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ANALYSIS OF HARDWOOD MANUFACTURERS LOCATION DECISIONS: NORTHERN AND CENTRAL APPALACHIAN STATES, 1989-1999

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ABSTRACT: *There continues to be significant federal, state, and local interest in forest-based economic development in the Northern and Central Appalachian region of the United States. This study is designed to follow-up on a similar study conducted ten years previous (Bodenman, 1991) and specifically identify and examine those factors important to hardwood manufacturer's location and expansion decisions during the 1989-1999 study period. The study is based on a mail survey of 365 businesses that utilize hardwoods in their production process. Principal findings are that the majority of establishments did not conduct a multiple-site location search, and that to a great extent, establishments locate based on personal ties. Similar to findings from an earlier study of the industry (Bodenman, 1991), 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 of new businesses.*

INTRODUCTION

There continues to be ongoing and significant interest at all levels of government in forest-based economic development in the Northern and Central Appalachian region[1] of the United States (Figure 1). At the federal level, the Appalachian Regional Commission (ARC), in conjunction with the U.S. Forest Service and other agencies concerned with economic development, has sponsored research and development programs to encourage forest-based development in the region (Herzog and Sclottman, 1991). Likewise, a number of development initiatives at the state (i.e, The Pennsylvania Hardwood Initiative) and local level have been in place over the last 10-15 years to encourage forest-based development (Jones and Koester, 1989). In a number of states and communities, this interest has been stimulated by employment cutbacks in traditional manufacturing and extractive industries. In others it has emerged from the realization that regional timber resources are becoming more valuable, that in many areas timber growth far exceeds removal (Figure 1), and thus, that there may be ways to better utilize local forest resources to foster economic development, particularly rural economic development (Bodenman et al., 1997; Bodenman et al., 1996; Fraser, 1993; Bodenman et al., 1990).

An evaluation of state and interstate programs to encourage forest based economic development by Jones and Koester (1989) concluded that the majority of industrialization programs in place prior to 1989, particularly those involving grants, loans, and tax concessions, implicitly assume that wood manufacturers conduct multi-site location searches. A review of state and local development programs promotional literature and websites indicates very little change in the approach to forest-based economic development over the last ten years. Likewise, the assumption of perfect information made in location theory implies that firms conduct a location search taking into account all available data

