

FACTORS AFFECTING THE LOCATION OF HARDWOOD MANUFACTURERS

FACTORS AFFECTING THE LOCATION AND OPERATION OF HARDWOOD MANUFACTURERS: NORTHERN AND CENTRAL APPALACHIAN STATES

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ABSTRACT There is growing federal, state, and local interest in forest-based economic development in the Northern and Central Appalachian region of the United States. This study identifies those factors important to the hardwood manufacturer's location decision. Concepts from neoclassical and behavioral location theory were integrated to develop a general framework for analyzing the location decision-making process. The majority of establishments did not conduct a multiple-site location search. To a great extent, establishments locate based on personal ties. The majority of variables found to influence location decisions are not directly controllable by state or local government. The policy implications are that existing establishments should be targeted for retention and/or expansion, rather than focusing on recruitment.

INTRODUCTION

There is growing federal, state, and local interest in forest-based economic development in the Northern and Central Appalachian region¹ of the United States. In several states and communities, this interest has been stimulated by severe employment cutbacks in traditional manufacturing and extractive industries. In others it has emerged from the realization that regional timber resources are becoming more valuable and that there may be ways to use them to foster economic development, particularly rural economic development (Bodenman et al. 1990).

Evaluation of state and interstate programs to encourage forest based economic development (Jones and Koester 1989) indicated that the majority of industrialization programs currently in place, particularly those involving grants, loans, and tax concessions, implicitly assume that wood manufacturers conduct multi-site location searches. Likewise, the assumption of perfect information made in location theory implies that firms conduct a location search taking into account all available data in the process of making a profit-maximizing location decision. Behavioral theorists indicate, however, that the firm may not conduct location searches to the extent implied by classical theory and previous research, suggesting that most location decisions may be outside the influence of state and local economic development policy.

The goal of this study is to identify and understand the factors important to hardwood manufacturer's locations. An appreciation of the factors and their importance in the hardwood manufacturer's location decision can improve the ability of policy makers, resource managers and local economic development communities to intervene in the location decision process, and may foster growth of the hardwood industry in their respective states and/or communities.

BACKGROUND

Ultimately the strengths and weaknesses of forest based economic development programs cannot be appraised until more complete knowledge is obtained about the economic factors which commonly influence the location decision of hardwood manufacturing firms. To be successful, public and private efforts to influence the location of forest based industrial activity must be based on an understanding of the factors which influence the location of firms, and how firms evaluate these factors when making a location decision.

Neoclassical location theory provides a conceptual framework for analyzing the investment decision of the hardwood manufacturing firm (Dicken and Lloyd 1990; Berry et al. 1987; Smith 1981). The theory holds that a firm's investment decision is directly related to expected profits, which depend on factors influencing cost and revenues. General factors that influence this decision may be separated into three types: (1) those that affect the demand for output; (2) those that affect cost of production at a particular location; and (3) non-market factors such as quality of life, the natural environment, and personal considerations, that

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

may affect the attractiveness of a location as a place to live and do business. The weight of these general factors and the specific components of each will determine whether a plant locates near the raw material resource, the market or elsewhere.

Because both current and future information about prices, markets and costs is expensive to obtain, the process of acquiring information will directly affect location decisions. One method used by firms to reduce search costs is to make location decisions in several stages. Surveys and interviews with business decision-makers indicate that most large firms tend to select a location in at least two stages (Schmenner 1982; Moriarity 1980; Browning 1980). First a region (perhaps a state or larger) is selected on the basis of such factors as the size of the potential market, the general level of factor costs, or the existence of a reliable supply of natural resources. Then within that region, a number of communities are examined in greater detail, considering specific information such as the cost and availability of different types of labor, land, transportation, taxes, and other spatially varying factors (Schmenner 1982; Browning 1980). This two-stage process reduces the amount of costly information that would be required if all sites were investigated.

