

Comparative Advantage: The Impact of ISO 14001 Environmental Certification on Exports

FLORENCIA BELLESI,
DAVID LEHRER, AND ALON TAL*
*The Arava Institute for Environmental Studies,
Kibbutz Ketura, D.N. Eilat, 88840 Israel*

Relative to the enormous acceptance of the ISO 9000 quality standard, the ISO 14001 environmental management certification has been met with only moderate enthusiasm among industrial facilities. The literature on corporate motivation for ISO 14001 participation is relatively modest considering the enormous number of publications reviewing other aspects of its adoption and implementation. It would seem that the present “marketing” package supporting ISO environmental commitments does not seem to offer sufficiently persuasive incentives for increased sales, either domestically or internationally. While researchers assume that a higher export rate of companies is positively associated with higher ISO participation rates, there have been very few empirical studies that support this inference, and conclusions have not been based on data taken from importing countries or from a systematic evaluation of expressed corporate preference for products sold by ISO 14001 certified companies. The present study reports the results of a survey to firms in six countries that are Israel’s leading trade partners, importing chemicals, textiles, and produce. The survey results confirm that while the international market still considers price and quality as the paramount factors in selection of suppliers, environmental management systems (EMS) are an important feature that is frequently taken into consideration. EMS certification appears to signify a supplier who is managing the business well and exhibiting ethical responsibility. The European market proved to be more environmentally conscious than those in other industrialized parts of the world. EMS offer a particularly valuable advantage for producers wishing to reach European markets. As policy-makers seek to expand the voluntary adoption of EMS, a clear advantage for exporters should be highlighted among national industries.

Introduction

In today’s global economy, organizations are increasingly called upon to demonstrate sound management of environmental, social, and economic issues. As the limitations of command, control regulation, and government incentives for environmental protection became apparent around the world, environmental management systems (EMS) were suggested as a valuable supplement to environmental regulation (1). EMS initiatives constitute a structured, voluntary policy instrument for encouraging pollution re-

duction measures and environmental practices (2, 3). Advocates argue that EMS have the potential of “greening” industries from construction (4) to cars (5), to farming (6), to refrigerators (7).

Established in 1996, the International Standards Organization (ISO) 14001 (8) has emerged as the world’s leading EMS framework, designed to help organizations improve environmental performance and demonstrate sound environmental management (9). Other EMS exist in the world, and a few countries have even developed their own EMS schemes. The best-known non-ISO EMS is the Eco-Management and Audit Scheme (EMAS), sponsored by the European Union to assess, report, and improve the certified companies’ environmental performance (10).

Nevertheless, the ISO 14001 standard is by far the most popular EMS worldwide, and 112 countries have begun to issue certifications pursuant to its guidelines. ISO 14001 standards are actually a continuation of the ISO 9000 standard for quality management. Promulgated in 1986, ISO 9000 is the pre-eminent quality management standard, with over 400 000 certifications reported in some 158 countries. The ISO 14000 series was designed as a continuation of the quality management standard, serving as a tool for the encouragement of environmental management. The purpose of ISO 14001 is to raise industry awareness of the interaction between production, the company’s products, and the environment. The standard requires constant improvement in the environmental performance of the company or facility (11).

Relative to the enormous acceptance of the ISO 9000 quality standard, the ISO 14001 environmental management certification has been met with only moderate enthusiasm among industrial facilities. Five years after its introduction, only 36 000 firms worldwide had received ISO 14001 certification, roughly 10% of ISO 9000 levels (12). At the end of 2002, some 49 462 ISO 14001 certificates had been awarded in 118 countries (13), still an order of magnitude lower than ISO 9000 certifications worldwide. It should be noted, however, that a key reason the ISO 9000 certification is better known and established on the worldwide market is because it has been available since 1987, while ISO 14001 was established in 1996, almost 10 years later.

Israel offers a good example of this phenomenon. Only 112 (13) companies in Israel have been certified as adopting an ISO 14001 certification, a small fraction of the 6000-plus firms that have received ISO 9000 certification (13). Despite the dependence of many producers on export sales, the vast majority of Israeli corporations have not been convinced that adopting an EMS will improve their economic position, either through increased market share or reduced compliance demands from government agencies. As a result, the potential of the ISO 14001 environmental management system as a tool for encouraging environmental technological upgrading and compliance has not been realized. This skepticism, hardly to unique to Israel, is pervasive in the United States as well as in most developing countries (14). This study was designed to ascertain whether there was an empirical basis for claims that ISO 14000 certification improved the marketability of products for export.

