Eastern white pine: Production, markets, and marketing of primary manufacturers

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Abstract

Eastern white pine (EWP) production and manufacturing have been a staple of the forest products industry since the arrival of the first settlers in the United States. Current EWP market segments range from cabinets to flooring to log cabins to moulding to toys. Today's EWP producers and manufacturers are faced with unprecedented challenges from substitute products, in addition to the loss or near loss of discrete markets. Our research question focused on regional differences in EWP production, quality, manufacture, markets and competition, and management. To assess EWP manufacture and production, a mail survey of EWP primary manufacturers was conducted in three regions of the eastern United States: New England (NE), Mid-Atlantic (MA), and Lake States (LS). Our findings indicate that the primary market for NE EWP is retail, while the log home and timber frame segment is the primary market for the LS and MA regions. Seventy-three percent of responding mills, in all regions, have less than $5 mm in total annual sales; 48 percent reported $1 mm or less. Across all regions the typical mill reported 25 employees or less, operates a single facility, and interregional trade is minimal. The effect of imported species was surprisingly less than anticipated, with more than one-half of the respondents reporting that imports did not have an effect on their operation(s). However, in NE, the leading region for EWP production, nearly half of the respondents reported imports as being deleterious to their business. The NE region is clearly the leader in production, markets, and management strategies.

Eastern white pine (*Pinus strobus* L.) (EWP) production and manufacturing have been a staple of the forest products industry since the arrival of the first settlers in the United States. For illustration, Colonial era New England was considered "Crown Land" of the British Empire, and King George I took jurisdiction of the tallest and largest EWP trees. EWP trees 24 inches or more in diameter, within 3 miles of water, were designated with the "Mark of the Broad Arrow"; these trees were known as "King's Pine" and were to be harvested and used solely as ship masts for the Royal British Navy (Sutton 2002). In the 20th century, the box and shook market was dominant and required round edged, air-dried lumber; today in New England it is primarily a kiln-dried, planed board market (Smith 2003). Current EWP market segments range from cabinets to flooring to log cabins to moulding to toys. Today's EWP producers and manufacturers are faced with unprecedented challenges from substitute products, in addition to the loss or near loss of discrete markets.

EWP represents more than 8 percent of the total sawtimber volume on viable timberland, about 77.6 billion board feet (BBF) (United States Forest Service (USFS) Forest Inventory & Analysis 2004a). EWP has a broad geographic range, ranging from Manitoba to Newfoundland, through the northern United States to northeastern Ohio, and then southward along the Appalachian Mountains to northern Georgia. EWP grows at sea level in its northern range and up to 5,000 feet in the Southern Appalachian Mountains (lower range). With EWP

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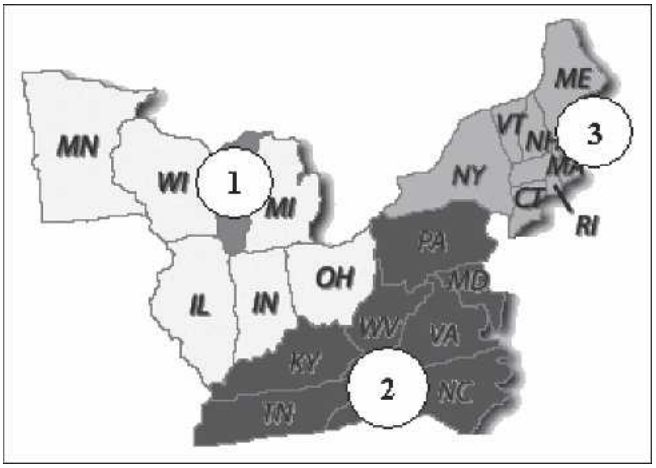

Figure 1. — Regional map and study regions: 1) Lake States, 2) Mid-Atlantic, 3) New England.

representing such a large segment of our eastern forests, there is considerable landowner and manufacturer interest in realizing more value from EWP. For instance, EWP ranks fourth among species in overall production in the United States: Hard maple, soft maple, spruce/fir, cherry, ash, and hickory each rank below EWP (USFS Timber Products Output (TPO) 2004b). Summated EWP production volumes obtained from the Northeastern Lumber Manufacturers' Association (NeLMA) membership directory indicated members produced 624 million (mm) bf of lumber annually (NeLMA 2003). Yet, the entire EWP production volume reported by the U.S. Census Bureau (2003) was 600 MMBF and 525 MMBF was estimated by the USFS TPO (2004). Discrepancies in these estimates demonstrate the inherent difficulty in estimating lumber production.

