Business Strategy and the Environment
Bus. Strat. Env. **21**, 157–169 (2012)
Published online 26 June 2011 in Wiley Online Library
(wileyonlinelibrary.com) **DOI:** 10.1002/bse.724

Stakeholders' Engagement in Promoting Sustainable Development: Businesses and Urban Forest Carbon

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ABSTRACT

To better understand how businesses' motivation and support for green projects varies by their organizational objectives and characteristics, this study investigates a case of urban forestry carbon credits in a broader context of climate change mitigation efforts. Companies and organizations currently participating in the Chicago Climate Exchange (CCX) were surveyed regarding their perception of consumers' concerns with climate change, attitudes toward government regulations, factors important to their emission management decisions, and their interest in buying and paying premiums for carbon credits sourced from urban forestry. Statistical analysis of the responses reveals noticeable differences among various types of business organizations. The findings are useful for understanding how businesses respond to different kinds of green products and will help in the development of green product markets. Finally, the results will help in developing effective environmental policies that respond well to businesses' objectives and preferences. Copyright © 2011 John Wiley & Sons, Ltd and ERP Environment.

Received 22 December 2010; revised 22 April 2011; accepted 29 April 2011

Keywords: climate change; environmental policy; stakeholder attitudes; green product; strategic marketing; sustainable development

Introduction

ENVIRONMENTAL STEWARDSHIP, TOGETHER WITH WORKPLACE SAFETY AND HUMAN RIGHTS, ARE TOP CORPORATE SOCIAL responsibility concerns. As corporate practices and production standards come under media scrutiny, businesses are looking for new ways to maintain their positive public reputation and foster a greener image (Misol, 2010). To demonstrate their commitment to social and environmental responsibility, some businesses are engaging in green projects aimed at energy conservation, provision of ecosystem services, and climate change mitigation. At the same time, intensifying environmental concerns increase public support for green projects. Green projects are gaining popularity largely because they are often considered efficient (i.e. a low-cost approach in the long-run) and sustainable. These projects also generate a range of joint benefits for society. Media scrutiny of corporate practices and increasing public demand for greener ways to conduct business are likely to encourage businesses to show their commitment to sustainable development through investments in green

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projects. A survey recently conducted by Welford *et al.* (2007) found the environment to be a top corporate priority agenda item among businesses and their stakeholders.

Factors motivating participation in green projects include credibility and reputation, relationship with stakeholders, cost reduction, operational effectiveness, and compliance with business and legal agreements (Michael *et al.*, 2010). It has also been argued that environmental performance indirectly generates higher revenue for businesses through reduction of production costs, product differentiation ability, and market access (Ambec and Lanoie, 2008). These factors may motivate businesses to either adopt cleaner technology or to invest part of their profit in green projects such as environmental improvements, afforestation, or wildlife conservation. The development of market-based incentives could be beneficial in influencing businesses to be innovative in environmental management. For example, Revell and Rutherfoord (2003) argued that small and medium sized enterprises could be better motivated by their inclusion and engagement in collaborative initiatives rather than by supply chain regulations. These are some of the ways in which governments could promote corporate social and environmental responsibility by providing businesses with opportunities to invest in green projects.

Previous studies have asserted that the perception of business executives and attributes of the organization can influence the adoption of green initiatives (Masurel, 2007; Michael *et al.*, 2010). Therefore, it is important to understand business operators' attitudes and behavior towards green projects. However, little research has been conducted to understand the association between a company's interests and its initiatives toward specific environmental issues such as climate change (Haddock-Fraser and Tourelle, 2010). From an economic standpoint, understanding interests, attitudes, and behaviors of businesses would also be important for exploring appropriate market-based instruments to promote private investment in the management of green projects. Businesses vary greatly in terms of size, geographical scope, customers, and profit objectives. They also vary with respect to their polluting potential and the expectations from their stakeholders that they address the problems (Gonzalez-Benito and Gonzalez-Benito, 2006). Therefore, it is reasonable to expect that businesses with varying characteristics could have different attitudes and behaviors with respect to environmental regulation and sustainable initiatives.[1]

Emerging literature on business strategy and the environment has analyzed businesses' environmental behavior and actions. In general, these studies have examined the innovativeness and environmental performance of companies in relation to their attributes and the characteristics of management executives. Vernon *et al.* (2003) suggested that larger organizations have the advantage of technical and financial resources to adopt green technologies and sustainable practices while smaller businesses are at a disadvantage, with limited capacities to adopt and adapt. Larger companies have been found to be more aware than their smaller counterparts in terms of environmental obligation and pressure (Baylis *et al.*, 1998) and are likely to be more proactive as well (Gonzalez-Benito and Gonzalez-Benito, 2006; Zhu *et al.*, 2008). Some studies also concluded that corporate mangers of medium sized businesses usually view their environmental impact to be low because of the size of their business (Hendry, 1992) and believe that the environment and sustainability are of lesser importance to their business (Hutchinson and Chaston, 1995).