Behavioral location theorists hold that firms do not try to maximize or minimize any single variable as a overall objective in a location decision; they try to attain satisfactory rather than optimal patterns of behavior -- "profit satisficing," for example, rather than profit maximizing (Cyert and March 1963; Berry et al. 1987). The actual location search is strongly influenced by the firm's projected production needs based on the goals of the firm, i.e., entry into new markets, maintenance of market share, product diversification, new production processes (Dicken and Lloyd 1990). Profit satisficing may provide an explanation for firms' willingness to conduct a limited search for only an acceptable location. Broadly speaking, firms will tend to choose sites where an acceptable level of sales is essentially guaranteed (Richardson 1979; Webber 1972).

Incorporating behavioral concepts into the neoclassical approach to investment greatly enhances the development of a general framework for analyzing the factors important to hardwood manufacturing location. Recognizing that profits depend in part on the location of future sellers and consumers, firms must try to secure a location that will be reasonably good (at least allow them to stay in business) regardless of what other firms decide. By relaxing the assumption of perfect information and placing emphasis on the decision making environment, and the costs associated with location search, behavioral theory provides an alternative perspective to the location decision of the hardwood manufacturing firm.

THE DATA

Two industry segments were selected for study -- lumber and wood products (Standard Industrial Classification -- SIC -- 24) and furniture and fixtures (SIC 25). In both of these groups, logs and cut lumber are primary inputs in manufacturing, as opposed to pulp, which is the primary input for paper and allied products (SIC 26). The paper industry was excluded from the study because the current industry structure, technology and related size economies, and environmental regulatory requirements limit its potential for growth in the region. The hardwood processors produced lumber (SIC 2421), hardwood dimension and flooring (SIC 2426), millwork (SIC 2431), wood kitchen cabinets (2434), hardwood veneer and plywood (2435), structural wood members (SIC 2439), nailed wood boxes (2441), pallets (2448), containers (SIC 2449), and furniture and fixtures (SIC 2511, 2521, 2531, and 2541).

The data are drawn from a mail survey of 2002 wood manufacturing establishments in the ten-state region. The sample was selected from the 1990 Harris Industrial Manufacturing Directory, which lists virtually every firm operating in a state through 1989. A random sample of the 5,336 companies was drawn, stratified by size, state, and SIC category.

The survey method followed Dillman (1978) and consisted of four contacts during February and March, 1990: an initial mailing with questionnaire, a follow-up post-card reminder, and two other mailings with questionnaires. The original sample was reduced to 1,818 after deleting undeliverables and firms that were out of business. The total usable response rate was 56%. The sample was further reduced by excluding establishments that did not specifically use hardwood in their manufacturing process, leaving a final sample of 496 establishments for the purposes of this study. For further details on the sample and returns, see Bodenman (1991).

RESULTS

For the purposes of this study, factors affecting location were evaluated on the basis of general location factor categories, plus specific location factors within these general categories. The general categories selected from location theory and previous studies are: (1) market access, (2) wood raw materials access, (3) labor costs and availability, (4) infrastructure, service and utilities, (5) taxes and regulatory considerations, and (6) personal and community considerations (Browning 1980; Dicken and Lloyd 1990; Moriarity 1980; Schmenner 1982; Smith 1981). Respondents were asked to assign each general location factor a rating between 0 and 100 (totaling 100 for all 6 factors), based on the importance of the general factor to the location decision. The higher the value, the more important that variable in the establishment's location decision. Average ratings are listed in Table 1.

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Table 1. Average Location Factor Ratings¹ by Location Search Process

	n	Market Access	Wood Raw Material	Labor Costs, Availability	Services, Utilities	Taxes, Regulations	Personal Considerations
Conducted Location Search	138	22.73	20.83	19.08	9.11	7.65	20.85
Did not Conduct Search	358	19.42	18.83	13.04	5.97	5.10	37.74
Total	496	20.34	19.39	14.72	6.84	5.81	33.02

¹ Rated 0-100 based on the relative importance of factor to firms location decision.

Note: T-tests indicate that the differences between firms that conducted a location search and those that did not are all statistically significant at the 0.05 level.

General factor ratings

Overall, the factor ranked highest by hardwood manufacturers was community and personal considerations (rated 33%). The two location factors rated least important were infrastructure, services, and utilities (rated 7%), followed by tax and regulatory considerations (rated 6%). These last two factors, strongly controlled by state and local government, and often emphasized in economic development efforts, therefore, are of marginal importance in hardwood manufacturing location decisions.

