.60)	0.3060 (2.04)**	0.3029 (2.51)*
STPURCH	-0.2231 (1.40)	-0.4212 (2.28)**	-0.1453 (-1.11)	-0.2874 (1.52)†	-0.4020 (1.80)***	0.0565 (0.42)	-0.0724 (0.50)	-0.1377 (1.37)
STPOP	-0.0024 (2.40)**	-0.0016 (1.79)***	0.0016 (1.61)†	-0.0035 (2.52)*	-0.0089 (3.30)*	0.0006 (0.41)	0.0014 (1.05)	-0.0012 (1.60)†
NONMET	16.980 (1.74)***	19.538 (2.32)**	16.380 (1.87)***	20.379 (1.43)†	12.680 (0.88)	-15.705 (1.58)†	7.824 (0.66)	5.491 (0.65)
\bar{Y}	47.6%	65.0%	35.0%	28.6%	58.3%	20.8%	50.1%	52.7%
Observations at 0% and 100%	22.0%	9.5%	26.2%	39.4%	27.3%	43.6%	25.2%	20.4%
N	89	36	65	60	26	79	84	89
Pseudo R-square	.188	.424	.386	.246	.528	.300	.178	.187
Chi-square	20.64	26.54*	40.78*	19.62**	29.07*	33.98*	18.24**	20.42*

*Numbers in parentheses are t-ratios.

Significance levels: *.01, **.05, ***.10, †.15.

Establishment Characteristics

The significance of establishment characteristics varies considerably by industry. Establishment employment size (EMP1990) is statistically significant for six of the eight industries—saw and planing mills, millwork, containers and pallets, building materials, kitchen cabinets, and furniture. As hypothesized, the signs on the coefficients are positive for all eight industries examined. That is, the larger the establishment, the higher the level of exports. Interestingly, the predictive power of employment size is a less significant export predictor for establishments in the lower value-added industries, such as sawmills, dimension and flooring, pallets and containers, and “other” hardwood products. The first three of these industries are rural and resource-oriented.

The percentage of an establishment owned by county residents (LOCOWN) is statistically significant and negative for only two of the industries—dimension and flooring, and containers and pallets—which are lower value-added industries. Previous research shows that locally owned businesses are less likely to be export oriented. The results here indicate, however, that this variable is

not a major influence on export levels for hardwood processing industries. Thus, locally owned businesses, which tend to be small, locally-generated entrepreneurship, can be considered just as likely to export out of state, and therefore worthy of policy attention.

At the same time, whether or not the establishment is a branch operation (BRANCH) appears to play an influential role in the export level for certain industries. As noted above, branch plant establishments are typically not locally owned, and therefore are more likely to be externally oriented, unlike independently owned and operated establishments. The variable is positively related to exports for all but one industry, and statistically significant for dimension and flooring, millwork, and kitchen cabinets. Interestingly, the variable is statistically significant but negatively related to exports in the building materials sector model. This finding indicates that unlike the other hardwood industries, building materials branch plants may be established to penetrate local markets, as found by Bilkey and Tesar (1977) for other industries.

The percentage of total operating costs spent on wood raw materials (PCTWRM), a proxy for value added, is negatively related to exports for six of the

eight industries but statistically significant for only kitchen cabinets—one of the two highest value added industries examined. This finding indicates that a higher raw material content, and thus lower the value added, does not necessarily mean a local market orientation.

The percentage of wood raw material that is hardwood (HARDWRM), a proxy for input specialization, is positively related and statistically significant for four of the eight industries—sawmills, building materials, furniture, and “other” hardwood product industries, and the signs are positive for seven of the eight industries. The higher the percentage of hardwood, the higher the percentage of the establishment’s sales that are exported. The implication is that establishments which specialize in hardwood are more likely to be export oriented than establishments which use relatively less hardwood. Thus, efforts to generate or attract businesses that use a state’s hardwood resource do appear likely to added to the export base.

The percentage of an establishment’s in-state purchases of wood raw materials (STPURCH), an indicator of resource orientation and backward linkage, is negatively related to export levels for seven of the eight industries examined. That is, the higher the level of in-state purchases the lower the export level. The coefficient is statistically significant for only dimension and flooring and building materials, and marginally so for containers and pallets. This result indicates that the greater the raw material orientation the lower the direct exports, particularly for these lower value-added industries.

Locational Characteristics

State population (STPOP) was generally negatively related to the level of exports, thus supporting the hypothesis. It was statistically significant for four of the eight industries, and marginally so for two other industries. That is, as market size increases, the level of exports decreases, *ceteris paribus*. This conforms to previous research for other industries.

