

*Final Report from Surveys of Executives  
of WCMA Member Firms:*

*Third-Party, Chain-of-Custody Environmental Certification in  
the North American Wood Component Industry*

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## EXECUTIVE SUMMARY

In early Spring, 2008, we conducted a research project to investigate executives' perceptions of the benefits and challenges of environmental certification, perceptions of hostility in their firms' business environment, and their intentions to adopt environmental product certification. We attempted to survey executives from all WCMA member firms (156 firms). We received completed surveys from executives representing 84 WCMA members.

The following is a synopsis of our major research findings:

- executives perceived certification to be valuable in:
  - gaining customers in existing and new markets
  - satisfying existing customer demand for environmentally certified products
  - improving the company's image and reputation
  - maintaining competitive position versus competitors who have adopted environmental certification
  - improving competitive position versus competitors who have not adopted environmental certification
  
- executives perceived the following challenges to be difficult or very difficult to overcome
  - cost challenges (initial and on-going costs)
  - keeping certified material streams separate from non-certified material streams
  - acquiring a consistent supply of certified hardwood lumber
  - altering relationships with existing suppliers to obtain certified wood and wood-based materials
  
- of the factors examined, executives' responses to items about the process adaptation challenges of certification were the most influential in distinguishing between those executives who decided to adopt certification and those who did not
  
- of the factors examined, executives' responses to items about environmental stance benefits of certification were the second most influential in distinguishing between those executives who decided to adopt certification and those who did not

- executives from smaller firms are less likely to intend to adopt environmental certification
- executives believe it is difficult or very difficult to charge a premium for environmentally certified products above the price for non-certified products
- of the 84 firms in the study, executives from 17 of the firms indicated that their firm had already adopted environmental certification, and executives from 18 other firms indicated that their firm was in the process of adopting certification
- executives indicated that they perceived hostility in the business environment among all the dimensions of hostility that were assessed

## INTRODUCTION TO THE PROJECT

The environmental awareness or consciousness of consumers, and society in general, has been steadily increasing in recent years. One way this environmental awareness can be evidenced is by the increase in ‘green’ or environmentally oriented consumer products such as hybrid cars, eco-detergents, and the plethora of products touting a reduction in packaging materials. Of course, some of the impetus for the development of these products may be tied to regulations and industry cost savings as well as other factors. Regardless of the factors that brought about the creation of these ‘green’ products, they appear to be well received by consumers.

A little closer to home to the wood industry, the green building movement is creating market space for environmentally oriented wood products. A portion of these environmentally oriented products are the so-called environmentally certified products. In many cases, environmentally certified products need to contain certified parts made from certified materials.

Many manufacturers of end-use products (i.e., cabinets, furniture, architectural woodwork, etc.) rely on wood component manufacturers to supply them with component parts. As these end-use manufacturers seek to offer environmentally certified products they will need to rely on wood component manufacturers to supply them with certified component parts. In cases where end-use manufacturers want to offer products with a label endorsed by a specific certification scheme (i.e., FSC, SFI, CSA, etc.), this places a need for wood component manufacturers to be third-party, chain-of-custody certified.

Beyond any existing demand for environmentally certified wood components, there are other benefits of (or reasons to pursue) the adoption of environmental certification. These benefits include product-market opportunities beyond existing demand, competitive posture of a firm, and improvement of a firm’s image to name a few. Along with benefits of environmental certification are challenges of adopting certification. Challenges could include costs, manufacturing process alterations, and difficulties in acquiring certified raw materials.

One aim of this research project was to document wood component industry executives’ perceptions of the benefits and challenges of environmental certification. Another aim was to evaluate executives’ intentions to adopt certification and examine factors influencing these intentions. In addition to perceptions of certification, another important factor that was

considered in this research was executives' perceptions of hostility in the business environment. Hostility or threat in the business environment has been shown to impact executives' decisions about whether or not to pursue environmental initiatives.

With an emphasis on executives' perceptions and intentions, this research employs an "upper echelons" perspective or framework. The "upper echelons" perspective accounts for and acknowledges the importance of executives' perceptions and actions in company outcomes. In other words, the "upper echelons" perspective recognizes that executives are an important factor in the success and shortcomings of firms.

### **Study Objectives**

An important overall goal of the project was to provide the WCMA and its member firms with information about WCMA executives' perceptions of third-party, chain-of-custody environmental certification (i.e., related to the FSC, SFI, and CSA certification schemes). The project was designed to gain a better understanding of executives' perceptions of the benefits and challenges of certification as well as their intentions of adopting certification. Additionally, the project evaluated executives' perceptions of hostility in the business environment, since past research and theorizing has suggested these perceptions to be influential in executives' decisions about environmental initiatives.

We had the following specific objectives:

- Document executives' perceptions of the benefits and challenges of environmental certification
- Document executives' perceptions of hostility in the business environment
- Evaluate the influence of executives' perceptions of the benefits and challenges of environmental certification on their intentions to adopt certification
- Evaluate the influence of executives' perceptions of hostility in the business environment on their intentions to adopt certification

## RESULTS

### Respondent Profile: Executive Characteristics

A majority of the respondents were male (77 or 92%). The average wood products industry tenure of respondents was approximately 23.5 years. The lowest industry tenure among respondents was 2 years, and the highest industry tenure among respondents was 55 years.

When asked if they were an owner of the company, 46 (55%) respondents indicated that they were. When asked if they were a founder of the company, only 16 (19%) respondents indicated that they were. Executives were also asked to give their title. Table 1 provides frequency counts by respondents' titles.

**Table 1. Frequencies of Executives' Titles**

Executive titles	Frequency
President	18
CEO	15
Executive with a marketing and sales title	11
Executives with an operations title	10
Vice President of _____	10
Executive of a business unit	5
Owner	4
CFO	3
Title not specified	3
Executives with an environmental title	2
General manager	1
Human resource manager	1

Executives were also asked about their functional orientation. An executive’s functional orientation was determined based on the categorization of output versus throughput. Output functions include marketing, sales, and product development, where as throughput functions include production, process engineering, and accounting.

There were 27 executives with output functional orientations, and 39 with throughput orientations. For 13 of the executives, functional orientation could not be cleanly determined, so these executives were deemed to have a neutral functional orientation. Finally, there were 5 executives who did not provide adequate information to determine their functional orientations.

**Respondent Profile: Company Characteristics**

The addresses of WCMA member firms were provided by the WCMA. Using census region classifications by the U.S. Department of Commerce (please refer to [http://www.census.gov/geo/www/us\\_regdiv.pdf](http://www.census.gov/geo/www/us_regdiv.pdf)), responses were designated by region. Table 2 shows frequency counts of responses by region.

**Table 2. Frequencies of Executives’ Responses by Region**

<b>Region</b>	<b>Frequency</b>
Midwest	34
Northeast	23
South	17
West	7
Canada	3

The median<sup>1</sup> number of people employed by respondent firms was approximately 80. The smallest firm in the sample employed 6 people, and the largest firm in the sample employed 2000 people. The median age of respondent firms was approximately 40 years. The youngest firm in the sample has been operating for 1 year, the oldest firm in the sample has been operating for 183 years. The median value for 2007 annual sales of respondent firms was \$15 million.