The role of government and development agencies in hardwood manufacturing location decisions was also examined. In response to the question "When your company located this plant at this site did you receive any financial or other types of aid from federal, state, or local agencies or groups concerned with business development?", 87% of the respondents answered "no". Of the respondents that answered "yes" to this question (13%), only 25% answered "yes" to "Was the aid you received crucial to your decision to locate at this site rather than another site?" These findings imply that aid packages currently in place, at both the state and local levels, have not had much influence in the location decision of this industry.

Perhaps the key finding of this study, however, is that few hardwood manufacturing establishments actually conduct location searches in which data on multiple sites is considered. The study found that 74% of the hardwood manufacturing establishments surveyed did not conduct a multiple-site search. For the 26% of establishments that did conduct a location search, the search process was as follows: (1) less than 1% of these establishments considered a location outside of the United States; (2) 15% first selected a region or section of the nation larger than the state in which to locate; (3) 29% considered other state(s), besides the state in which they located; and (4) 93% considered other communities besides the one in which they located. This finding indicates that the geographical dimensions of location search are much more confined than implicitly assumed by location theory and economic development strategies based on theory.

Location factor ratings by establishments that conducted a multiple-site location search and those that did not are listed in Table 1. T-tests performed for each variable revealed that differences in percentage ratings between the two categories of respondents vary significantly from zero at the 0.05 level for all factors. The greatest percentage difference between establishments that conducted a multiple-site location search and those that did not involves the rating assigned to community and personal considerations. Establishments that did not conduct a multiple-site search gave this variable a 38% rating versus the 21% average rating assigned by establishments that did conduct a multiple-site search.

Market access was the factor rated most important (23%) by establishments that did conduct a multiple-site location search, and ranked second (19%) by establishments that did not conduct a location search. Both categories of respondents rated tax and regulatory considerations lowest in terms of importance in the establishment's location decision -- 8% by firms that conducted a

multiple-site search, and 5% by firms that did not. Thus, even establishments that conducted a multiple-site search, and considered data on a number of different sites before making a location decision, did not consider this variable to be very important in their decision. Infrastructure, services, and utilities was also rated low by both categories of respondents -- 9% by establishments that conducted a location search, and 6% by establishments that did not. Both of these factors are strongly controlled by state and local government and are often emphasized in development and recruitment efforts. The low overall rating of both variables, however, indicates that neither carries much influence or importance in the hardwood manufacturing establishment's location decision. Wood raw materials access was rated relatively the same by both categories of respondents -- 21% and 19%, respectively. Labor costs and availability, however, were rated 19% by establishments that conducted a location search versus 13% by establishments that did not. Although considered important by establishments that did consider multiple sites in their location decision, overall labor is ranked less important than personal considerations, market access, and wood raw materials access.

Component Ratings

In addition to rating general location factor categories, respondents were asked to rate 4-5 components within each general factor category. Components were assigned a 1, 2, 3, or 4 rating depending on the importance of the factor component in the establishments location decision, where 1 = critical, 2 = very important, 3 = somewhat important, and 4 = not important. Because of the number of component variables ranked (30), only those with average ratings less than 2.50 (the lower the rating, the more important the factor component in the location decision) will be discussed.

Average component ratings are listed in Table 2. Overall, six components from four general location factor categories were rated 2.50 or less. The component rated highest was personal ties to the area, with a 1.90 rating. The high rating assigned this variable is consistent with the overall high percentage rating assigned the general factor category (33%). The component rated second highest was availability of an existing building or site, with a 2.28 rating. This rating is surprising given the low overall percentage rating (7%) assigned the general factor category: infrastructure, services, and utilities.

The next highest rated component was good labor relations with a 2.34 rating. A pool of labor with adequate skills, and attitude towards industry were rated 2.50. None of the other 24 components were assigned overall average ratings of 2.50 or less. Only two general factor categories did not have any components rated 2.50 or less: market access, and tax and regulatory considerations. Tax and regulatory considerations was also assigned a low percentage rating (6%) and ranked lowest overall of the six general factor categories. In contrast, market access was ranked second overall with a 20% rating. However, the highest rated component in this category was proximity to market area with a 2.52 rating, followed by roads and other transport facilities with a 2.68 rating.