Revell and Blackburn (2007) found that a substantial number of small firms in the United Kingdom did not have favorable views towards adopting eco-efficiency measures because of the associated cost. A similar observation was noted among consumers by Grankvist and Biel (2007), who found that professional consumers placed higher importance on product prices than their environmental footprints. A recent study by Garlbreath (2010) compared the corporate governance practices of US and non-US firms and found non-US firms to have better governance performance for addressing climate change issues.

There have been a number of studies investigating the relationship between the characteristics of consumers as individual purchasers and their interest in purchasing green products or adopting innovative products. For example, Rowlands *et al.* (2003) found that attitudinal characteristics, such as ecological concern, liberalism, and altruism, were correlated with a buyer's intention to purchase green electricity. A recent study by Ozaki (2011) analyzed the case of consumers' adoption of green electricity and concluded that the adoption of sustainable innovation depends on the way the product reflects a consumer's identity, image, and values. Social norms and personal relevance were found to be more important than just sympathy to the environmental issues. Earlier, Boer (2003) investigated the role played

[1]See Gonzalez-Benito and Gonzalez-Benito (2006) for a detail discussion of factors that influence the environmental proactivity of businesses.

DOI: 10.1002/bse

by sustainability labeling on production and consumption and suggested that social pressures and interactions with market forces will result in a more differentiated role of sustainability labels.

Previous studies also indicated that business executives and the boards have different perceptions of environmental issues, which in turn influence their adoption or pursuit of environmental initiatives (Sharma and Nguan, 1999; Campbell, 2003; Sangle 2009). For example, Michael *et al.* (2010) surveyed business executives to see how the perceived benefits and challenges of adopting environmental certification affected a firm's decision to enroll in a certification scheme. They found a significant difference in perceptions between executives of companies with and without enrollment in certification. Similarly, Carlsen *et al.* (2001) conducted a survey of family-operated tourism businesses to evaluate their environmental perception, conservation ethic, and commitment to sustainability. They found that businesses owned by families with a higher quality of lifestyle and environmental concern were more likely to adopt sustainable practices. Pinkse and Kolk (2010) argued that a number of firm- and industry-specific factors influence the way firms deal with climate change mitigation and related policies.

Other studies have investigated the empirical relationship between firms' environmental initiatives and their financial performance. For example, Hart and Ahuja (1996) found a direct relationship between environmental and financial performance of businesses based in the United States. Klassen and McLaughin (1996) found that firms with strong environmental management saw significant positive returns while those with poor environmental management experienced negative returns. Mir (2008) analyzed the environmental behavior of micro-enterprises in Chicago and found that factors such as the level of the owner's experience and external pressure, including government intervention and access to market opportunities, influenced adoption of environmental actions.

To date, the literature has almost exclusively focused on examining the relationship between the environmental performance and financial returns of businesses. However, little research has been conducted to understand their perception of and willingness to support green projects. Understanding business motivations will be helpful in identifying the value they place on the products and services received from green projects.

To better understand how businesses' motivations and support for green projects varies by their organizational objectives and characteristics, this study investigates a case of urban forestry carbon credits in a broader context of climate change mitigation efforts. The study relies on a survey of carbon credit buyers to understand their attitudes, preferences, and willingness to pay a price premium for credits generated from urban forestry projects. The potential green return associated with urban forestry carbon credits is substantial. First, companies buying credits sourced from urban forests would not only meet their offset needs, but also help arrest global climate change. Second, urban forestry projects, unlike methane capture, provide a range of joint benefits to city residents such as esthetic beauty, wildlife habitat, air quality, and water conservation. Third, because of shrinking resources, cities and municipal governments nationwide are struggling financially, therefore, promoting green projects like urban forestry carbon credits could be a promising avenue for cities to increase their revenues.

Urban Forestry Carbon Credits

Urban forestry carbon credits are generated from the absorption and storage of atmospheric carbon dioxide by trees and forests located in urban areas (McPherson, 1994). Such projects are usually owned and managed by local governments units such as a city, county, or municipality. Trees and forests located along roadsides, public parks, and forest reserves are managed according to sustainable forest management guidelines and every ton of carbon absorbed and stored by those trees can typically be counted as one credit under certain standards. These standards may vary by type of registry and trading scheme. Such credits are assigned with a unique identifier and then sold in a market to businesses which want to offset their carbon emissions, either voluntarily or as part of mandatory compliance. While the market for other types of carbon credits such as methane capture, renewable energy, and agriculture soil carbon have already been established the United States and elsewhere, potential markets for urban forest carbon are still under development (Poudyal *et al.*, 2010).

Recent studies indicate that there is a strong potential for an urban forestry carbon market in the United States and beyond. In the United States, urban areas maintain average tree coverage of 27% (Nowak *et al.*, 2001). Research findings indicate that there are 4 billion urban trees in the United States. (Nowak *et al.*, 2001) and another 70 billion are growing in metropolitan areas nationwide (Bratkovich *et al.*, 2008). The carbon absorption and storage capacity of urban forests in the United States has been estimated to be as high as 700 million tons (Nowak and Crane, 2002).