A nonmetropolitan location (NONMET) does not appear to be detrimental to out-of-state exporting by hardwood processors. The relationship was positive for seven of the eight industries, and statistically significant for four of the seven (although only marginally so in one case). Interestingly, these four are the lowest value-added industries. The one negative coefficient, was marginally significant (at the .15 level), was for kitchen cabinets, one of the two highest value-added industries.

Summary and Conclusions

Resource-based economic development efforts are taking on renewed emphasis in state development policies. In the ten northern and central Appalachian states, the hardwood forest resources provide particular potential. Policies to strengthen a state’s economy in this area implicitly rest upon the export base concept and process. That is, the more an industry exports from a state the more it contributes to the state’s employment and income. The purpose of this paper was to examine the role of specific hardwood manufacturing industries in directly exporting beyond state borders, and to determine establishment, state and county factors associated with higher export levels.

The survey of 642 establishments found that almost 41 percent were primarily export-oriented (greater than 50 percent of sales made out-of-state), with that group exporting an average of 84 percent of their sales. Industries with the highest percentage of exporting establishments were dimension and flooring, building materials and furniture manufacturers. The least export-oriented were kitchen cabinets and container and pallet manufacturers, with an average of over 70 percent of sales made in the state where located.

Tobit regression results indicated that larger establishments, branch plants, and those with higher levels of specialization in hardwood processing had higher percentages of out-of-state exports. Also, locations in nonmetropolitan counties were positively related to higher export levels. These latter establishments tended to be the lower value-added (less processing involved) industries. A larger state population (larger local market) was negatively related to exports, as was a higher level of raw material purchases in the state of location (resource orientation). These results conform to predictions from location theory, which say that higher value-added industries tend to locate closer to final markets.

The results indicated that a focus on hardwood processing industries is a viable economic development policy. First, the range of industries examined all contribute to a state’s export base. Second, a greater specialization in hardwoods leads to higher export levels. Third, and of at least equal importance, nonmetropolitan areas also can expect to benefit from export-oriented processors. While nonmetropolitan processors are most likely to be lower value-added, the results indicate that this does not necessarily imply lower exports. Two of the top five export industries were lower value-added, with one of these the highest exporter. Also, size was a less significant predictor of ex-

ports for lower value added industries, which tend to be nonmetropolitan and smaller in size.

The results also lend support for both of the two main directions in development efforts—recruitment and support of locally generated businesses. The standard perception that branch plants fill the export base role, and thus should be recruited, was supported, although not for all industries. Building materials branch plants appear to have nonmetropolitan locations to serve these markets. Also, only 10 percent of the establishments were branch and/or subsidiary operations. In addition, research by Barkley (1993) and Barkley and Hirschberger (1992) indicates that the growth potential from this source is low. This would imply that the chances of a branch plant locating in rural areas are lower, vs. a locally owned and generated enterprise, and thus should not be the primary focus of a development efforts.

The second focus for local development efforts is the small, locally owned and generated businesses, which comprise the large majority of the hardwood manufacturing establishments. The hypothesis (drawn from previous research) that small locally-owned businesses are not export oriented was neither clearly supported nor refuted. Also, previous research has shown that these businesses are more likely to expand in the immediate area (Smith et al. 1992). To increase the exports from businesses that have little such orientation, however, will require considerable effort. They tend to lack experience in, orientation to, and awareness of broader markets. In addition, they typically lack access to the capital and technology (Markley 1992) that would allow them to reduce costs, expand production, and add value to the product.

A longer term rural development policy might be to focus on the locally generated, lower value-added industries that use a natural resource and are already exporting, and work with them to move into other, higher value-added product lines, or develop ties with such processors. They have the export orientation and contacts, and could be considered strong candidates for further export expansion (Cavusgil 1984). An example is the dimension and flooring sector, which could be termed an "ideal" industry from the rural development perspective—higher levels of exports, employment, and purchases of local raw material than other sectors. Other lower value-added industries, such as millwork and pallets and containers, may not contribute as much in direct exports, but these products are intermediate goods that likely end up as indirect exports.

A final practical implication is that the information from this study can form the basis for state and

local Cooperative Extension programs, U.S. Forest Service initiatives to form community action teams for forest resource-based economic development, and state legislative actions. To take advantage of these findings, however, further research is needed to identify factors that can be more influenced by direct state or local actions. Such research might concentrate on determining characteristics of individual owner/operators and the local entrepreneurial climate to see which policies may positively affect export orientation.

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