Given the available resource volume, it is reasonable to ask why EWP producers have not expanded production to utilize this resource to its full potential. First, a growing disparity exists between the quantity of EWP available in a region (**Fig. 1**) and the quantity being harvested in that region (Irland 1999, Wiedenbeck 2003). Why does this disparity exist?—availability, traditional markets, production limitations, and competition from foreign species are all mentioned as possible factors. Second, it has been noted that the Mid-Atlantic (MA) and Lake States (LS) regions tend toward using EWP to produce low-value products such as pulp stock, pallet cants, and engineered wood products (e.g., oriented strandboard); whereas the New England (NE) area tends to produce more highly valued lumber and value-added products (Wiedenbeck 2003). Third, while MA and LS sawmills process local EWP, they also procure logs from the NE, albeit a small quantity (Wiedenbeck 2003). Fourth, foreign species (e.g., radiata pine, red pine, etc.) are imported as substitutes for use in traditional EWP markets. For instance, several of radiata pine's applications (e.g., moulding and millwork) are shared with EWP, rendering the two species direct competitors (Horgan and Maplesden 1997, Harding et al. 1999). New Zealand and Chile hold considerable growing stock volumes of radiata pine that may portend an increase of imports to the United States, or at a minimum imports will remain steady for the next 10 years (Jélves et al. 1989, Horgan and Maplesden 1997). This does not suggest that the utilization of EWP faces an inevitable decline, but for EWP to remain a viable market species, a better understanding of markets and market forces was necessitated. Finally, we were interested in discerning if "business clusters" existed. While Porter (1998) is not the first to invoke the cluster concept, his work is applicable to the EWP industry in NE. For instance, clusters are defined as critical masses located in a discrete area with highly linked industries and institutions. These clusters include but are not limited to suppliers, manufacturers, and retail outlets that afford an industry to benefit from atypical competitive success. According to Porter (1998), clusters affect competition in three ways: 1) firm productivity increases, 2) clusters drive the direction and pace of innovation, and 3) stimulate the formation of new businesses within the cluster. A central premise in cluster theory is that competitive advantage has its genesis in local assets, which includes knowledge, relationships, and motivation; and these assets cannot easily be replicated by distant rivals (Porter 1998).

Problem statement and objectives

As noted previously, an inequality exists between the quantity of EWP available in a region and the quantity being harvested and processed in a region (Irland 1999, Wiedenbeck 2003). Furthermore, sawmills in the MA and LS regions produce a considerable volume of EWP, but they often procure logs from the NE region (Wiedenbeck, 2003). Additionally, we received queries from locales with substantial volumes of EWP regarding markets and production but they lack markets and/or industry to utilize this resource. The ultimate goal of this research is to provide information for EWP timberland growers, producers, and manufacturers with knowledge that will support them in stumpage sales, production, and marketing.

The primary purpose of this study was to assess if regional differences existed in EWP quality, production, manufacture, markets and marketing, management, and competition (i.e., foreign imports). We expected to find regional differences based on anecdotal and documented evidence of regional EWP manufacturing (e.g., sales, production volume, etc.), preferences, and the available resource base and associated EWP quality.

Objective

To identify regional differences in EWP characteristics: Quality, production, manufacture, markets and marketing, management, and competition between the New England, Mid-Atlantic, and Lake State regions of the United States.

Methodology

EWP production, utilization, and market data were collected from primary manufacturers by a mail survey. The 8-page questionnaire was designed and then reviewed by faculty from Virginia Tech, University of Wisconsin, and USFS personnel; lastly, the instrument was pretested among industry representatives. The questionnaire consisted of 24-questions (categorical, scale, and open-ended). The population of interest was EWP manufacturers in three regions of the eastern United States: The LS included Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin; the MA included Kentucky, Maryland, North Carolina, Pennsylvania, Tennessee, West Virginia, and Virginia; and the NE included Connecticut, Massachusetts, Maine, New Hampshire, New York, Rhode Island, and Vermont. The sample frame for each region was developed on a state-by-state basis from state and

industry directories and the NeLMA membership directory. NeLMA is the primary industry association for EWP producers and its membership is representative of the EWP industry.

After development of the sample frame and pretesting, the initial mailing, consisting of a personalized cover letter and questionnaire, was sent out to a total of 1,292 primary manufacturers (a census was attempted) in April 2004. All NeLMA and non-NeLMA members were included in the survey. The first mailing was followed by a reminder postcard approximately 3 weeks later; a second cover letter and questionnaire were mailed 2 weeks after the reminder postcard was sent; and a second reminder postcard was sent after an additional 3 weeks.

The questionnaire requested information on several aspects of production, which included: demographic (i.e., job title, number of employees, facilities, etc.); EWP market characteristics (i.e., production, sales in dollars, production mix, and markets); EWP regional quality comparisons to ascertain the perceptions of quality among the three regions EWP and grading rules employed; EWP log availability; EWP raw material procured from within and from other regions (and why); the effect of imported species on operations; EWP product and business attributes; marketing and promotional efforts; and technology investment and frequency. Likert-type questions, with a range of 1 to 7, were chosen in order to maximize variance among the respondents.