DOI: 10.1002/bse

Similar potential for urban forests to produce carbon offset has been estimated elsewhere. For example, Stoffberg *et al.* (2010) estimated that the city of Tshwane in South Africa alone has the possibility of producing about 55 thousand tons equivalent carbon credit, with a monetary value of $3 million. Likewise, Yang *et al.* (2005) estimated that the urban forest in Beijing, China could store 0.2 million tons of carbon, which potentially could be developed as offset credit and sold to businesses seeking offsets. Further, recently compiled urban forest resource data in Europe (Konijnendijk 2003) indicated a tremendous potential for storing carbon in urban trees. Identifying potential consumers of green products like urban forest carbon credits would be a first step toward establishing an effective market (Peattie, 2001), helping urban forest managers to identify potential green consumers and accordingly develop a plan to meet their needs.

Objectives

The objective of this study is to advance knowledge of businesses' attitudes, preferences, and willingness to support green projects based on their organizational characteristics and structure. Specifically, the study examines questions about how various characteristics such as profit objectives, size, and geographic scope of the business, along with concerns about customer attitudes toward climate change, influence businesses' interest in investing in green projects. Another objective is to determine what preferences businesses have for particular types of projects, and whether they would be willing to pay premiums for carbon credits sourced from urban forests. The findings will contribute to the development of effective environmental policies and which support sustainable development.

Methods

Survey

This study surveyed individual businesses and organizations that are currently involved in carbon trading in the Chicago Climate Exchange (CCX). The survey targeted two categories of CCX participants: members and associate members.[2] The members are basically the businesses and organizations with commitment to reduce their direct emissions, whereas the associate members are those with commitment to reduce their indirect emissions. The targeted group was very diverse, representing manufacturing, real estate, information technology, financial services, electric power generation, consulting, aerospace equipment, electronics, forest products sectors, and some non-profit organizations.

Altogether, there were 186 potential respondents from the CCX list of members and associate members at the time of survey. The survey process began with first making telephone contact with as many participants as possible. Then the survey was administered during the fall of 2009 using a modified tailored design method for mail questionnaires (Dillman, 2000).

Most of the questions began with a statement and then asked respondents to indicate their level of agreement/disagreement using a five-point Likert scale format.[3] The first set of questions was about respondents' attitudes and perception about climate change, client relationships, and government regulations on emission control. The second set of questions asked them to rank or rate their preference for carbon credits based on the characteristics (e.g. location and type) of the offset projects. The third set of questions asked them about their motivations and willingness to purchase urban forest carbon credits. A value elicitation question in this section used a standard stated preference payment card (Welsh and Poe, 1998) to let them express their willingness to pay for urban forestry carbon credits under current and future price scenarios. The final group of questions asked about the characteristics of the company such as employment, asset value and annual revenue, ownership type, existence of a

[2]Other member categories such as aggregators and liquidity providers were not surveyed because they are not the primary user of carbon credits and may have little influence on the ultimate demand for credit.

[3]We chose a five-point Likert scale for a number of reasons. First, this is the most commonly used scale for questions dealing with preferences or similar data (e.g. measuring the level of agreement, happiness between two extremes). Second, we wanted to label those scale points to make sure respondents understood them and indicated their responses correctly, and the five-point scale offered the best option to place readily distinguishable labels.

DOI: 10.1002/bse

public relation body, and scope of the business operation. The survey instrument was reviewed by experts in the area of forestry and natural resource valuation and later pre-tested on a subset of respondents. The details of the survey can be found in Poudyal *et al.* (2011), which include the results pertaining to the general interest of all respondents in urban forestry carbon credits. This research is focused on how specific business characteristics influence corporate environmental responsibility, demand for various types of green projects, and willingness to pay a premium for urban forestry carbon.

Sample mean responses to questions were calculated for various types of business organizations. Respondents were classified into three categories: (i) for-profit versus non-profit organizations, (ii) organizations with only domestic operations (United States) versus international (United States and foreign locations), and (iii) small businesses (fewer than 1000 employees) versus large businesses (more than 1000 employees). Differences in their mean willingness to pay premiums were plotted and tested using paired *t*-tests. A cut-off value of $P = 0.10$ was used to indicate statistical significance.

Results

A total of 58 responses were received, giving an adjusted response rate of 41.4%. Those unwilling to participate were excluded from the response rate calculation because most of them expressed their unwillingness during the telephone contact and thus did not look at the actual content of the survey. Others cited company policy or change in their portfolio of projects as reasons for not participating. None of the non-participants were identified as protestors.

There was significant variation among respondent characteristics. In terms of ownership, roughly 55% were private, or for-profit businesses, about 25% were non-governmental organizations (NGOs) or public organizations, and the remaining 20% were government entities. Workforce size for respondents varied from as few as 2 to a high of 21,000, with a mean workforce of nearly 10,000. Similarly, nearly half (48%) had only domestic operations (United States), while another 35% indicated domestic and international operations, and 17% indicated regional operations.