Components were also compared by establishments that conducted a location search and those that did not (Table 2). Overall, establishments that conducted a location search rated factors other than "personal ties to local area," higher (more important) than establishments that did not. In the general factor category "market access," establishments that conducted a location search assigned relatively high ratings to roads and other transport facilities (2.39) and proximity to market (2.35). In the general factor category "wood raw materials access," both categories of respondents assigned high ratings to local availability of wood raw materials. In this case, a t-test revealed that mean differences between ratings are not significantly different from zero at the 0.05 level. In other words, neither category of respondent rated the variable significantly higher than the other.

Low wage rates, high worker productivity, good labor relations, pool of labor with adequate skills, availability of existing building or site, business taxes, property taxes, local zoning laws, environmental regulations, community attitude toward industry, and personal ties to the local area were all rated highly by firms that conducted a location search. On the other hand, the components rated highly by firms that did not conduct a location search include: personal ties to the local area (1.78), local availability of wood raw materials (2.40), good labor relations (2.43), and availability of an existing building or site (2.31).

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Table 2. Average Component Ratings¹ by Location Search Process

Specific Factor Variables by Six Categories	Conducted Location Search	Did Not Conduct Location Search	Overall Average
<u>Market Access:</u>			
Roads, Transport Facilities	2.39	2.80	2.68
Proximity to Market Area	2.35	2.59	2.52
<u>Raw Materials Access:</u>			
Local Availability of Wood Raw Materials	2.50*	2.40*	2.43
<u>Labor Cost/Availability:</u>			
Low Age Rates	2.50	2.87	2.77
High Workforce Productivity	2.19	2.63	2.51
Good Labor Relations	2.11	2.43	2.34
Pool of Labor with Adequate Skills	2.16	2.63	2.50
<u>Infrastructure/Services:</u>			
Availability of Building or Site	2.21*	2.31*	2.28
<u>Taxes/Regulations:</u>			
Business Taxes	2.44	2.85	2.74
Property Taxes	2.36	2.78	2.66
Local Zoning Laws	2.20	2.75	2.59
Environmental Regulations	2.49	2.92	2.80
<u>Community/Personal:</u>			
Attitude Toward Industry	2.21	2.61	2.50
Personal Ties to Area	2.22	1.78	1.90

¹Rated 1, 2, 3, or 4 based on the importance of the factor in the establishment's location decision, where:

- 1 = critical,
- 2 = very important,
- 3 = somewhat important,
- 4 = not important.

*T-test results indicate differences between the firms that conducted a location a location search and those that did not are not statistically significant at the 0.05 level.

SUMMARY AND POLICY IMPLICATIONS

States in the Northern and Central Appalachian region are increasingly recognizing the employment and economic potential of their hardwood forest resources. Programs have been established to foster the growth of hardwood manufacturing. Most are based on the traditional assumption, in both theory and practice, that new firms will move into a state and/or community. This approach implies that a location search will be conducted. The goal of this study was to examine the location decision of a sample of hardwood manufacturing firms in the region and determine: (1) the factors important to firm location; and (2) how firms evaluate these factors when making a location decision.

Community and personal considerations was the general location factor ranked most important by hardwood manufacturing establishments. The two components rated highest in this general factor category were community attitude towards industry, and personal ties to the area (lived here; family here). The overall high rating assigned these general factor components indicate they are the most influential factors in the hardwood manufacturers location decision. Only community attitude towards industry, however, is controllable by state and/or local government.

Market access was the general factor ranked second in importance, followed closely by wood raw materials access. Labor costs and availability ranked fourth. The factors infrastructure, services, and utilities, and tax and regulatory considerations were ranked last. Both of these factors are strongly controlled by state and/or local government and are often emphasized in development and recruitment efforts. The low overall rating given these factors by both establishments that conducted location searches and those that did not, however, indicates that neither carries much influence or importance in the hardwood manufacturing establishments' location decision. This concurs with the finding that few establishments receive aid, and of those that do, fewer still consider aid crucial to the decision to locate in a particular state or community.