In addition to the mail survey, 19 personal interviews were conducted (NE 6, MA 6, and LS 7) after completion of analysis of the mail survey. These interviews were conducted to validate mail survey results and to gather data not obtainable with mail survey methods. Companies chosen for personal interviews were based primarily on their willingness to participate and location. The first section of questions investigated whether interviewees had a preference for EWP coming from a particular region of the U.S. EWP lumber "Premium" grade lumber (from each region) was collected, photographed, and then evaluated by the interviewees. The goal of this experiment was to detect bias for EWP originating from a discrete geographical region of the U.S. Initially, the boards were anonymously labeled and in phase two the boards were labeled by region. Respondents from all regions indicated that any of the boards could have originated from their region; however, when region was revealed a strong preference for NE EWP was discerned. In section two, questions were asked in an interview format. For instance, two questions investigated regional raw material quality and imported species effect. NE EWP was deemed the highest quality by all respondents and most reported that radiata pine had an extremely negative effect on existing EWP markets.

Several statistical techniques were employed for data analysis: Student's and independent samples *t*-tests, principal components analysis (PCA) (varimax rotation), and analysis of variance (ANOVA) *F*-tests and multivariate ANOVA *F*-tests (both $\alpha = 0.05$). All techniques employed a statistical level or *p*-values (*p*) of 0.05, and SPSS® 12.0 was used for all analysis. PCA was used for data reduction in order to simplify the data set (i.e., reducing the information from several measured variables into a smaller set to maximize variance) and to detect structure in the relationships between variables. PCA reflects both the common and unique variance of variables, as the algorithm searches for a linear combination of variables so that maximum variance is extracted from the variables. PCA is the appropriate tool for this and other analysis since it allows the researcher to eliminate variables that do not maximize variance and assist in explaining the findings. Therefore, PCA was applied for data reduction and as a structure detection method.

Response

The adjusted response rate for all regions was 21.7 percent: 48.9 percent NE, 15.8 percent MA, and 17.2 percent LS. The adjusted response rate was calculated by dividing the number of returned and completed questionnaires by the total number of questionnaires mailed (after subtracting the unusable questionnaires). Unusable questionnaires included both bad addresses and those that did not produce EWP for a total of 441. The response rate from NE may indicate a greater economic interest in EWP, which may derive from traditionally strong EWP markets in NE and/or the presence of NeLMA.

Nonresponse bias

Thirty nonrespondents, selected randomly, were contacted by phone after the completion of the data collection. These non-respondents were asked four Likert-type rating questions along with demographic questions, and they also were asked to estimate their total annual EWP production. One statistically significant difference was discerned between respondents and nonrespondents; respondents rated *color* to be a significantly more important quality attribute than nonespondents (mean: 5.28 vs. 4.43, respectively; $p < 0.01$). Additionally, the Armstrong-Overton method (1977) was employed and included the same questionnaire items; one item was found to be statistically significant. Early respondents reported a significantly higher mean annual EWP production (5.5 MMBF) than did late respondents (290 MBF). In both testing methods, items found non-significant were *strength, machinability, dimensional stability, good reputation, flexible payment schedule, ease of ordering, fast delivery*, and *broad product range*.

Results and discussion

EWP primary producer demographics

A series of demographic questions were asked to determine what differences might exist between regions in EWP manufacturing. First, EWP production data were requested. The mean per mill for all regions was nearly 3.5 million BF (MMBF), and the median was 290 thousand BF (MBF). For the NE region, the mean was slightly more than 7.1 MMBF and the median 500 MBF. In the LS, the mean was 441 MBF and the median was 100 MBF. For the MA region, the mean was slightly more than 2.5 MMBF and the median was 420 MBF (**Table 1**). NE EWP production is an indicator of the regionality of EWP manufacture and markets. An estimate of U.S. EWP annual production was not made due to heavy kurtosis discerned in the data, a notably higher response rate from NE, and the response from large production mills was higher than from smaller mills. The response appeared to be from a small number of mills producing disproportionately more volume than a typical mill, which resulted in a frequency distribution toward larger production mills.

Next, we asked participants for the number of employees at their facilities. The majority of respondents (73%) reported employing 50 or fewer per mill in all regions. The MA and NE regions reported more mills employing 50 or more than did the LS (**Table 2**). More than 80 percent of respondents (in all

Table 1. — Estimated EWP production.

Region	N	Mean—EWP	Median—EWP	CM—total	Median—total
NE	59	7.1 MMBF	500 MBF	10.7 MMBF	1.7 MMBF
MA	54	2.5 MMBF	420 MBF	9.1 MMBF	3.0 MMBF
LS	53	441 MBF	100 MBF	2.5 MMBF	450 MBF
Global	166	3.5 MMBF	290 MBF	7.6 MMBF	1.4 MMBF

Table 2. — Number and percentage of employees per mill by region.

	NE		MA		LS		Total	
Employees	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)
< 25	44	68	41	66	45	83	130	73
25 to 50	7	11	9	15	8	15	24	13
51 to 100	8	13	6	10	0	0	14	8
101 to 200	4	6	4	7	1	2	9	5
201 to 300	1	2	1	2	0	0	2	1
Total	64	100	61	100	54	100	179	100

regions) reported operating a single facility rather than multiple facilities.