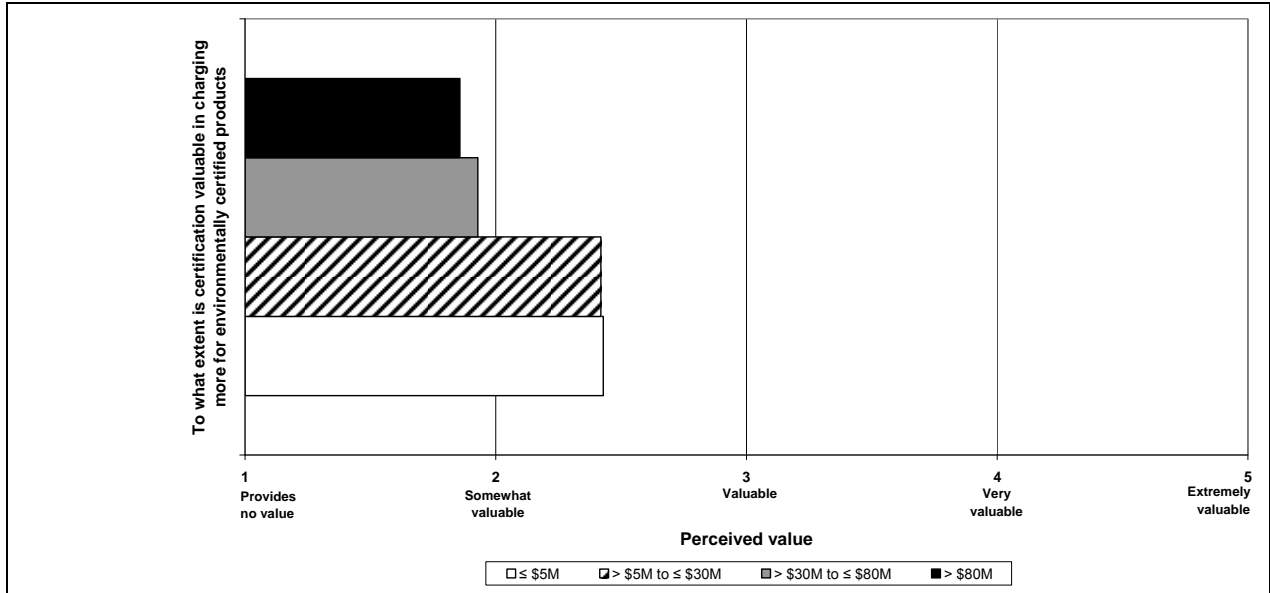
<sup>1</sup> In some cases, median values (versus mean or average values) are reported to better represent the central tendency of the data.

### **Charging a Premium for Environmentally Certified Products**

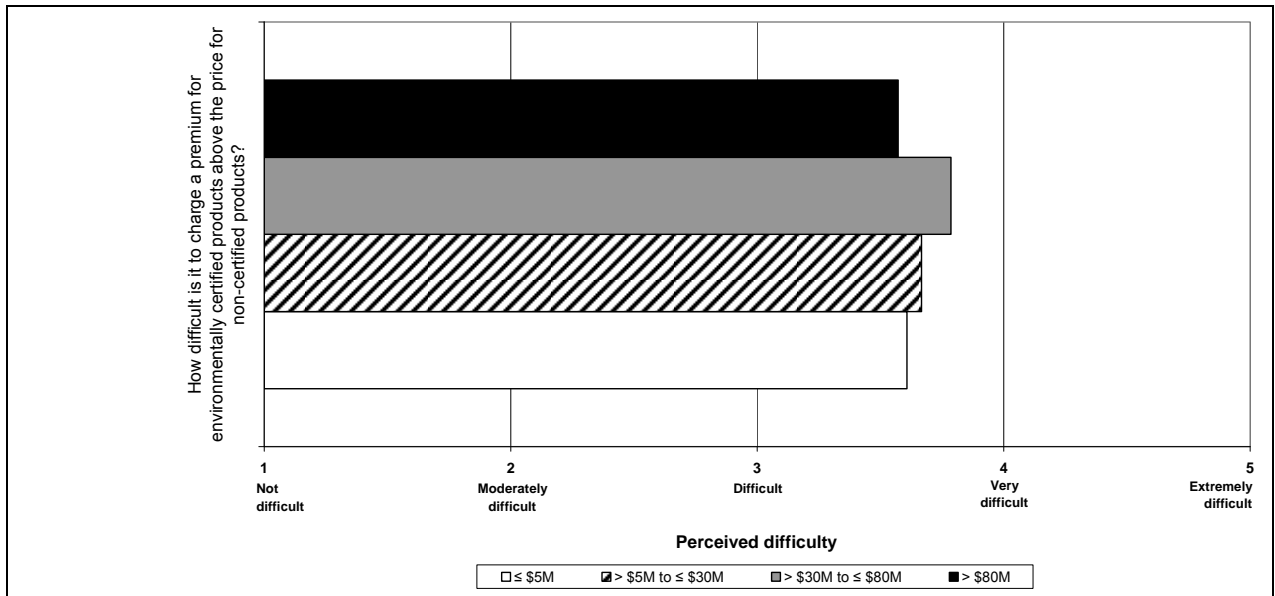
Executives were asked two questions to evaluate their perception of their firms' abilities to charge a premium for environmentally certified products above and beyond non-certified products. The first question asked executives to indicate the extent that environmental certification is valuable in charging more for environmentally certified products. Responses to this question are shown in Figure 1 and are distinguished by firm size. The second question asked executives to indicate the degree of difficulty in being able to charge a premium for environmentally certified products above the price for non-certified products. Responses to this question are shown in Figure 2 and are distinguished by firm size.

Responses to these two questions indicate that executives from firms of various sizes believe that charging a premium for environmentally certified products is difficult to very difficult. In other recent research, executives from the kitchen cabinet industry also indicated that they do not believe environmental certification provides much value in charging a premium for certified products. During a recent management development seminar held with hardwood manufacturing managers, this same issue of charging a premium was openly discussed among seminar attendees. Many attendees indicated that they believe there is difficulty in charging a premium for environmentally certified products.

**Figure 1. Executives' Perceptions of the Value of Certification for Charging More for Products**



**Figure 2. Executives' Perceptions of the Difficulty of Being Able to Charge a Premium for Environmentally Certified Products**



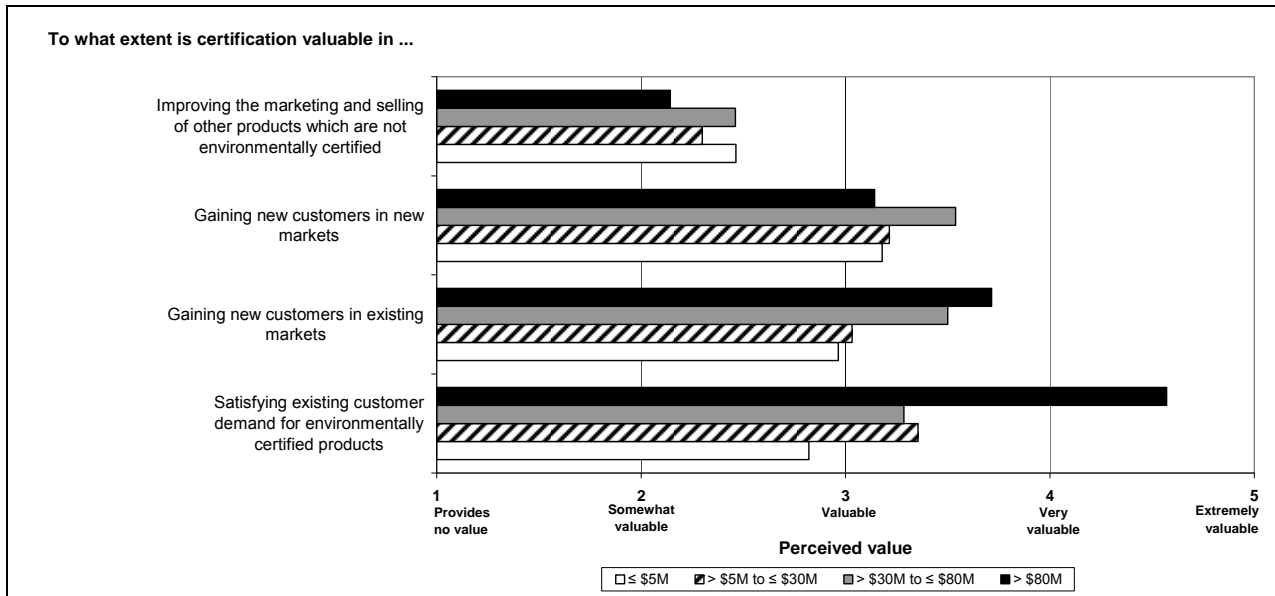
## Benefits of Environmental Certification