Nearly all respondents (98%) had an estimate of their annual greenhouse gas (GHG) emissions. The average annual level of emissions was 5.26 million metric tons. However, slightly more than one-third (36%) had no target set for reducing their GHG emissions in the next 5 years. About 10% had the target of a reduction of less than 5%, 24% had the target of reducing from 6% to 10%, 12% have the target of reducing from 11% to 20%, and 9% had the target of reducing their emissions from 21% to 50%. Fewer than half the respondents (40%) had been participating in carbon trading for 1 to 3 years, 21% for 3 to 5 years, and 29% for more than 5 years, whereas the remaining 7% had just started in 2009 and about 2% were no longer participating at the time. On average, respondents bought roughly 33,000 CO_2 equivalent credits in 2008.

Table 1 presents the average importance of various business aspects as rated on a Likert scale (1 = extremely unimportant, 5 = extremely important). Six factors including efficient operation, profits, and stock prices were rated

	Profit motive		Business operation		Employment	
	For-profit	Non-profit	US only	Worldwide	Small	Large
Efficient operation	4.75	4.68	4.67	4.76	4.63	4.82
Profits	***4.90***	***4.00***	4.58	4.73		
Environmental stewardship	4.66	4.76	4.71	4.70	4.80	4.60
Stock prices	***4.47***	***3.83***	4.11	4.45	4.71	4.22
Public image	4.63	4.72	4.67	4.66	***4.80***	***4.53***
Legal compliance	4.84	4.88	4.78	4.93	4.76	4.96

Table 1. Respondents' rating of importance on various business elements (5 = extremely important, 1 = extremely unimportant) Mean response numbers in bold italics indicate a significant ($P < 0.10$) chi-square statistic.

DOI: 10.1002/bse

with higher scores of importance by for-profit businesses than by non-profit businesses. As the for-profit businesses are likely to be privately or corporately owned, it is reasonable to expect their higher emphasis on profits and stock prices. Conversely, the non-profit businesses and organizations placed a higher level of importance on environmental stewardship, public image, and legal compliance. These observations are consistent with the nature and business objectives of non-profit organizations as they are likely to be motivated by such agendas as public welfare, conservation, and good governance. However, chi-square tests indicated that these two types of organizations revealed significantly different levels of importance for only profits ($P = 0.00$) and stock prices ($P = 0.03$).

Organizations with domestic and international operations placed slightly higher importance on efficient operations, profits, stock prices, and legal compliance than organizations operating just domestically. However, the differences were not statistically significant. Likewise, smaller businesses placed slightly higher importance on environmental stewardship, stock prices, and public image. Large companies placed slightly higher importance on efficient operations and legal compliance. A chi-square test suggested that large and small companies indicated significantly different levels of importance for public image ($P = 0.03$), suggesting that small businesses may be more concerned about public image than their larger counterparts.

Table 2 compares the businesses' average level of agreement (5 = strongly agree, 1 = strongly disagree) with statements about their customers' concerns with climate change and policies to support pro-climate companies. Non-profit organizations and businesses operating internationally indicated a slightly higher level of concern about global climate change among their customers and preference to use suppliers that reduce GHG emissions. However, results from the chi-square test were statistically insignificant, thus the business organization categories as classified here did not differ regarding their knowledge of customers' concerns about climate change or preference for pro-environmental companies.

Table 2 further compares respondents' agreement or disagreement with the statements explaining company views toward favoring pro-environmental customers and government regulations regarding GHG emissions. There was no statistical difference between for-profit and non-profit companies, and none between small and large businesses in terms of favoring suppliers that reduce GHG emissions. There was also no difference regarding paying a premium to suppliers that reduce GHG emissions. A recent study in the United Kingdom revealed that companies which have a close connection with their clients are more active in participating in environmental initiatives, such as climate change mitigation, than companies somewhat removed from their clients. However, the companies that participate in environmental initiations seek either a cost-reduction or a social image benefit in

	Profit motive		Business operation		Employment	
Our customers...	For-profit	Non-profit	US only	Worldwide	Small	Large
Are concerned about climate change	4.03	4.23	4.03	4.19	4.12	4.11
Favor a company that reduces GHG emission	4.03	4.30	4.07	4.19	4.15	4.11
Our company would....						
Favor a supplier that reduces GHG emissions if the costs were comparable	4.43	4.52	***4.69***	***4.25***	4.59	4.34
Consider paying a premium to a supplier that reduces GHG emissions	3.34	3.71	3.76	3.22	3.76	3.22
Prefer government regulation as opposed to no government regulation of GHG emissions	3.80	3.87	4.00	3.67	***3.89***	***3.76***
Prefer mandatory regulation as opposed to voluntary regulation with standards	3.61	3.54	3.88	3.28	3.58	3.57

Table 2. Respondents' rating of agreement with clientele's knowledge and government regulations (5 = strongly agree, 1 = strongly disagree)
GHG, greenhouse gas.
Bold italics indicate a significant ($P < 0.10$) chi-square statistic.