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

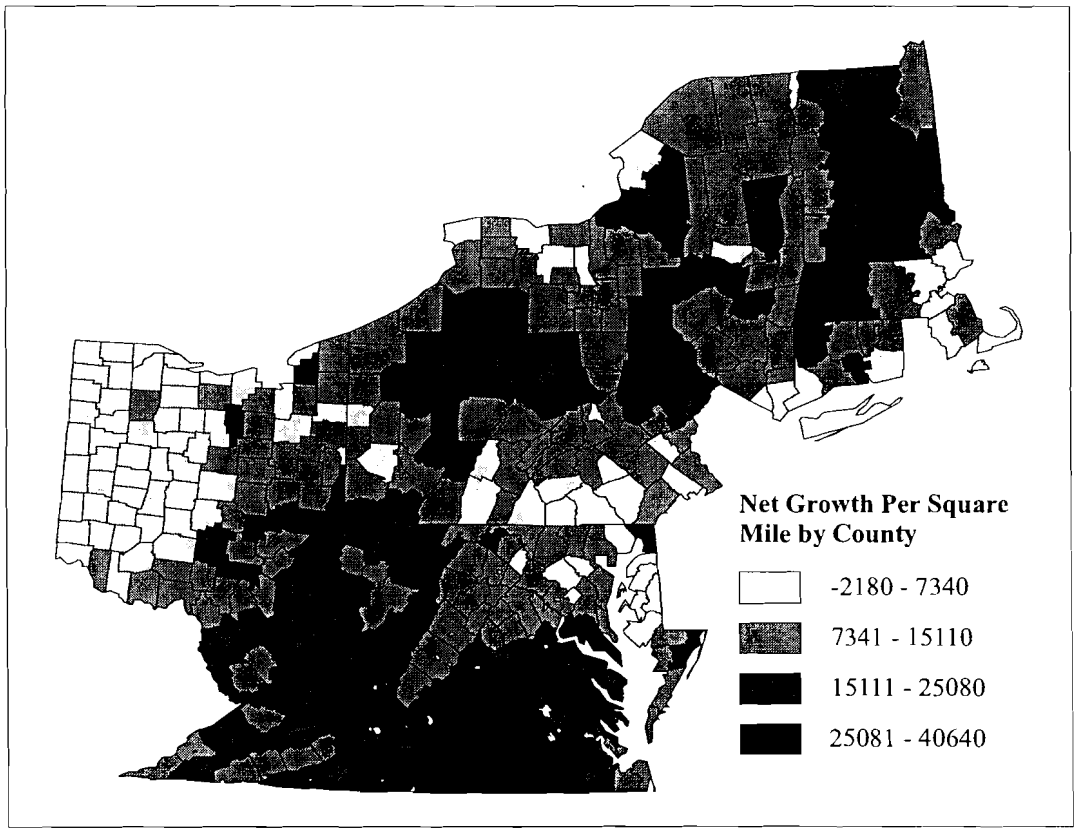

Figure 1. Net growth stock on timberland (cuft) divided by the total area of land in each county (mile^2), 1989-1999 forest inventory data. *Source*: U.S. Forest Service.

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 suggests that most location decisions may be outside the influence of state and local economic development policy.

The goal of this study is to follow-up on a similar study of the industry (Bodenman, 1991) conducted ten years earlier, and specifically identify and understand the factors important to hardwood manufacturer's location decisions. 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 foster growth of the hardwood industry in their respective states and/or communities.

BACKGROUND

Neoclassical location theory provides a conceptual framework for analyzing the investment decision of the hardwood manufacturing firm (Hayter, 1997; Harrington and Warf, 1995; Chapman and Walker, 1991; Dicken and Lloyd, 1990; Berry et al., 1997; 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 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 (Hack, 1999; Drezner, 1995; Greenhut, 1995; 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 (Hack, 1999; Drezner, 1995; 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 an 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., 1997; Beckman, 1999). 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 (Chapman and Walker, 1991; 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 (Laulajainen and Stafford, 1995; 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

The study is designed as a follow-up to a previous study of the hardwoods industry (Bodenman, 1991) conducted in 1990. 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 2000 wood manufacturing establishments in the ten-state region. The sample was selected from the 1999 Harris Industrial Manufacturing Directory, which lists virtually every firm operating in a state with the SIC codes listed above. A random sample of the 8,726 companies was drawn, stratified by size, state, and SIC category.

The survey method followed Dillman (1978) and consisted of four contacts during June,

July, and August, 1999: an initial mailing with questionnaire, a follow-up post-card reminder, and two other mailings with questionnaires. The original sample was reduced to 1,942 after deleting undeliverables and firms that were out of business. The total usable response rate was 52%. The sample was further reduced by excluding establishments that did not specifically use hardwood in their manufacturing process, and/or did not make a new location and/or relocation decision during the 1989-1999 study period, leaving a final sample of 365 establishments for the purposes of this study.

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 (Beckman, 1999; Hack, 1999; Drezner, 1995; Dicken and Lloyd, 1990; Browning, 1980; 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.

General Factor Ratings

Overall, the factor ranked highest by hardwood manufacturers was community and personal considerations (rated 36%). The two location factors rated least important were infrastructure, services, and utilities (rated 8%), followed by tax and regulatory considerations (rated 5%). These last two factors, strongly controlled by state and local government, and often emphasized in economic development efforts (Kish-Goodling; Jones and Koester, 1989), therefore, appear to be 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?", 91% of the respondents answered "no". Of the respondents that answered "yes" to this question (9%), only 21% answered "yes" to "Was the aid you received crucial to your decision to locate at this site rather than another site?." Similar to findings in an earlier study (Bodenman, 1991), 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 76% of the hardwood manufacturing establishments surveyed did not conduct a multiple-site search. For the 24% 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) 9% first selected a region or section of the nation larger than the state in which to locate; (3) 26% considered other state(s), besides the state in which they located; and (4) 89% considered other communities besides the one in which they located. Again, similar to findings in an earlier study of the industry (Bodenman, 1991), 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

Table 1 Average Location Factor Ratings[1] by Location Search Process

	n	Market Access	Wood Raw Material	Labor Costs, Availability	Services, Utilities	Taxes, Regulations	Personal Considerations
Conducted Location Search	89	25.16	18.17	16.85	11.57	8.32	21.78
Did not Conduct Search	276	18.77	16.85	12.09	7.10	4.30	41.18
Total	365	20.36	17.38	13.38	8.21	5.30	36.34

[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.

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 41% rating versus the 22% average rating assigned by establishments that did conduct a multiple-site search.