Executives were asked to evaluate the extent in which environmental certification is valuable in achieving a list of given outcomes. The outcomes, or potential benefits, that were evaluated included: product-market benefits, environmental stance benefits, and competitive posture benefits. Figures 3, 4, and 5 show executives' responses relative to these three categories of potential benefits of environmental certification.

Product-market benefits encompass issues of customers and associated market share. Items evaluating product-market benefits are shown in Figure 3. Highlights from responses to product-market benefits include:

- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 3.4 on the value of certification in gaining new customers in existing and new markets and in satisfying existing customer demand for environmentally certified products
- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 2.3 on the value of certification in improving the marketing and selling of other products that are not certified
- on a scale from 1 to 5 with 5 representing the “most valuable,” executives from the largest firms sampled (> \$80M in annual sales) gave an average response of 4.6 on the value of certification in satisfying existing customer demand for certified products

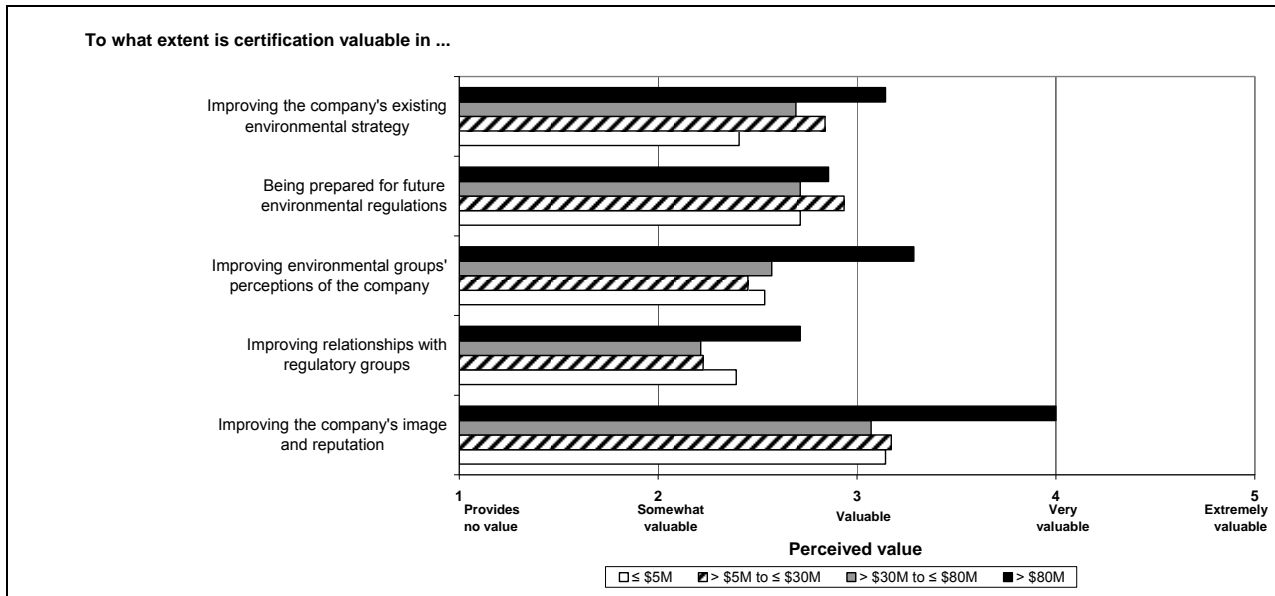
**Figure 3. Executives’ Perceptions of the Value of Environmental Certification in Achieving Product-market Benefits**



What we termed “environmental stance benefits” encompass issues of relationships with regulatory agencies, environmental groups’ perceptions of the firm, preparation for future environmental regulations, and improvement of the firm’s image and reputation. Items evaluating environmental stance benefits are shown in Figure 4. Highlights from responses to environmental stance benefits include:

- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 3.3 on the value of certification in improving the company’s image and reputation
- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 2.8 on the value of certification in: (1) improving environmental groups’ perceptions of the company, (2) improving the company’s existing environmental strategy, and (3) being prepared for future environmental regulations
- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 2.4 on the value of certification in improving relationships with regulatory groups
- in general, executives from the larger firms perceived certification to be more valuable in achieving environmental stance benefits than executives from smaller firms

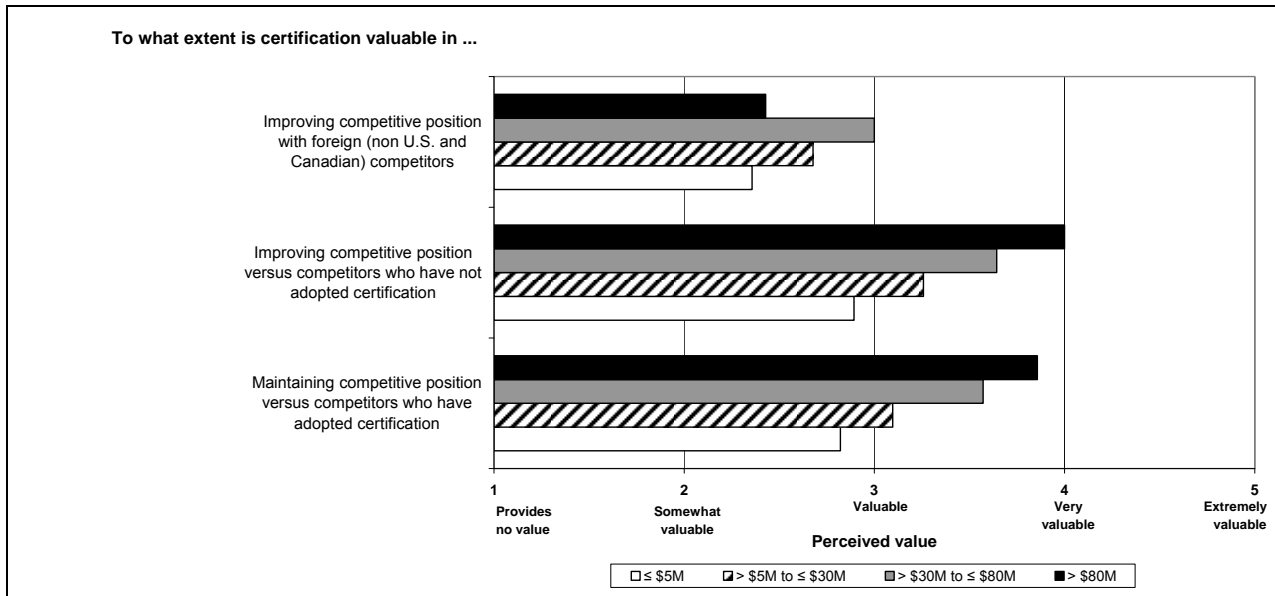
**Figure 4. Executives’ Perceptions of the Value of Environmental Certification in Achieving Environmental Stance Benefits**