DOI: 10.1002/bse

return (Haddock-Fraser and Tourelle 2010). However, a chi-square test indicated that respondents with only domestic operations indicated a significantly higher level of agreement in favoring suppliers who reduce GHG emissions, if the prices were comparable ($P = 0.01$). Between respondents with domestic and international operations, domestic operators also indicated a somewhat higher level of agreement that they would be willing to pay a premium to suppliers that reduce GHG emissions; preferring government regulations as opposed to no government regulations; and preferring mandatory regulations as opposed to voluntary regulations. However, chi-square tests suggested that the differences were statistically insignificant.

Small businesses indicated a higher level of agreement in preferring government regulations as opposed to no government regulations of GHG emissions ($P = 0.01$), suggesting that larger companies are less likely to support government regulations for GHG emissions control.

Respondents were also asked about the importance of factors that may influence their decision about offsetting their carbon emissions. Table 3 presents the level of importance they placed on various factors, including public image, production cost, being proactive, environmental responsibility, shareholder requests, and legal compliance. As seen in the second column, for-profit businesses place higher importance on production cost ($P = 0.10$) and shareholder requests ($P = 0.08$) when making decisions to offset their carbon emissions. Comparisons of importance scores in the third column suggest that there was no significant difference between businesses operating domestically and internationally in terms of the influence of these factors on their decisions about offsetting carbon emissions. Interestingly, the mean importance score on production cost was significantly different between small and large business organizations ($P = 0.03$). This suggests that production cost might be a more important factor for large businesses than their smaller counterparts in making decisions about offsetting their GHG emissions. Further, smaller businesses also assigned a slightly higher score of importance to factors like public image and environmental responsibility, whereas larger businesses attached a higher score to factors like shareholder requests and legal compliance, although these differences were not statistically significant. Earlier, Simpson *et al.* (2004) found that small and medium sized enterprises in the United Kingdom were aware of the influence of environmental issues in their business, but considered the efforts required to address those issues as a cost not transferable to clients or consumers.

Respondents were asked to rate their preference for a carbon credit source based on project location. As most of the companies with GHG emissions are likely to be located in urban areas, understanding their preferences for local projects is important when exploring the desirability of urban forestry projects. Table 4 breaks down the average preference for projects located in various places by respondent subgroups. Based on the location, four types of projects were considered: (i) local projects that capture atmospheric carbon within 200 miles of the emissions source; (ii) regional projects that capture atmospheric carbon within the same region of emission, for example, the southern United States; (iii) national projects that capture atmospheric carbon within the country of the emission source; and (iv) international projects that capture atmospheric carbon outside the country of the emission source. For-profit businesses, domestic operators, and small businesses all indicated higher levels of preference for locally generated projects compared with their counterparts. The preference was significantly different between for-profit and non-profit businesses ($P = 0.09$), and businesses operating domestically only and internationally ($P = 0.00$).

	Profit motive		Business operation		Employment	
	For-profit	Non-profit	US only	Worldwide	Small	Large
Public image	4.50	4.36	4.39	4.48	4.53	4.33
Production cost	***4.53***	***4.16***	4.18	4.58	***4.04***	***4.68***
Being proactive in future legislation	4.03	3.92	4.03	4.20	3.89	4.37
Environmental responsibility	4.62	4.68	4.64	4.65	4.73	4.55
Shareholders requests	***3.86***	***3.80***	3.38	4.15	3.72	3.90
Legal compliance	4.48	4.61	4.36	4.72	4.39	4.66

Table 3. Respondents' rating of factors influencing their decision about offsetting carbon emissions (1 = extremely unimportant, 5 = extremely important)
Bold italics indicates a significant ($P < 0.10$) chi-square statistic.

DOI: 10.1002/bse

	Profit motive		Business operation		Employment	
	For-profit	Non-profit	US only	Worldwide	Small	Large
Local projects (within 200 miles of emission source)	***4.80***	***5.00***	***5.00***	***4.66***	4.94	4.78
Regional projects (within the same region of emission source)	4.05	3.91	4.05	3.90	4.05	3.92
National projects (within the country of emission source)	3.31	3.07	3.05	3.46	3.11	3.33
International projects (outside the country of emission source)	2.38	1.57	2.04	1.09	2.22	1.78

Table 4. Respondents' rating of preference for carbon credit source projects (5 = highest preference, 1 = least preference)
Bold italics indicate a significant ($P < 0.10$) chi-square statistic.

Comparison of mean preference scores suggests that non-profit organizations and domestic operators are likely to have higher preferences for local credit sources, such as urban forestry, than their counterparts. This is comparable with the observations of a recent study by Kolk *et al.* (2010), who found that domestic businesses in China showed higher concern for economic and philanthropic dimensions when compared with foreign counterparts.