Respondents were asked to estimate 2003 gross sales (all products, including EWP) at their mill. Total sales ranged from "less than $1 mm" to "more than $50 mm." The vast majority (73%) of each region's mills reported less that $5 mm in annual sales, with the LS region having proportionally more (83%) mills with sales under $1 mm. NE reported more than 2 and 5 times, respectively, the number of mills in MA and LS with sales more than $15 mm (**Table 3**). Again, this is an indicator of traditional and strong EWP markets in NE.

Lastly, participants were asked to give their job title. Eighty-seven percent of the respondents were firm owners (59%) or presidents (28%); with 9 percent being vice presidents or mill managers (7 and 2%, respectively).

Regional EWP quality comparison

Lumber quality and associated EWP attribute information are of prime importance, particularly for interregional trade and for the development of management/marketing information (i.e., competitive advantages and marketing communications). Evaluation of grading rules and quality attributes from the producers' perspective were assessed through a series of questions. First, we queried respondents about the grading standard(s) employed. In NE, EWP standards are administered by NeLMA; however, only 38 percent of NE respondents reported using NeLMA rules and nearly 29 percent graded to customer specifications. In the MA, customer grades were most commonly used (40%), followed by proprietary (39%), NeLMA (10%), and other (11%). Proprietary (48%), customer (35%), and NeLMA grades (17%) were the top 3 grades reported in the LS.

The origin and procurement of raw material are important factors in production. Directly related to origin of the raw material is interregional trade; material origin was identified as a possible reason for the underutilization of EWP in the MA and LS. Anecdotally, discussions with producers indicated a preference for NE EWP. This led us to ask, is there interregional trade? And if so, is this trade due to perceptions of NE EWP being of superior quality? To investigate these issues, we asked participants to estimate the quantity of raw material procured from each region. Our findings indicate that the vast majority of EWP raw material is procured from within the home region of the respondents; more than 95 percent (**Table 4**). Not surprisingly, we discerned that interregional trading usually occurred between mills located on or near regional borders. These results clearly indicated that interregional trade is minimal; however, this does not disprove our supposition regarding the perceived superior quality of NE EWP.

Closely related to raw material origin is the availability of EWP raw material (i.e., logs), a concern that was voiced during pretesting. Nearly 50 percent of the participants from each region reported log procurement as problematic. Reasons varied from region to region; for instance, in NE weather was cited as challenging and inconsistent supply was noted in all regions. "Other" was the second most frequently mentioned procurement factor in NE and the MA and included: Canadian competition for logs results in increased EWP stumpage/log prices; logger shortages, insurance costs, and that insects/diseases were "killing" EWP and consequently reducing tree health and log quality. If the availability of EWP is problematic, this may denote a marketing opportunity for white pine cooperatives and producers in the MA and LS regions.

Next, we asked a series of questions regarding EWP quality and attributes. First, respondents were asked to rate EWP quality in each region. EWP from NE was perceived as "better" and thus was rated "highest" by participants in all regions. This relationship also was true for the MA and LS regions, NE rated LS EWP higher than the MA region. What is interesting to note is that NE respondents rated LS EWP to be of higher quality than did the LS respondents themselves (**Table 5**). Next, participants assessed EWP physical quality, results indicate that a majority reported having "No" opinion (60%) on each region's EWP; however, NE respondents (37%) indicated that regional physical differences existed. For the 60 percent of respondents who expressed that they did not have an opinion, the lack of interregional trade may explain the minimal procurement of EWP logs from other regions.

Lastly, we asked respondents to identify the state they deemed held the highest quality EWP. NE states were reported most frequently: Maine (44), New Hampshire (17), New York (9), and Vermont (8). North Carolina (10) and Wisconsin (8) were the most frequently reported non-NE states.

Table 3. — Mills, total sales, and sales by region (number and percentage).

	NE		MA		LS		Total	
Total sales ($)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)
< 1 mm	19	32	20	37	36	68	75	46
1 to 5 mm	18	31	19	34	10	19	47	29
5 to 15 mm	11	19	8	15	5	9	24	14
15 to 25 mm	3	5	3	6	1	2	7	4
25 to 50 mm	5	8	3	6	1	2	9	5
> 50 mm	3	5	1	2	0	0	4	2
Total	59	100	54	100	53	100	166	100

Table 4. — EWP roundwood procurement by region.

	Regional EWP procurement		
Origin of roundwood	NE	MA	LS
	(%)		
NE	95.9	2.2	0.2
MA	2.2	95.1	0.0
LS	1.9	2.4	99.8

Table 5. — EWP lumber quality ratings[a] by region.

			Regional mean ratings			
Region	No.	Composite mean	LS	MA	NE	*p*-value
NE	98	5.03	4.94	5.00	5.07	0.92
MA	92	4.59	4.36	4.81	4.21	0.15
LS	91	4.38	4.36	4.31	4.56	0.81

[a]Scale: = 1 to7; qualifiers = low-medium-high.