Competitive posture benefits are tied directly to a firm’s competitors. Items evaluating competitive posture benefits are shown in Figure 5. Highlights from responses to competitive posture benefits include:

- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 3.3 on the value of certification in maintaining competitive position versus competitors who have adopted certification
- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 3.4 on the value of certification in improving competitive position versus competitors who have not adopted certification
- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 2.6 on the value of certification in improving competitive position with foreign (non U.S. and Canadian) competitors
- relative to domestic competitors, executives from larger firms perceived certification to be more valuable in achieving competitive posture benefits than executives from smaller firms

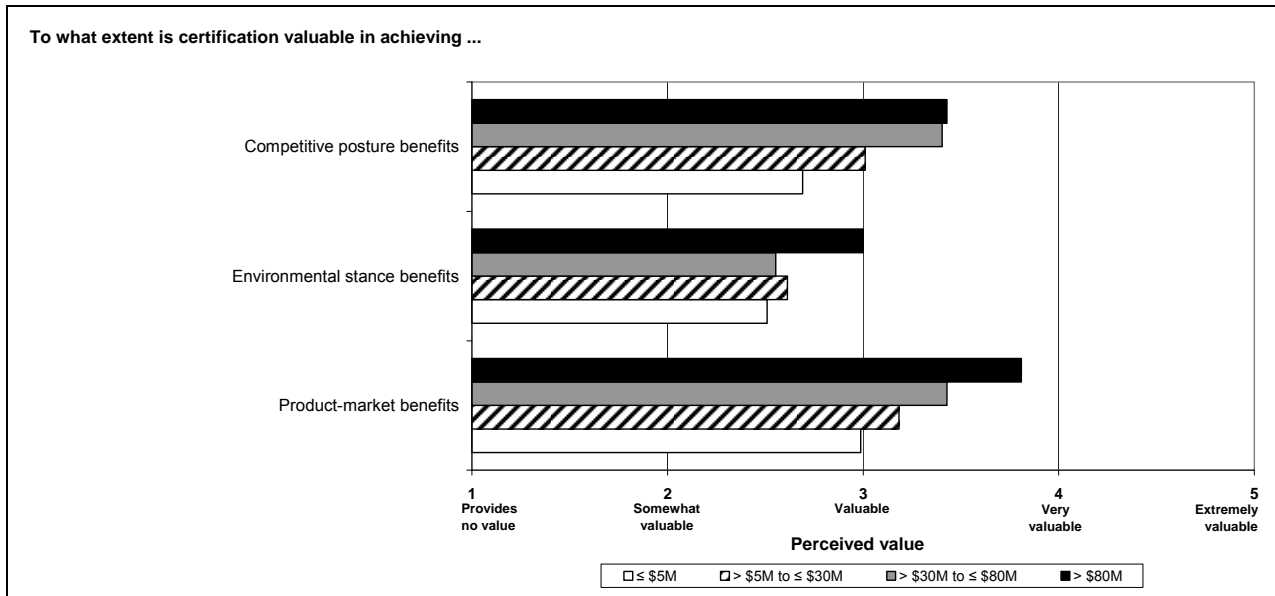
**Figure 5. Executives’ Perceptions of the Value of Environmental Certification in Achieving Competitive Posture Benefits**



All the various benefits (i.e., product-market, environmental stance, and competitive posture) of environmental certification were compared to one another. Figure 6 shows this comparison. Highlights from responses to this comparison include:

- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 3.4 on the value of certification in achieving product-market benefits
- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 3.1 on the value of certification in achieving competitive posture benefits
- on a scale from 1 to 5 with 5 representing the “most valuable,” executives gave an average response of 2.7 on the value of certification in achieving environmental stance benefits
- despite the lower degree of perceived value of environmental stance benefits, executives’ responses to items about environmental stance benefits were more influential in distinguishing between those executives who decided to adopt certification and those who did not than responses to other benefits of certification

**Figure 6. Executives’ Perceptions of the Value of Environmental Certification in Achieving Product-market, Environmental Stance, and Competitive Posture Benefits**



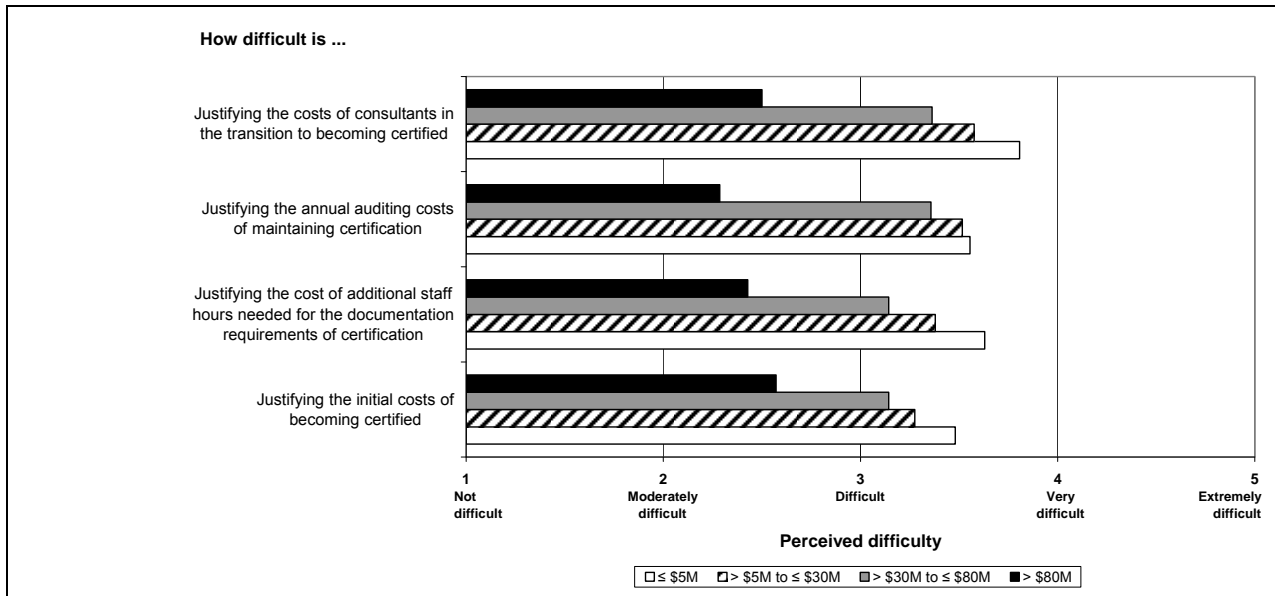
## Challenges of Environmental Certification

Executives were asked to evaluate how difficult it is to overcome challenges related to adopting environmental certification. The challenges that were evaluated included: cost challenges, process adaptation challenges, and material supply challenges. Figures 7, 8, and 9 show executives' responses relative to these three categories of challenges of environmental certification.