Statistically significant differences between establishments that conducted a location search and those that did not were found for each of the factors ranked. Establishments that conducted a location search placed less emphasis on the importance of community and personal considerations, and more on the other factors ranked. Not surprisingly, however, the ranking of factors between those conducting a search and those not was quite similar. The only difference in rank was between personal considerations and market access. Establishments that conducted a location search ranked market access first and community and personal considerations second. The order was reversed for establishments that did not conduct a location search. All other factors were ranked in the same order. Thus, although the emphasis placed on each factor by establishments that conducted a location search versus those that did not was significantly different, the overall ranking of each factor in order of importance was similar.

Those concerned with development and expansion of the hardwood manufacturing industry must recognize that most location decisions are outside the influence of state and/or local economic development policy. Although location theory and economic development strategies based on theory implicitly assume otherwise, the majority (74%) of the hardwood manufacturing establishments surveyed did not conduct location searches. To a great extent, establishments locate where they do based on personal ties to an area. In addition, the majority of variables found in this study to influence the likelihood of search are not controllable by state and/or local government.

Because it is highly unlikely that the typical hardwood manufacturing establishment will conduct a location search, recruitment of new industry to the state should not be the chief objective of economic development efforts. Instead, the implication is that existing establishments should be targeted for retention or expansion. Attitude towards industry was one of the specific factors controllable by state and/or local government that was rated most important by the hardwood industry. The ties of existing industries to the state and/or local community, therefore, can and should be strengthened. Establishments that develop deep roots in the state and community will not need the costly tax concessions and other incentives often emphasized in recruitment programs. Development resources, thus can be re-directed to efforts focused on expanding existing industries, particularly those industries determined to have a competitive advantage.

Market access was the factor ranked most important by establishments that conducted a location search, and ranked second, behind personal considerations, by establishments that did not search. The overall importance of market access implies, however, that those interested in development of hardwood manufacturing industries can help by sponsoring market research, identifying new and growing markets, and actively supporting industry product promotion programs. Obviously, development and expansion of industry can occur only if markets for products produced in the region grow. If markets for hardwood products do not expand, states in the region will be playing a zero sum game. One state's gain in production and employment will only be another state's loss.

Access to wood raw materials was the factor ranked next in importance by both establishments that conducted a location search and those that did not. The importance of wood raw materials access to hardwood manufacturers emphasizes the importance of both accurate data on timber supplies availability, as well as sustainable rates of harvest. Retention and/or expansion of these industries cannot take place if timber supplies from the area are depleted and/or forest land use shifts and restrictions on harvesting limit industry access to timber.

Promoting educational programs that foster a stable, diverse, and abundant labor pool is sound development policy for all industries. Low wage rates, high workforce productivity, a labor pool with adequate skills, and in particular, good labor relations, were all specific factors rated highly important by establishments that conducted location searches. Good labor relations also was rated highly important by establishments that did not search. Thus, high levels of educational and vocational training are needed to ensure that a steady stream of trained labor is available to industry. However, with respect to hardwood manufacturing industries, the findings of this study imply that these programs should not be emphasized at the expense of programs designed to

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expand product markets, and increase resource availability/accessibility. Growth in employment opportunities will expand only if the markets for products and the industry itself expands.

Overall, development efforts need to be directed at improving those factors considered most important by hardwood manufacturers in their location and/or expansion decisions. Factors of little importance to the industry should receive less focus in development policy. For example, availability of an existing building or site was one of the specific factors rated highest (second only to personal ties to area) by both those establishments that searched and those that did not. However, as part of the general factor category "infrastructure, services, and utilities," the variable was ranked next to last in terms of importance by both categories of respondents. Similarly, local zoning laws and property taxes were two of the factor components rated highly important, but the factor category tax and regulatory considerations was ranked last in terms of importance to the establishments' location decision. Surprisingly, environmental regulations, a specific factor often complained about by industry, was not considered very important in the establishments' decision to locate and/or expand. Both findings imply that attention to these factors in recruitment and development programs should be de-emphasized.

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