Market access was the factor rated most important (25%) 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 4% 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 -- 12% by establishments that conducted a location search, and 7% 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 -- 18% and 17%, respectively. Labor costs and availability, however, were rated 17% by establishments that conducted a location search versus 12% 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. All of these findings are generally consistent with findings from an earlier study of the industry (Bodenman, 1991).

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 2.35 (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 2.35 or less. The component rated highest was personal ties to the area, with a 1.64 rating. The high rating assigned this variable is consistent with the overall high percentage rating assigned the general factor category (36%). The component rated second highest was availability of an existing building or site, with a 1.98 rating. This rating is surprising given the low overall percentage rating (8%) assigned the general factor category: infrastructure, services, and utilities.

The next highest rated component was good labor relations with a 2.22 rating, followed closely by high workforce productivity (2.28), and pool of labor with adequate skills (2.31). Of the other 24 components, only proximity to market area (2.33) was assigned an overall average rating of less than 2.35. Only two general factor categories did not have any components rated 2.35 or less: wood raw materials access, and tax and regulatory considerations. Tax and regulatory considerations was also assigned a low percentage rating (5%) and ranked lowest overall of the six general factor categories. In contrast, wood raw materials access was ranked third overall with a 17% rating. However, the highest rated component in this category was local availability of wood raw materials with a 2.42 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 (2.04) and proximity to market (2.18). Likewise, in the general factor category "wood raw materials access," establishments that conducted a location search assigned a relatively high rating (2.26) to local availability of wood raw materials.

High worker productivity, good labor relations, pool of labor with adequate skills, availability of existing building or site, 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 (1.50), proximity to market area (2.34), good labor relations (2.27), and availability of an existing building or site (2.06).

SUMMARY AND POLICY IMPLICATIONS

States in the Northern and Central Appalachian region (Figure 1) continue to recognize the employment and economic potential of their hardwood forest resources. Programs have been established to foster the growth of hardwood manufacturing. Most however, continue to be based on the traditional assumption, in both theory and practice, that new firms will conduct a multi-state and/or multi-community location search. The goal of this study was to follow-up on an earlier study of the industry (Bodenman, 1991) and examine the recent location decisions (1989-1999) 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.

Similar to the findings in an earlier study of the industry (Bodenman, 1991), 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.

General factor categories ranked second, third, and fourth in importance were market access,

Table 2 Average Component Ratings by Location Search**

Specific Factor Variables by Six Categories	Conducted Location Search	Did Not Conduct Location Search	Overall Average
Market Access:			
Roads, Transport Facilities	2.04	2.63	2.46
Proximity to Market Area	2.18	2.34	2.33
Raw Materials Access:			
Local Availability of Wood Raw Materials	2.26	2.50	2.42
Labor Cost/Availability:			
High Workforce Productivity	2.09	2.36	2.28
Good Labor Relations	2.09	2.27	2.22
Pool of labor with Adequate Skills	2.16	2.38	2.31
Infrastructure/Services:			
Availability of Building or Site	1.78	2.06	1.98
Cost of Fuel and Utilities	2.39	2.59	2.53
Taxes/Regulations:			
Property Taxes	2.47	2.65	2.59
Local Zoning Laws	2.56*	2.55*	2.55
Environmental Regulations	2.31	2.54	2.47
Community/Personal:			
Attitude Toward Industry	2.39*	2.36*	2.37
Personal or Environmental Amenities	2.38	2.65	2.57
Personal Ties to Area	2.06	1.50	1.64

**Rated 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

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

wood raw materials access, and labor costs and availability, respectively. The factor categories 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.

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, property taxes, and environmental regulations were three 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. Both findings imply that attention to these factors in recruitment and development programs should be de-emphasized.

Perhaps most importantly, those concerned with development and expansion of the hardwood manufacturing industry must recognize that a significant majority of 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 continue to assume otherwise, the majority (76%) of the hardwood manufacturing establishments surveyed did not conduct location searches. This finding concurs with an earlier study of the industry (Bodenman, 1991). 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.

The clear implication is that existing establishments should be targeted for retention or expansion. Because it is highly unlikely that the typical hardwood manufacturing establishment will conduct a location search, recruitment of new industry should not be the chief objective of economic development efforts. Furthermore, one of the specific factors rated most important by the hardwood industry—attitude towards industry—is controllable by state and/or local government. 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 retaining and expanding existing industry within the state and/or local community.

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