Effect of imported species

During the past 10 to 15 years, radiata, red, and Scots pines have entered the U.S. marketplace and disrupted traditional EWP value chains (Horgan and Maplesden 1997). A series of questions were asked to assess the effect of these substitute species on EWP markets and to evaluate comparative species attributes. First, we elicited responses on whether import species had a positive or negative effect on operations; we also provided space for respondents to further elaborate on their responses. Regional response differences to this question were minimal. The most notable response was that "import species have a negative effect on operations" was selected 10 times more frequently than the response "positive effect." However, even more respondents indicated that imports did not have an effect on their operations. At a cursory level, this implies that imports are not creating deleterious effects, or one may infer that in context of the recent housing boom, that the overall demand for housing materials masks the detrimental effects of imports (**Table 6**).

Lastly, a series of questions requested that participant's rate EWP attributes from a customer's perspective. Discernment of salient attributes may provide EWP a competitive advantage(s) to employ against radiata pine or substitute species. *Color* was rated the highest product attribute, followed by *machinability* and *dimensional stability*—all regions assessed these characteristics as relevant EWP attributes. *Strength*, *durability*, and *minimal defects* were rated as the least important attributes. ANOVA did not yield any statistical differences among the attributes (on a regional basis) (**Table 7**).

Eastern white pine markets and marketing

To assess EWP markets and marketing philosophies, we queried participants on the following topics. First, we asked respondents to estimate EWP production marketed to secondary manufacturers, which in some sense is a proxy for EWP markets. In NE, the retail market (e.g., interior boards/paneling, clapboards, dimension, rough lumber, etc.) was nearly half of the total production (49%); this was followed by log cabin/timber frame (16%), window (8%), and door and crate/container segments (6 percent each)—aggregated these three segments comprised 84 percent of NE's production with the remaining 16 percent attributed to miscellaneous categories.

Retail also is an important market segment in the MA (17%) and LS (7%) regions but not nearly to the extent as in NE. The MA's most prominent market segment was log cabin/timber frame (34%), followed by window (11%), furniture, moulding/millwork, and door markets (each about 10%)—74 percent of production. Other MA markets include cabinet, flooring, casket, crate/container, and dimension (9%). In the LS, the log cabin/timber frame segment was the largest (28%), followed by furniture (14%), moulding/millwork and door (11 percent each), dimension lumber (9%), window (8%), and casket (7%)—91 percent of the LS's production. Other LS markets include cabinet, flooring, crate/container, and landscaping (2%). Aggregated across all regions, the three largest market segments are: 1) retail (40%), 2) log cabin/timber frame (20%), and 3) window (9%) (**Fig. 2**). Each region has similar markets; however, the size of the NE retail market is salient (7.1 MMBF compared to 2.5 and 0.4 MMBF for MA and NE, respectively) as it reinforces the supposition of regional and traditional consumer preferences in NE for EWP products.

Marketing strategies and marketing communication tactics by EWP producers were explored, which included association membership, marketing communication channels, and communication tactics. In essence, with marketing communication, a firm attempts to identify the most effective message to position or communicate attributes about its product(s) to trigger the consumer to adopt/purchase the product (Schulz 1996). Marketing communications are methods of facilitating

Table 6. — Effect of import species on business operations.

	Positive		Negative		No effect	
Region	(No.)	(%)	(No.)	(%)	(No.)	(%)
NE	2	6.6	17	49.2	33	44.1
MA	1	1.7	23	39.0	35	59.3
LS	4	3.8	30	32.7	27	63.5
Total	7	4.1	70	40.7	95	55.2

Table 7. — EWP attribute ratings[a] by region.

			Regional mean ratings			
Attribute	No.	Mean	NE	MA	LS	*p*-value
Color	149	5.28	5.34	5.08	5.43	0.47
Machinability	156	5.22	5.49	5.11	5.02	0.22
Dimensional stability	151	4.94	5.04	4.69	5.11	0.39
Rustic look	153	4.61	4.57	4.45	4.83	0.56
Historic look	155	4.38	4.39	4.10	4.68	0.33
Paintability	150	4.35	4.61	4.24	4.16	0.34
Few defects	147	4.27	4.29	4.20	4.32	0.93
Durability	149	4.15	4.15	4.22	4.09	0.93
Strength	150	3.47	3.41	3.59	3.40	0.81

[a]Scale = 1 to 7; qualifiers = low-medium-high.