Cost challenges encompass issues of the initial cost of becoming certified, costs tied to documentation requirements of certification, costs of consultants, and on-going annual auditing costs. Items evaluating cost challenges are shown in Figure 7. Highlights from responses to cost challenges include:

- on a scale from 1 to 5 with 5 representing “extremely difficult,” executives gave an average response of 3.1 on the difficulty of overcoming the cost challenges of certification
- in general, executives from smaller firms perceived the cost-related challenges of certification to be more difficult to overcome than executives from larger firms

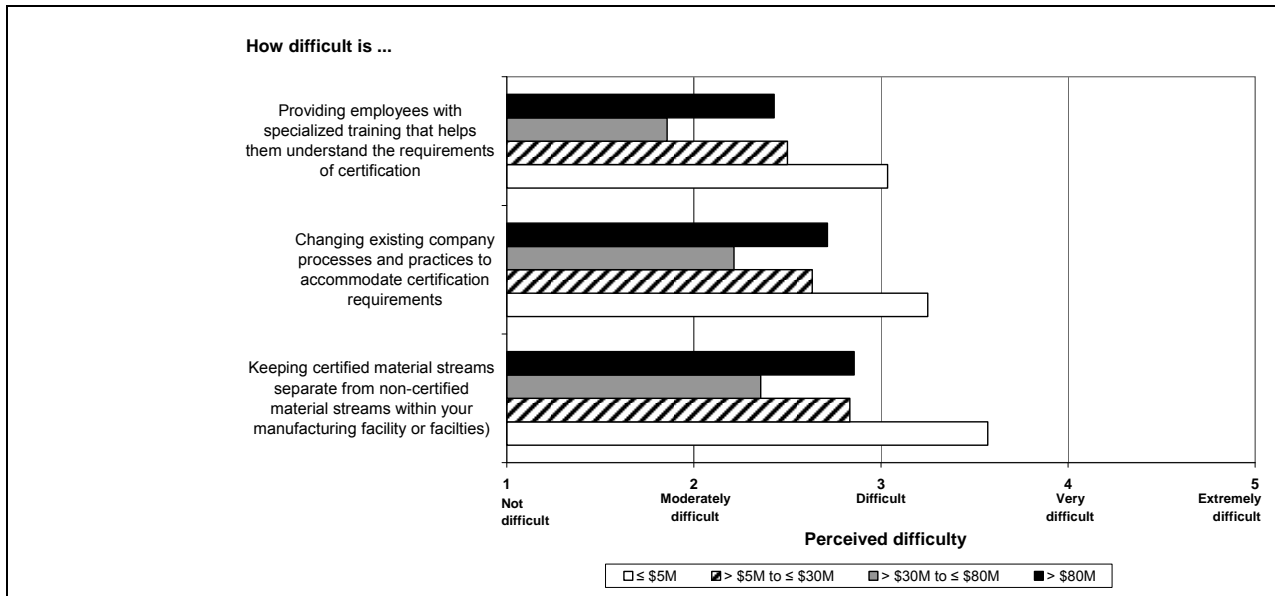
**Figure 7. Executives’ Perceptions of the Difficulty of Overcoming Cost Challenges of Environmental Certification**



Process adaptation challenges encompass issues of altering a firm’s processes and daily routines to accommodate the requirements of certification. Items evaluating process adaptation challenges are shown in Figure 8. Highlights from responses to process adaptation challenges include:

- on a scale from 1 to 5 with 5 representing “extremely difficult,” executives gave an average response of 2.9 on the difficulty of overcoming the challenge of keeping certified material streams separate from non-certified material streams
- on a scale from 1 to 5 with 5 representing “extremely difficult,” executives gave an average response of 2.6 on the difficulty of overcoming the challenges of (1) changing existing company processes and practices to accommodate certification requirements, and (2) providing employees with specialized training that helps them understand the requirements of certification
- executives from the smallest firms sampled ( $\leq$  \$5M in annual sales) perceived all of the process adaptation challenges of certification to be more difficult to overcome than executives from larger firms

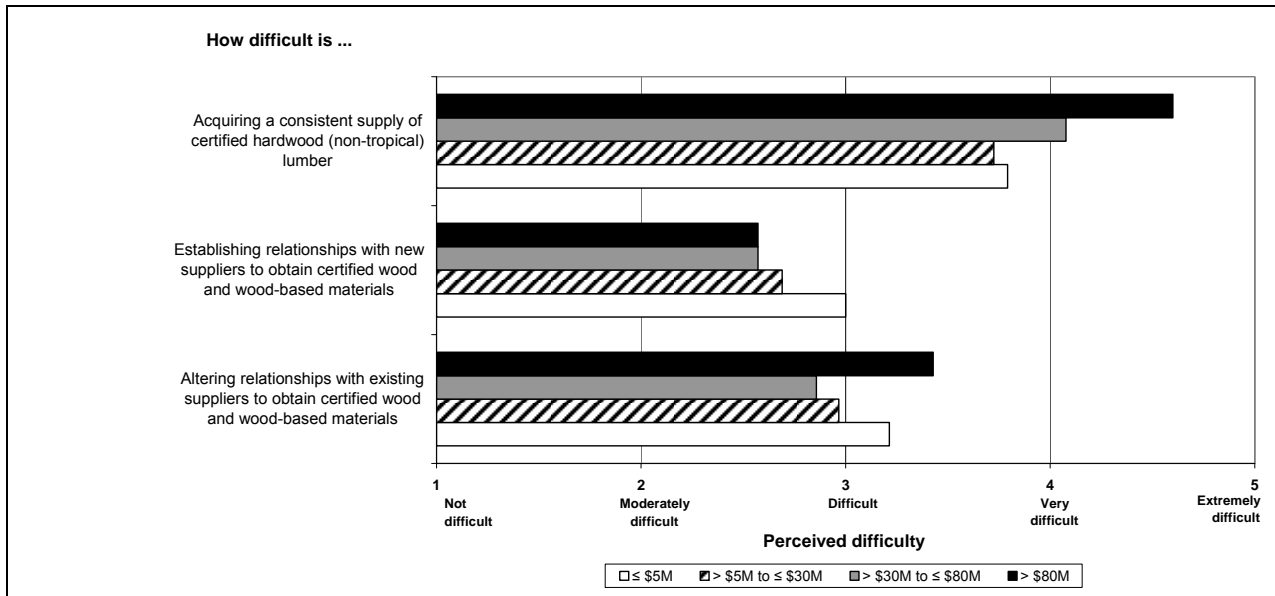
**Figure 8. Executives’ Perceptions of the Difficulty of Overcoming Process Adaptation Challenges of Environmental Certification**



Material supply challenges encompass issues of acquiring certified raw materials. Items evaluating material supply challenges are shown in figure 9. Highlights from responses to material supply challenges include:

- on a scale from 1 to 5 with 5 representing “extremely difficult,” executives gave an average response of 4.0 on the difficulty of overcoming the challenge of acquiring a consistent supply of certified hardwood lumber
- on a scale from 1 to 5 with 5 representing “extremely difficult,” executives gave an average response of 3.1 on the difficulty of overcoming the challenge of altering relationships with existing suppliers to obtain certified wood and wood-based materials
- on a scale from 1 to 5 with 5 representing “extremely difficult,” executives gave an average response of 2.7 on the difficulty of overcoming the challenge of establishing relationships with new suppliers to obtain certified wood and wood-based materials