Respondents were asked to indicate their willingness to pay a price premium for carbon credits generated from urban forestry projects. At the time of the survey, the price of carbon credit per metric ton of CO_2 equivalent was 50 cents. Respondents were provided with a payment card with two valuation scenarios and a range of payment amounts to indicate their willingness to pay a premium for credits sourced from urban forestry. It should be noted that the premium asked was in addition to what they currently pay for carbon credits. In the first scenario, a city or municipality selling the carbon credits from its urban forestry projects would not provide buyers with any type of recognition logo or certification. In the second scenario, a city or municipality selling credits would provide buyers with a highly visible recognition sign or logo at the project site acknowledging the buyer. In both scenarios, the premium payment options were 0, 1, 5, 10, 15, 25, 50, or 75 cents, $1, and more than $1.

There was a notable difference between respondents from the different business characteristic groups in terms of premiums they would offer for carbon credits sourced from urban forestry projects (Table 5). In the first valuation scenario, in which the buyer would not receive any logo or certification of purchase at project site, the average premium offered by non-profit businesses was 19 cents whereas the for-profit businesses offered an average premium of only 2 cents. A *t*-test indicated that this difference was statistically significant ($t = 2.32$, $P = 0.02$). Businesses with domestic operations only offered a higher premium (12 cents) than those operating internationally (6 cents), although the difference was statistically insignificant ($t = -0.86$, $P = 0.80$). Given the early lead of the European Union in climate change and carbon trading initiatives, one would expect some regional variation in businesses' willingness to support pro-climate projects. Our results corroborate an earlier study of Pinske (2007) that did not find North American industries to be different from European or Asian businesses in

Valuation scenario	Respondent category		Mean premium ($)
1. City *does not provide* a sign or logo highly visible at the project site	Profit-motive	For-profit	***0.02***
		Non-profit	***0.19***
	Scope of Operation	US only	0.14
		Worldwide	0.06
	Employment	Small business	0.12
		Large business	0.08
2. City *provides* a sign or logo highly visible at the project site	Profit-motive	For-private	***0.07***
		Non-profit	***0.25***
	Scope of Operation	US only	0.22
		Worldwide	0.13
	Employment	Small business	0.23
		Large business	0.11

Table 5. Average premium offered for an urban forest carbon credit (1 metric ton CO_2 equivalent)
Bold italics indicate statistical difference at $P < 0.10$.

DOI: 10.1002/bse

participating in carbon emission trading. Similarly, small businesses offered an average premium of 12 cents for a carbon credit sourced from an urban forest project whereas large businesses offered 8 cents; however, this difference was not statistically significant ($t = -0.60$, $P = 0.55$).

In the second valuation scenario, in which the buyers would receive an official recognition or certification logo from the local city at the project site, the average premiums offered by for-profit businesses and non-profit businesses, respectively, were 7 and 25 cents. A *t*-test indicated that the difference in premiums offered by these two business groups was statistically significant ($t = 1.87$, $P = 0.06$). In this scenario, companies with domestic operations offered a higher premium (22 cents) than their international counterparts (13 cents). But the difference was statistically insignificant ($t = -0.62$, $P = 0.53$). For urban forest credits that come with a recognition logo at a project site, small businesses offered a larger premium (23 cents) than did their larger counterparts (11 cents), although again the difference was not statistically significant ($t = -0.90$, $P = 0.37$).

The market price of carbon credits in the United States and elsewhere is expected to increase if the federal government introduces mandatory regulations for GHG emissions. To understand buyers' willingness to offer premiums for urban forest credits in such a hypothetical scenario, we used an additional payment card to elicit the expected premium should mandatory regulations be imposed and carbon prices rise. Six hypothetical base price levels ($5, $10, $15, $20, $25, or $30 per metric ton) were proposed in the presence of future mandatory regulations. Under each price scenario, respondents were asked to choose one of the six price premium options (0, 5, 10, 25, 50, 75, or 100%), representing what they would pay above the base market price, to obtain the additional recognition or certification logo. The premium under each base price scenario was computed by subtracting the base price from prices that the respondent expected to pay. Figures 1–3 compare the premium for different business organizations.

Figure 1 compares the premium (percentage of the base price) offered by for-profit and non-profit organizations. In the lowest hypothetical base price ($5), non-profit organizations offered a premium as high as 16% for credits sourced from urban forestry projects. Their average offer gradually declined to 6% with the $10 base price, and eventually to 2% with the $15 base price. It remained constant thereafter, at a about 2% of the higher base prices. The for-profit businesses, however, offered about a 2% premium in each base price scenario. A *t*-test indicated a significant difference in the premium offered between these two groups at the $5 base price scenario ($t = 2.10$, $P = 0.04$). However, the differences in premium offered were not significant at the $10 or higher hypothetical future prices.

Stated premiums in the hypothetical price scenarios differed little between businesses with domestic operations only and their international counterparts (Figure 2). At the lowest base price ($5), both groups offered a premium about 7% higher than base prices with no statistical difference. Moreover, there was no statistical difference in premium offered at any hypothetical base price.