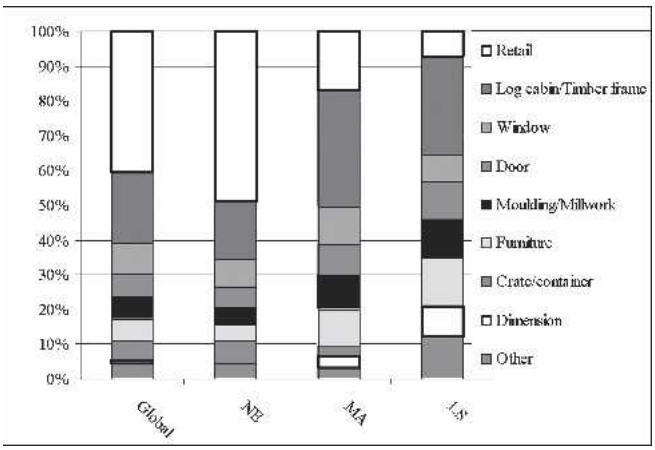

Figure 2. — Primary manufacturers' EWP markets—global and by region. Other: Cabinet, flooring, casket, landscaping, etc.

the dissemination of information and the exchange of knowledge between a firm and its customers. Marketing communication tactics are used to implement the communications strategy that allows a company to achieve its marketing objectives. Tactics include advertising, sales promotion, direct marketing, public relations, event marketing, etc. (Sirgy 1998). One strategy for marketing success is membership in organizations or associations that promote a firm's products. Participants were asked about the associations they belonged to and if they employed an association's brand logo. Thirty-three respondents belonged to NeLMA—26 were from NE, 5 from the LS, and 2 from the MA. Twenty employed the NeLMA brand logo on their products and 17 hailed from NE. In all regions, 34 percent of the respondents were members of an association. Employing the NeLMA logo (3.4%) or a non-NeLMA brand/logo (2.4%) was among the least utilized marketing communication tactics. The results are summarized in **Table 8**.

Response categories for marketing communication tactics assessment ranged from advertising to sales force to web page implementation. From our data, the principal messages producers sought to convey related to an emphasis on customer service and lumber quality, which were the two most frequently used tactics in all regions; advertisements in the Yellow Pages® and newspapers followed. Television and radio advertising were the least employed marketing communication tactics. In a comparison of regions, our analysis indicated that NE was particularly more proactive regarding employment of marketing communication tactics; for instance, NE participants employed more tactics than either the MA or LS. These promotional efforts likely are a contributing factor to the strength of NE's EWP industry. The exceptions were maintaining a webpage and maintaining a sales force—here the MA firms reported a slightly higher level of implementation (**Table 8**).

Next, we researched entrepreneurial philosophy; that is, do firms proactively search for new markets? Responses provide insight into a region's mills' overall strategic management philosophy. Nearly 20 percent of all respondents, across all regions, reported proactively searching for new markets. This consistent response appears to suggest, notwithstanding production volume and market segment differences, that participants were satisfied with current business levels. This apparent lack of entrepreneurial orientation may be an opportunity for new entrants to service latent demand or create new markets.

Businesses differentiate themselves by varying methods; to address participant's management strategies we investigated business service attributes. Our objective was to identify salient management efforts, both industry-wide and on a regional basis. *Maintaining a good reputation* was the highest rated service attribute across all regions. The notably high rating of "*reputation*" provides a strong indication that EWP primary manufacturers deem success as *reputation* dependent

Table 8. — Marketing communication tactics by region, frequencies, and percentages.

Tactic	NE	MA	LS	No. (%)
Emphasize customer service	31	25	28	84 (14.2)
Emphasize lumber quality	34	23	23	80 (13.2)
Phone book advertising	24	11	17	52 (8.8)
Newspaper advertising	21	8	15	44 (7.4)
Maintain sales force	16	18	7	41 (6.9)
Emphasize regional quality	19	10	12	41 (6.9)
Other tactic(s)	14	14	9	37 (6.3)
NeLMA membership	26	2	5	33 (5.6)
Firm webpage	13	15	5	33 (5.6)
Industry association member (non-NeLMA)	11	11	4	26 (4.4)
Trade journal advertising	10	7	9	26 (4.4)
Brochures	15	7	3	25 (4.2)
Attend trade show(s)	11	6	5	22 (3.7)
NeLMA logo	17	2	1	20 (3.4)
Brand/logo (non-NeLMA)	8	4	2	14 (2.4)
Radio advertising	5	1	5	11 (1.9)
Television advertising	2	0	0	2 (0.3)

and results in a 2-fold philosophy: 1) to meet and/or exceed customer needs and expectations and 2) to differentiate themselves from their competition. *Reputation* was followed by "*Understanding customer needs*," "*Special orders*," "*Solving customer problems*," "*Being available to the customer*," and "*On-time delivery*." The lowest rated service offerings were "*Competitive-pricing*," "*Just-In-Time delivery*," and "*Flexible payment schedule*" (**Table 9**).

To further explore strategic management philosophy as it relates to service attributes, we assessed several demographic variables. PCA analysis yielded several variables to analyze for fixed/main effects: Region ID, firm production level (volume), firm sales (volume), frequency of investing in new technology, and actively seeking new markets. First, we began by assessing Region ID as a main effect. For this model, "*fast delivery*" was significant; here the MA region was statistically different from the LS and NE (**Table 10**). "*Having a knowledgeable sales force*" was significant, with NE valuing this attribute differently than LS and MA.