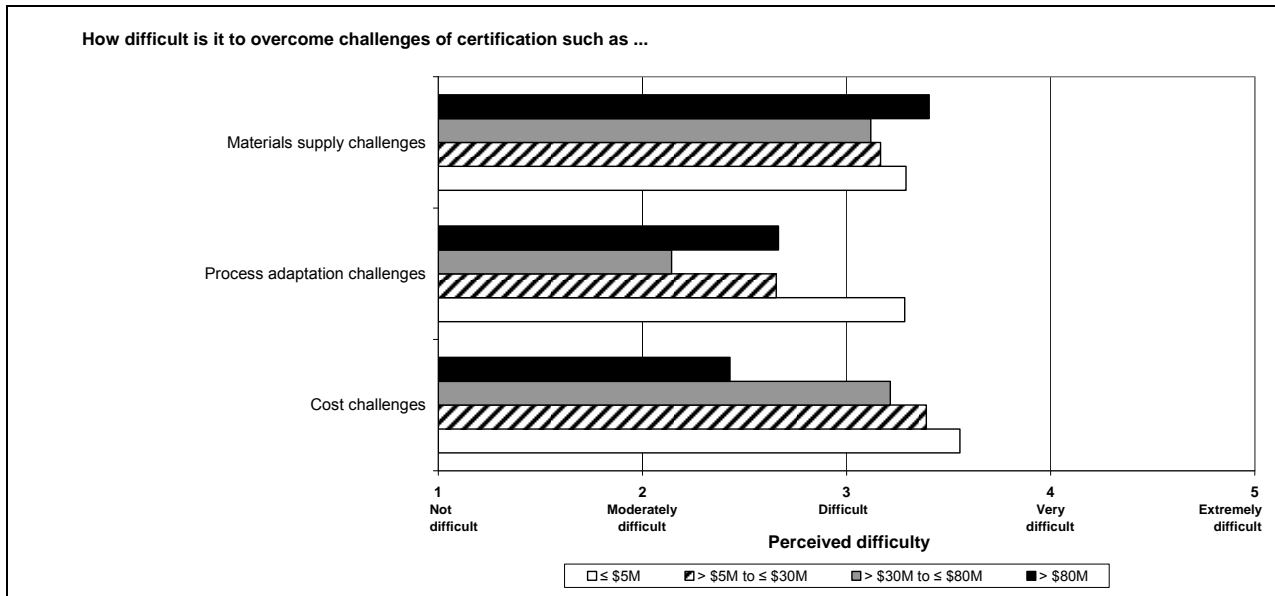
**Figure 9. Executives’ Perceptions of the Difficulty of Overcoming Materials Supply Challenges of Environmental Certification**



All the various challenges (i.e., cost, process adaptation, and material supply) of environmental certification were compared to one another. Figure 10 shows this comparison. Highlights from responses to this comparison include:

- on a scale from 1 to 5 with 5 representing “extremely difficult,” executives gave an average response of 3.2 on the difficulty of overcoming cost challenges and materials supply challenges of certification
- on a scale from 1 to 5 with 5 representing “extremely difficult,” executives gave an average response of 2.7 on the difficulty of overcoming process adaptation challenges of certification
- despite the lower degree of perceived difficulty of process adaptation challenges, executives’ responses to items about process adaptation challenges were more influential in distinguishing between those executives who decided to adopt certification and those who did not than responses to other challenges of certification

**Figure 10. Executives’ Perceptions of the Difficulty of Overcoming Cost, Process Adaptation, and Materials Supply Challenges of Environmental Certification**



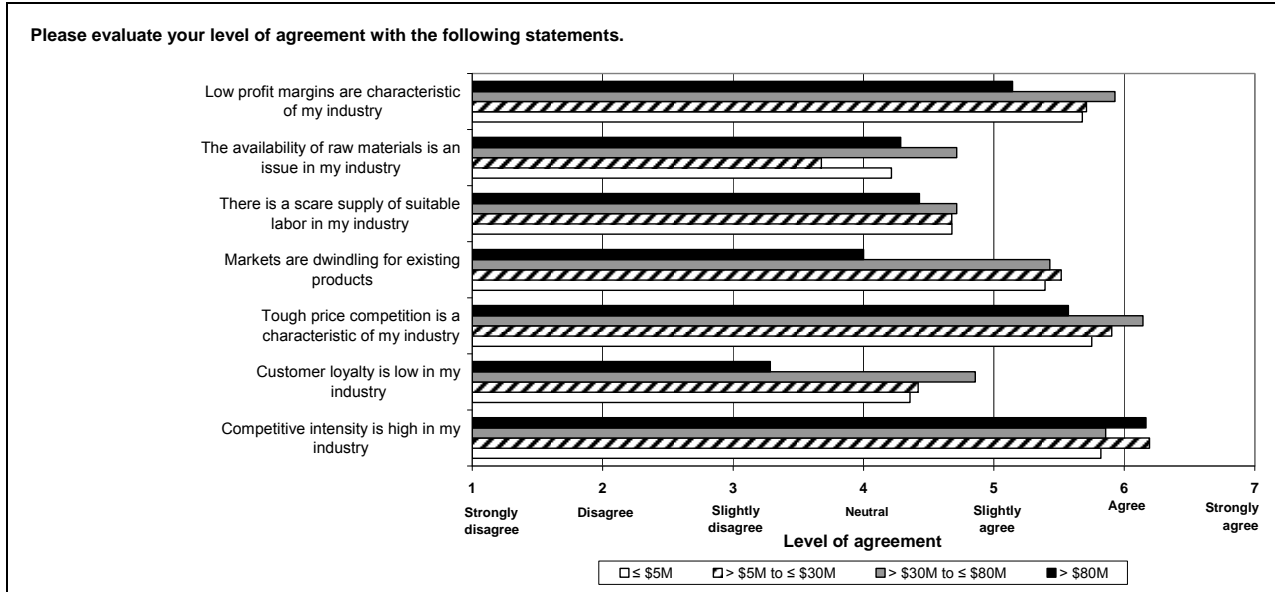
## Hostility in the Business Environment

Executives were asked about their perception of hostility in the business environment in which their firm operates. Perceptions of hostility in the business environment are tied to perceived threats from competitors, disloyal customers, raw material availability, available labor, profitability, and dwindling markets. Items evaluating perceived hostility in the business environment are shown in Figure 11. Highlights from responses to perceived hostility in the business environment include:

- on a scale from 1 to 7 with 1 representing “strongly disagree” and 7 representing “strongly agree,” executives gave an average response of 5.0 for a cumulative measure of all of the statements concerning hostility in the business environment
- on a scale from 1 to 7 with 1 representing “strongly disagree” and 7 representing “strongly agree,” executives gave an average response of 5.8 for the following statements concerning hostility in the business environment
  - *“competitive intensity is high in my industry”*
  - *“tough price competition is a characteristic of my industry”*
  - *“low profit margins are characteristic of my industry”*

Obviously, these results reflect the nature of the business environment that WCMA members currently face. It is interesting to note that larger companies seem to be facing fewer issues related to both customer loyalty and dwindling markets.

**Figure 11. Executives’ Perceptions of Hostility in the Business Environment**



### Intention to Adopt Environmental Certification

Ultimately, this research endeavor sought to examine whether or not executives' intended to adopt environmental certification. Table 3 shows executives' intentions to adopt certification by geographical region, with results suggesting that members in the Northeast are somewhat ahead of other regions in terms of adopting product certification.