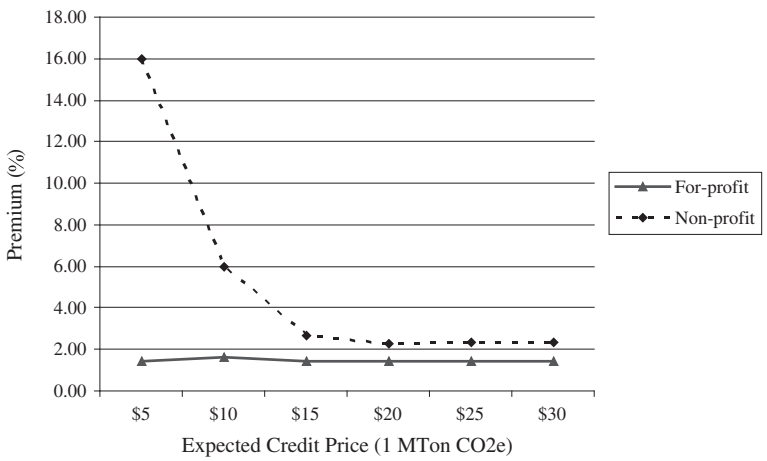

Figure 1. Premiums offered by for-profit and non-profit organizations for urban forest carbon credits in various hypothetical base price scenarios

DOI: 10.1002/bse

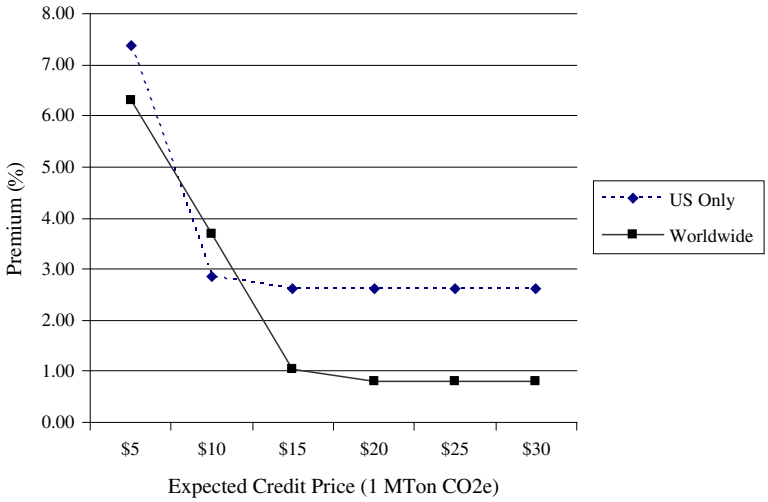

Figure 2. Premiums offered by businesses operating in the United States only and worldwide for urban forest carbon credits in various hypothetical base price scenarios

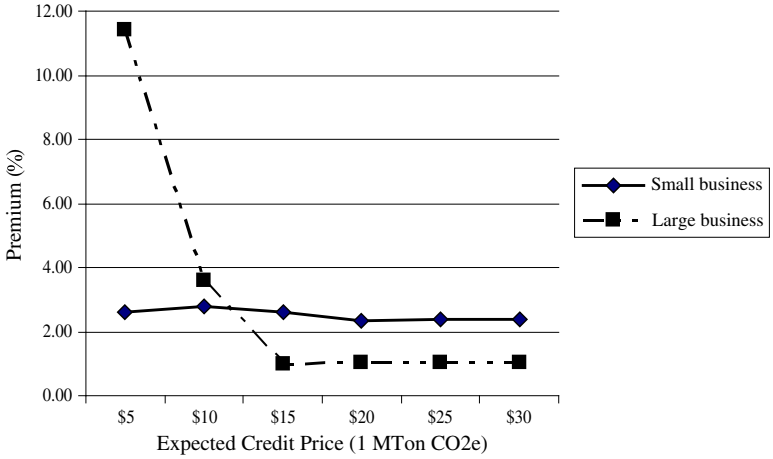

Figure 3. Premiums offered by small and large businesses for urban forest carbon credits in various hypothetical base price scenarios

Business size demonstrated a pattern somewhat similar to the for-profit and non-profit pattern above (Figure 3). Small and large businesses offered very different premiums at the $5 base price scenario, but the differences in premiums converged at a base price of $10 and remained statistically indistinguishable thereafter.

Discussion and Conclusion

Analyzing the perceptions and attitudes of business organizations regarding their customers' concerns and government regulation is important when trying to understand whether and how they will support green projects. While substantial research has been conducted in the areas of corporate behavior, and the relationship between financial and environmental performance, this study is perhaps first of its kind that actually elicits business organizations' attitudes, interests, and willingness to pay regarding green projects through a stated preference survey.