Production volume was investigated next and attribute scores for "*having a knowledgeable sales force*," "*maintaining strong customer relationships*," and "*offering a broad product range*" resulted in significant evidence of statistical differences. *Knowledgeable sales force* resulted in several statistical differences: Mills producing less than 99 MBF vs. 1 to 4.9 MMBF ($p = 0.01$), less than 99 MBF vs. 5 to 9.9 MMBF ($p = 0.04$), and less than 99 MBF vs. greater than 10 MMBF ($p = 0.00$); 100 to 499 MBF vs. greater than 10 MMBF ($p = 0.02$); and 25 to 25 MMBF vs. 5 to 15 MMBF ($p = 0.05$) (**Table 10**). The results indicated that respondents with large production volumes valued particular customer relationship management (CRM) attributes more importantly than smaller firms. Furthermore, these differences appear to be regionally (i.e., NE) driven, as statistical significance was found in a "Region by Production" analysis.

Next, we investigated the influence of a firm's entrepreneurial philosophy (i.e., did producers seek new markets); here several statistical differences were discerned, ranging from very strong evidence to significant evidence. *Knowledgeable sales force*, *solving customer problems*, *offering a broad product range*, *flexible payment schedules* (all $p \leq 0.01$), and understanding customer needs ($p = 0.04$) resulted in significant evidence of statistical differences. Mild statistical evidence (i.e., some evidence but not significant: $0.05 \leq p < 0.10$) was discerned for being *available to the customer* ($p = 0.06$), *ease of ordering* ($p = 0.07$), and *on-time delivery* ($p = 0.09$) (**Table 10**). NE respondents appeared to drive these differences, as regional results were statistically significant for all the attributes except for flexible payment schedules, which appeared to be driven by the MA region.

Fifth, the firm's frequency of investing in new technology was researched: *Ease of ordering* ($p = 0.01$), *fast delivery* ($p = 0.01$), and *broad product range* ($p = 0.03$) were significant. Mills that invested in new technology annually vs. once every 10 years ($p = 0.01$) appeared to have driven this result as no significant differences were noted in a regional analysis. In regards to ease of ordering, significant differences were found among: Annual vs. 1 to 3 years ($p = 0.03$), annual vs. 5 to 7 years ($p = 0.05$), and annual vs. once every 10 years ($p = 0.01$). In each instance, the more *frequent investment* appears to have driven the results. *Fast delivery* of products was of importance in annual vs. once every 10 yrs ($p = 0.03$), 3 to 5 yrs vs. 5 to 7 yrs ($p = 0.05$), and 3 to 5 yrs vs. 5 to 7 yrs ($p = 0.02$) (**Table 10**). Again, in each contrast, the more *frequent investment in technology* appears to have driven the results. These results may indicate that *technology investment* is a direct correlate of entrepreneurial philosophy; that is, these firms are aggressive in updating their mills and/or CRM software and have an overt entrepreneurial spirit.

Lastly, we analyzed the data for interactions (in a statistical model the effect of two, or more, variables is not simply additive). Estimation of a model that fails to account for the interaction will not provide an accurate estimation of the true relationship between the dependent and independent variables among the main effects. Interactions yield information, for example, information that allows the researcher to interpret data and direct research. According to Friedrich (1982), this is a "low-risk strategy," if the product term is significant then a researcher keeps it in the model, otherwise the product term can be eliminated from the model. Significant evidence of statistical significance was discerned in Region by Sales, Region by Production, Region by Seeking new markets, and Region by Investing in new technology. *Knowledgeable sales force* ($p = 0.03$) in Region by Sales and Region by Production ($p = 0.04$) was significant. Further interaction variance analysis (Jaccard and Turrisi 2003, p. 12) indicated, for both main effects, that NE respondents drove this finding. Results for *competitive pricing*, in a Region x Production analysis, indicated that the MA and NE ($p = 0.03$ and 0.05, respectively) appear to be more aggressive in *pricing* than the LS. In the

Table 9. — Ratings[a] of manufacturers' service attributes.

Attribute	N	Mean	Regional mean ratings NE	MA	LS
Maintain good reputation	174	6.18	6.22	6.16	6.17
Understand customer needs	172	5.63	5.82	5.66	5.38
Special order capabilities	172	5.62	5.37	5.72	5.81
Solving customer problems	173	5.60	5.59	5.65	5.55
Being available to the customer	174	5.57	5.57	5.60	5.53
On-time delivery	169	5.57	5.69	5.75	5.24
Strong customer relationships	166	5.53	5.82	5.53	5.20
Consistent prices	170	5.31	5.34	5.57	5.00
Ease of ordering	150	4.83	4.96	4.86	4.62
Deliver products fast	148	4.79	4.96	5.04	4.31
Broad product range	150	4.77	5.06	4.49	4.75
Knowledgeable sales force	167	4.62	4.92	4.72	4.15
Competitive-pricing	150	4.38	4.35	4.69	4.07
Offer JIT delivery	166	4.19	4.12	4.36	4.10
Flexible payment schedule	166	3.28	3.18	3.53	3.14

[a]Scale = 1 to 7; qualifiers = low-medium-high.

Table 10. — Assessment of main/fixed effects—manufacturers' business attributes.