**Table 3. Executives' Intentions to Adopt Environmental Certification by Region**

<b>Region</b>	<b>Have adopted environmental certification</b>	<b>Currently in the process of becoming environmentally certified</b>	<b>Have not pursued environmental certification, although currently considering doing so</b>	<b>Not currently planning to pursue environmental certification, but may do so in the future</b>	<b>Have no intention of pursuing environmental certification</b>
Northeast	10	1	5	4	2
Midwest	3	9	12	10	0
South	1	7	4	5	0
West	3	1	0	3	0
Canada	1	1	0	1	0

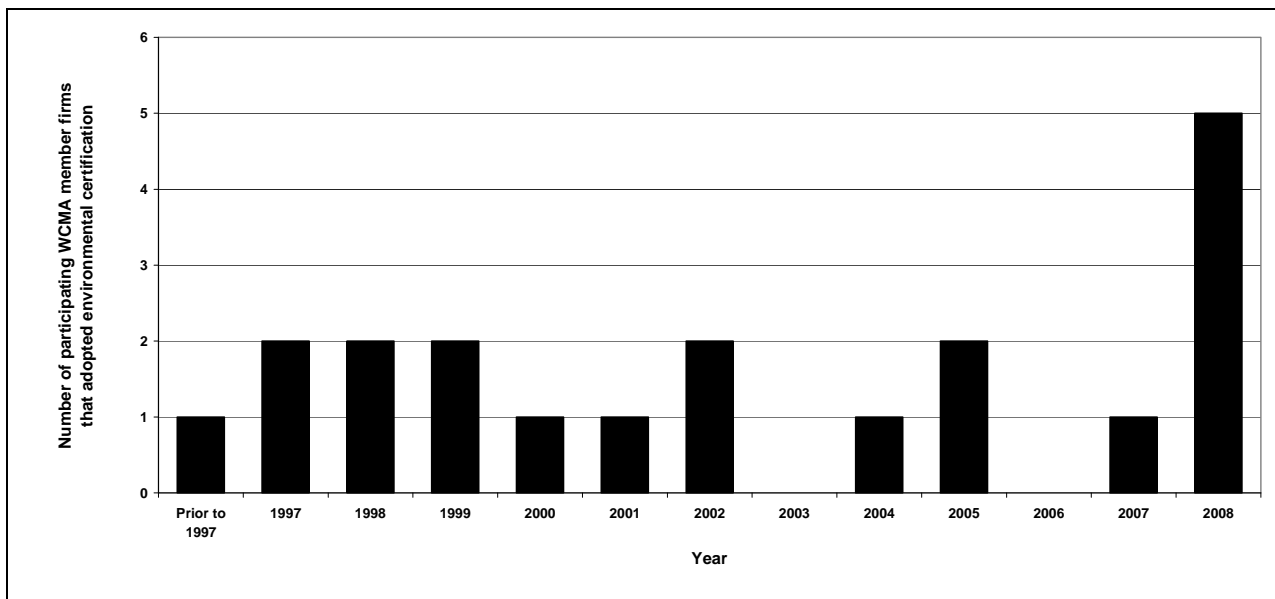
Table 4 displays executives' intentions to adopt certification by firm size. Of note is that 17 firms have adopted environmental certification and 18 firms are in the process of adopting environmental certification.

**Table 4. Executives' Intentions to Adopt Environmental Certification by Firms Size**

<b>Annual sales (2007)</b>	<b>Have adopted environmental certification</b>	<b>Currently in the process of becoming environmentally certified</b>	<b>Have not pursued environmental certification, although currently considering doing so</b>	<b>Not currently planning to pursue environmental certification, but may do so in the future</b>	<b>Have no intention of pursuing environmental certification</b>
≤ \$2.5M	1	1	4	7	1
> \$2.5M to ≤ \$5M	1	1	4	6	1
> \$5M to ≤ \$10M	0	3	2	3	0
> \$10M to ≤ \$20M	5	5	5	4	0
> \$20M to ≤ \$30M	1	1	1	2	0
> \$30M to ≤ \$40M	1	1	2	0	0
> \$40M to ≤ \$60M	2	4	0	0	0
> \$60M to ≤ \$80M	3	1	0	0	0
> \$80M to ≤ \$100M	0	1	0	0	0
> \$100M to ≤ \$250M	2	0	3	0	0
> \$250M	1	0	0	0	0
<b>All firms</b>	<b>17</b>	<b>18</b>	<b>21</b>	<b>22</b>	<b>2</b>

Figure 12 shows the adoption of environmental certification by WCMA member firms (who participated in this research) by year. The relatively large number of firms that adopted certification in 2008 would suggest that this is a “hot area” for member firms, and yet the graph indicates a rather steady increase in WCMA members adopting certification over the past 10 years.

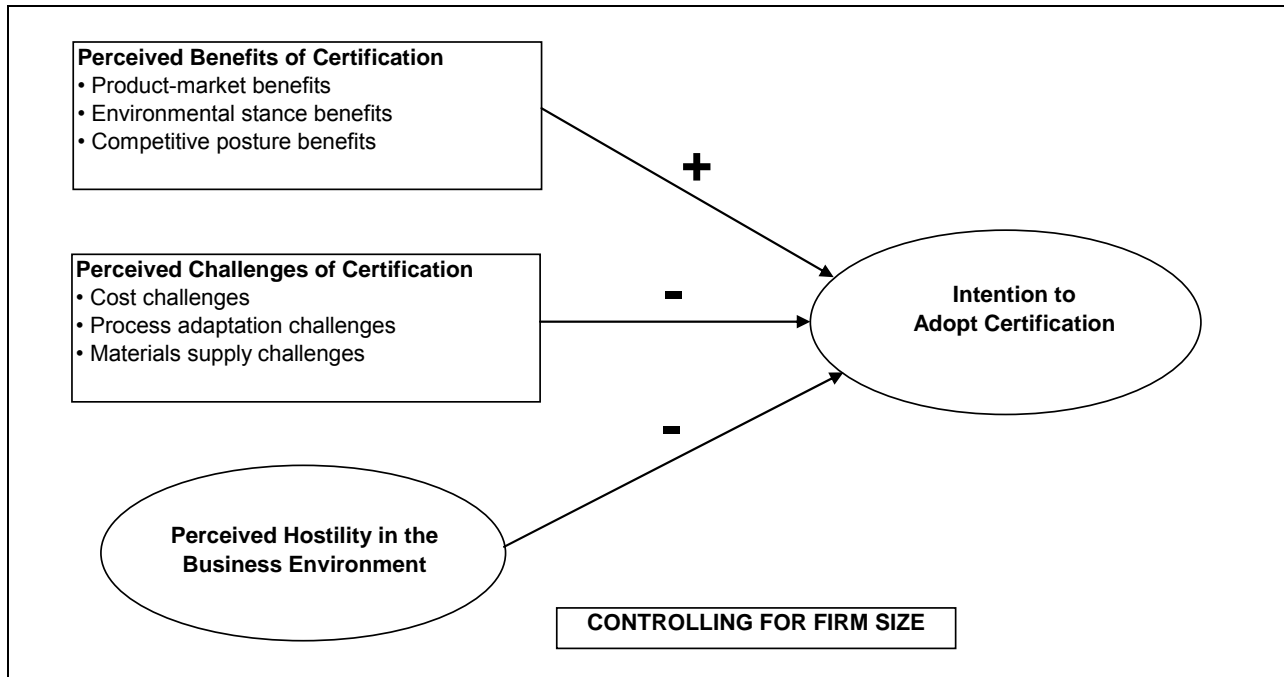
**Figure 12. The Number of WCMA Member Firms (who participated in the research) that Adopted Environmental Certification by Year**



Beyond the descriptive data provided throughout this report, this research also examined the influence of executives' perceptions of benefits and challenges of certification and perceptions of hostility in the business environment on their intentions to adopt, or not adopt, environmental certification. Figure 13 shows the research model used to examine executives' intentions to adopt certification. A brief overview of key research findings based on the model in figure 13 is as follows:

- of the factors examined, executives' responses to items about the process adaptation challenges of certification were the most influential in distinguishing between those executives who decided to adopt certification and those who did not
- of the factors examined, executives' responses to items about environmental stance benefits of certification were the second most influential in distinguishing between those executives who decided to adopt certification and those who did not
- executives from smaller firms are less likely to intend to adopt environmental certification
- executives from smaller firms perceive a greater degree of difficulty associated with challenges of certification than executives from larger firms
- executives from smaller firms perceive certification as being less valuable in achieving product-market benefits and competitive posture benefits than executives from larger firms
- executives from various size firms do not significantly differ in their perceptions of environmental stance benefits of certification

**Figure 13. Research Model Exploring Executives' Intentions to Adopt Environmental Certification**



## DISCUSSION AND CONCLUSIONS

Based on the above results, it seems that adopting environmental certification is not going to improve profitability via charging a premium for environmentally certified products. It appears that the adoption of environmental certification may be most beneficial in capturing market share and helping to competitively position a firm. This suggests that economic returns received from adopting environmental certification may not be gained immediately, but may be seen on a more delayed basis. Or, we would also suggest that in some markets having certified products is becoming “table stakes” that are necessary just to be able to sell into those markets. While certified products may not enjoy much of a premium, they at least allow producers to make sales that they otherwise might not have.