DOI: 10.1002/bse

This study shows a high level of support for the regulations targeted at environmental management, including climate change mitigation. This is consistent with earlier observations made from similar surveys of businesses in the United Kingdom (Merritt, 1998) and Sweden (Paulsson and Malmborg, 2004). We also found insignificant differences between companies in terms of their knowledge of consumer awareness and concerns about climate change, and customers' preferences for green projects like urban forestry. The only differences we observed were between organizations doing business domestically versus those operating domestically and internationally. Domestic operators indicated significantly higher levels of agreement supporting GHG emission reduction. Small businesses were more likely to prefer government regulation as opposed to no government regulation of GHG emissions. No significant difference was found between organizations conducting business only in the United States as opposed to worldwide in the importance they placed on various business attributes in making decisions about offsetting carbon emissions. This is consistent with a Chinese study that found no significant difference between domestic and international companies in terms of the importance placed on environmental issues during their business operation (Kolk *et al.*, 2010). However, for-profit businesses were more likely than non-profit businesses to place a higher level of importance on production cost and shareholder requests.

Similarly, large businesses were more likely than small businesses to place higher importance on production costs in making decision about offsetting their carbon emissions. These observations provide support for government policies that will help business organizations to adopt cost-efficient technologies or raise environmental awareness among their customers and shareholders.

Further, there was a significant difference between for-profit and non-profit businesses, and businesses operating only in the United States versus worldwide in terms of their preference for location of offset projects. Non-profit organizations and those operating only within the United States demonstrated a higher preference for buying locally generated carbon credits. This observation is particularly meaningful in marketing carbon credits sourced from local green projects such as urban forestry. As most of the businesses and companies requiring emission offsets are clustered near urban areas, urban forest projects managed by local cities could be a desirable source of carbon credits. Business organizations showed relatively little support for credits generated from outside their area of operations.

We also observed significant statistical differences among business organizations in terms of their willingness to pay a price premium for credits generated from urban forest projects. The observed difference in businesses behavior is in line with the earlier conclusion of Jeswani *et al.* (2008), who in a study of the United Kingdom and Pakistan found that size and type of ownership, among other factors, influence a business's response to climate change. In each valuation scenario, non-profit business organizations offered a significantly higher price premium for a carbon credit sourced from urban forests. This suggests stronger support by non-profit organizations for green projects. In the hypothetical scenarios of higher carbon credit prices, there was a difference in premiums between for-profit and non-profit businesses, and between small business and large business, when the expected base price was low. When the hypothetical base price went up, the premium for urban forestry credits paid by all groups gradually converged, being indistinguishable above a price of $15 per ton. This result suggests that non-profit and for-profit companies would behave similarly at very high carbon credit prices. This could mean that the non-profit organizations have a potential altruistic or public welfare motivation showing generous support for green projects only while it is affordable. However, they are forced to behave like for-profit companies at the higher prices, potentially due to their budget situation and other financial constraints.

Findings from this study will be useful in understanding the attitudes and preferences of companies and business organizations regarding their support for green projects like urban forests. Even though this particular study has an urban forestry focus, it provides a general idea of how business organizations of different types will potentially respond to other kinds of green products and projects. Key observations from the statistical analysis provide a number of specific policy ramifications in promoting environmental stewardship and corporate responsibility. First, cities and municipalities as owners and managers of urban forest offset projects could label their product to appeal to the appropriate segment of the business organizations and companies interested in buying urban forest credits. By doing so, they will be able to not only supply the type of credits those companies want, but also to collect premiums that buyers would pay for corporate recognition.

Second, our study indicates that most of the non-profit organizations, perhaps due to their public welfare motivation, are interested in paying a premium for urban forest offset credit. However, market participants that are profit oriented could also be encouraged to buy the product if cities could offer appropriate incentives such as tax

DOI: 10.1002/bse

breaks. For example, some kind of local property tax exemptions or deduction allowances for funds invested in those credits. Third, it should be noted, however, that the ability and willingness of business organizations to offer premiums would be limited at higher base prices for credit offsets. Fourth, government agencies could take lesson from this case study and try out strategic marketing (e.g. labeling, pricing) of other similar green products such as green electricity, recycled materials, and a number of other ecosystem services that business organizations frequently purchase.

It should be noted that the conclusions drawn in this study are based on the responses of US-based businesses to a particular green product scenario, i.e. urban forest carbon offsets. However, businesses, regardless of their geographical location, are increasingly considering the purchase of emission offsets as a way to remain competitive in a carbon-constrained world (Schultz and Williamson 2005; Dunn, 2002). The results from this study will therefore have useful implications for other industrialized countries. Further, several comparative studies have pointed out that the corporate environmental behavior (e.g. innovation, adoption,) of US-based businesses is generally comparable to that of their European counterparts (Pinske, 2007; Lindell and Karagozoglu, 2001).

It should also be noted that respondents in our survey are probably best representing the population of 'early adopters' and 'environmentally conscious' businesses rather than the complex universe of business organizations. A final important caveat of this study is the limited number of observations. However, in contrast to other sample-based surveys, we contacted the entire population (all CCX members participating in carbon trading) and the survey process did not violate any statistical principles. The number of observations could be increased by including over-the-counter buyers; however, finding their contact information and inviting them to participate in the survey would, of course, be very difficult.

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