Attribute	Region	Sales	Production	New markets	New technology
		(*p*-values)			
Maintain good reputation	0.96	0.58	0.31	0.52	0.23
Understand customer needs	0.33	0.67	0.06[a]	**0.04**[b]	0.40
Special order capabilities	0.16	0.99	0.29	0.45	0.30
Solving customer problems	0.98	0.54	0.25	**0.01**[b]	0.29
Being available to the customer	0.87	0.53	0.36	0.06[a]	0.51
On-time delivery	0.79	0.48	0.22	0.09[a]	0.26
Strong customer relationships	0.08[a]	0.24	**0.02**[b]	0.18	0.14
Consistent prices	0.65	0.97	0.12	0.83	0.93
Ease of ordering	0.37	0.29	0.76	0.07[a]	**0.01**[b]
Deliver products fast	**0.03**[b]	0.24	0.45	0.27	**0.01**[b]
Broad product range	0.13	0.64	**0.03**[b]	**0.01**[b]	**0.02**[b]
Knowledgeable sales force	**0.04**[b]	**0.03**[b]	**0.00**[b]	**0.00**[b]	**0.05**[b]
Competitive-pricing	0.37	0.26	0.04	0.75	0.46
Offer JIT delivery	0.79	0.53	0.17	**0.04**[b]	0.48
Flexible payment schedule	0.17	0.83	0.37	**0.01**[b]	**0.03**[b]

[a]Mild evidence of statistical significance, *p*-values italicized.
[b]Evidence of statistical significance, $\alpha = 0.05$.

Region x Seeking new markets analysis—*speed of delivery* resulted in an interaction; again both NE and MA ($p = 0.04$ and 0.05, respectively) appear to be more entrepreneurial in their business operations. Finally, an interaction was noted in Region by Investing in new technology regarding *knowledgeable sales force* ($p = 0.00$) (**Table 10**), here NE respondents drove this finding.

What is interesting to note is that across all main effects, maintaining a "*Knowledgeable sales force*" was evaluated as a significant business attribute. This finding may be attributable to competition (both domestic and international), as *having a sales force* is needed to market the unique qualities of EWP vs. substitute products and as a commitment to CRM. Secondly, offering a *broad product range* was significant in total production, *seeking new markets*, and *investing in new technology*; this indicates that high-volume production mills management philosophy is intended to, at the very least, maintain or enhance market share.

Analyzing the NE EWP industry from a management perspective, one is drawn to the concept of business clusters. In New England, the raw material exists in conjunction with primary and secondary manufacturing, which includes innovative processes, traditional markets, and marketing skills. Arguably, the NE EWP industry "fits" the definition of a business cluster: 1) firm productivity (the largest mills and secondary manufacturers are located in NE) and 2) they drive the direction and pace of innovation (e.g., marketing communication tactics and CRM). In addition, there appears to be a latent preference for NE EWP products throughout the United States that arises from a perception of higher quality EWP from NE.

Study limitations

As with all research, limitations occur and include unanticipated factors, time, and monetary constraints. In addition, limitations include the interpretation of results and other issues that need to be considered when trying to generalize these analyses to the broader issue of interest. Efforts were made to ensure that data were accurate, the sample was representative, and the interviews were objective. We also did not ask respondents to categorize or differentiate between "green" and/or "air/kiln dried" sales; this may have had an impact in the responses. This study represents a "snapshot in time" of EWP production and markets in the eastern United States. Since the response was weighted to larger mills, these results may not accurately reflect smaller EWP producers.

Summary and conclusion

Our findings indicate that the primary market for NE EWP is retail, while the log home and timber frame segment is the primary market for the LS and MA regions. Seventy-three percent of responding mills, in all regions, have less than $5 mm in total annual sales; 48 percent reported $1 mm or less. Across all regions the typical mill reported 25 employees or less, operates a single facility, and interregional trade is minimal, according to our data. Respondents were nearly equally divided on whether procuring EWP was problematic; however, inconsistent supply was reported by several respondents as business detriments.

The majority of respondents indicated that imports of radiata pine did not have an effect on their operations. However,

in NE, the leading region for EWP production, nearly half of the respondents reported imports as being deleterious to their business. Ratings of EWP and substitute species (e.g., radiata pine) attributes indicated that color and machinability are the two most important attributes, while the least important were strength and durability. In all three regions, an emphasis on customer service and lumber quality were the most frequently reported promotional tactics; NE participants employed promotional activities more frequently than other regions. Analysis indicated that *reputation*, *understanding customer needs*, *handling special orders*, and *offering a broad product range* were perceived by EWP respondents to be the most important business services provided to their customers. *On-time*, *fast*, and *JIT delivery* were rated as the least important services.

The New England region is clearly the leader in production, markets, and management strategies. If the MA and LS regions primary producers are to capitalize on their EWP resource and central location to numerous markets, then it appears those regions' producers should emulate the EWP industry in New England.

These findings indicate that producers of EWP have numerous challenges in producing and marketing their products. Market savvy companies could address some of these challenges by focusing on key findings found in this study.

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