Turning attention to the results about challenges of certification, it appears that attempting to adopt environmental certification poses difficulty in relation to cost challenges, materials separation, and the acquisition of certified raw material (i.e., hardwood lumber). Compared to executives from larger firms, executives from smaller firms indicated that cost challenges and materials separation challenges are more difficult to overcome. Perhaps smaller firms are more resource constrained (i.e., restricted cash flow, lack of computerized manufacturing control/monitoring systems) and therefore find it difficult to meet these challenges.

Executives from larger firms indicated that the acquisition of certified raw materials and associated supplier relationships posed a greater degree of difficulty than indicated by executives from smaller firms. Perhaps this is tied to two factors; due to their size, larger firms are likely to need a greater volume of certified materials thus concerns about certified material acquisition are magnified. Also, larger firms may be currently sourcing materials from a wider array of suppliers compared to smaller firms, and therefore altering supplier relationships may become more of a burden and securing enough certified material may be more complex than for smaller firms.

Even though executives’ perceptions of hostility in the business environment were not found to be influential on their intentions to adopt certification, these perceptions still indicate some interesting implications. Executives indicated an overall level of agreement with each

statement about hostility in the business environment suggesting that they do indeed see the context in which their firms operate in as hostile or threatening in many ways. There appears to be need at an industry level or beyond to develop the skills of the work force, secure on-going access to raw materials, and develop market opportunities.

The issues of work force development and raw material access are not simple to directly address, but there may be more immediate opportunities to develop markets. We believe that environmental certification is one of these market opportunities. As discussed above, executives who were surveyed generally indicated that environmental certification provides value in achieving product-market opportunities. As society places more emphasis on environmentally oriented initiatives and activities, the market for environmentally certified wood products, and the wood components used to make these products, is likely to grow.

## ACKNOWLEDGEMENTS

We would like to gratefully acknowledge the executives from WCMA member firms who took time to complete our surveys. We also thank Steve Lawser and WCMA board members who assisted in the development of the survey and provided understanding of the operating situations of WCMA.

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## Appendix A

### Measures & Methodology

The following section is provided to readers who wish to understand in more detail the methods that were used to collect and analyze the data from this project. Survey measures were developed in conjunction with the executive director and board members of the WCMA. In particular, the items used to assess the perceived benefits and challenges of environmental certification went through several iterations with much input from the WCMA. This approach to developing the survey allowed the research to evaluate those dimensions of environmental certification most likely to be at the fore in the minds of participants.

*Intention to adopt environmental certification.* An executive's intention to adopt environmental certification was measured with the following question: "What is the current status of your company's (or business unit's) decision to adopt, or not adopt, environmental certification?" The five response levels for this question were: (1) have adopted environmental certification, (2) currently in the process of becoming environmentally certified, (3) have not pursued environmental certification, although currently considering doing so, (4) not currently planning to pursue environmental certification, but may do so in the future, and (5) have no intention of pursuing environmental certification. Certification was defined as third-party certification such as that of the SFI, FSC, and CSA certification schemes.

*Perceived benefits of environmental certification.* Executives' perceptions of benefits of environmental certification were measured by a newly developed measure based on reported benefits of environmental initiatives by wood industry firms, research on opportunities of environmental initiatives (Henriques and Sadorsky, 1999; Sharma and Vredenburg, 1998), and Porter's (1980) views of the structure of the business environment. The development of this measure was heavily influenced by the work of Henriques and Sadorsky (1999) and Sharma and Vredenburg (1998), but is different enough from their measures to be considered more than a moderate modification. This measure consisted of items that gauge an executive's evaluation of issues of product-market opportunities, competitive posture, company image and reputation, and fulfillment of anticipated regulatory changes. Items in this measure had a 5 point Likert type response format anchored by (1) provides no value, (2) somewhat valuable, (3) valuable, (4) very valuable, and (5) extremely valuable.

*Perceived challenges of environmental certification.* Executives' perceptions of challenges of environmental certification were also measured by a novel measure based on reported challenges of environmental certification by wood industry executives obtained via phone interviews. The items in this measure were verified for validity by the WCMA. Items in this measure had a 5 point Likert type response format anchored by (1) provides no value, (2) somewhat valuable, (3) valuable, (4) very valuable, and (5) extremely valuable.

*Perceived Hostility in the Business Environment.* Executives' perceptions of hostility in the business environment were measured using the instrument developed by Covin et al. (1999). The measure contained 6 items with a 7 point Likert type response format anchored by (1) strongly disagree, (2) disagree, (3) slightly disagree, (4) neutral, (5) slightly agree, (6) agree, and (7) strongly agree. All the items were positively worded. A typical item is: "Competitive intensity is high in my industry." The estimated reliability of this instrument was  $\alpha = 0.74$ .

*Executive characteristics.* An executive's industry tenure was evaluated by asking executives how many years they worked in the wood industry. This variable was used in regression analyses as a control for commitment to the status quo of industry norms. Research by Hambrick et al. (1993) has shown that with an increase in tenure executives become more committed to the norms, or status quo, of their respective industry.

There does not seem to be a consensus among wood industry executives and managers as to whether firms are able to charge a higher price for environmentally friendly products versus those that are not specifically espoused as being environmentally friendly. To control for this in the regression analyses, executives were also asked about their belief in the ability to charge a premium for environmentally certified products. This variable was measured with a single item that gauged the difficulty in "being able to charge a premium for environmentally certified products above the price for non-certified products." This item had a 5 point Likert type response format anchored by (1) not difficult, (2) moderately difficult, (3) difficult, (4) very difficult, and (5) extremely difficult.

*Company characteristics.* To account for institutional effects (DiMaggio and Powell, 1991; Hannan and Freeman, 1977) of firms, both firm age and firm size were controlled for. The square root transformation of firm age was used to better approximate a normal distribution of the variable. A firm's previous year's annual sales was used as a proxy for firm size. The log transformation of sales was used to better approximate a normal distribution of the variable.

## **Appendix B**

### **Limitations**

The present study has a few limitations. Since data was obtained through the use of surveys, there may be response bias. Survey results collected at one point in time may not generalize to other time periods. Also, results may not generalize to other manufacturing contexts and certification schemes.

The research approach used focused on the importance of executives' perceptions. Factors not considered in this research, such as aspects of the manufacturing process (i.e., manufacturing control systems, floor space, material handling systems/equipment) and supply chain relationships, are likely to also influence executives' intentions to adopt environmental certification. All results provided in this report should be considered in light of the fact that additional factors are likely to weigh in to executives' perceptions and decisions about environmental certification.