A very basic threshold question might be raised: “Why are standards important for international trade?” Standards provide clear identifiable references acknowledged worldwide and promote fair competition in free-market economies. Hence, the purpose of an international standard is to avoid diverse standards, which would hinder international trade. According to Martincic (15), “standards facilitate trade through enhanced product quality and reliability, greater

* Corresponding author telephone +972-8-6356618; fax: +972-6356663; e-mail: alon@arava.org.

interoperability and compatibility, greater ease of maintenance and reduced costs". The name, "ISO" is not an acronym but comes from the Greek word "isos", which means "equal". The term ISO is related to "standards" in the sense that, if two objects meet the same standard, they ought to be treated in the same way.

According to Coglianese and Nash (16), EMS are "a set of internal rules that managers use to standardize behavior in order to help satisfy their organization's environmental goals". ISO 14001, however, is a management standard; it is *not* a performance or product standard. These standards do not require a specific level of pollution or a performance improvement but focus on awareness of the processes and procedures that may affect the environment. It is a process for managing the company's activities that impact the environment. The essential purpose of ISO 14001 is that companies will in due course improve their environmental performance by implementing ISO 14001 (17). This is due to the fact that the standard demands from a company a "constant improvement", that is, of the EMS itself and of its handling of the environmental impacts produced by the company. However, the literature available on the impact of the certification on the environmental performance of companies is contradicting and perplexing. Some studies claim a significant improvement, and some studies state the lack of comprehensive methods and comparable indicators in order to measure up to what extent companies actually improve their environmental performance due to the certification (18, 19).

The literature on corporate motivation for ISO 14001 participation is relatively modest considering the enormous number of publications reviewing other aspects of its adoption and implementation (20). Several explanations have been proposed for the hesitancy of firms to adopt an EMS and enter the ISO 14001 certification process. These include "comprehension" and concern about the consequences of attendant exposure to regulatory agencies (21). Hence, Delmas postulates that the relative dearth of ISO certification in the United States can be ascribed to fears that the certification process will make corporate environmental performance excessively open to greater public scrutiny (22). Yet the most compelling reasons for its lukewarm acceptance appear to be economic in nature. Empirical studies in locations as diverse as Singapore and Spain confirm that companies are concerned about the associated costs (23). The present "marketing" package supporting ISO environmental commitments does not seem to offer sufficiently persuasive incentives for increased sales, either domestically or internationally.

Almost all studies involving motivation of companies adopting ISO 14001 standards to date have supported the hypothesis that the more companies participate in the international market, the higher the ISO participation rates. There appears to be an empirical basis for the proposition that industries that rely heavily on exports are more likely to adopt ISO 14001 standards out of fear of losing market share internationally. A few isolated but highly publicized cases of multinational corporations requiring ISO 14001 certification of all suppliers [particularly in the auto industry (24)] offer anecdotal support for such a position (25).

Yet, the "export-incentive" conclusion is ultimately based on inferences from contrasting regression analysis results of EMS participation rates among firms in different countries with different export propensities. It is not based directly on data taken from importing countries or from a systematic evaluation of expressed preference for products sold by ISO 14001 certified companies. The enormous gap between participation in ISO 9000 and in ISO 14001 actually suggests that most exporting firms still do not find *market share* claims to be a sufficiently credible inducement to adopt an EMS.

To date, no study has offered empirical information about corporate policies regarding ISO 14001 approval among suppliers and acquisitions upon which manufacturers might base future business decisions.

The objectives of this study, therefore, are to evaluate the present trends among industries internationally toward importation from ISO 14001 approved firms, to explore the potential of international commerce to encourage environmentally friendly trade, and to evaluate whether an empirical basis exists for inferring a competitive advantage from ISO 14001 certification. The conclusiveness of the results suggests that for many exporting firms, the associated investment in environmental protection may be economically beneficial. The countries surveyed were selected because of their position as the leading importers of Israeli products. Yet, their geographical and economic diversity suggest that the results are relevant for exporting factories anywhere in the world.

The paper opens with a review of the literature concerning motivational factors for adoption of ISO 14000 (and ISO 9000) standards by firms. Subsequently, the methodology of the present study is described. Results from the survey are then presented with the final section offering an analysis and discussion regarding ISO 14001 certification's ability to influence improved environmental performance.

Motivation for EMS Certification. Even though the ISO 9000 certification by now is an internationally ubiquitous standard, there has not been extensive research conducted about firm motivation. The leading study in the United States by Anderson et al. (26) confirmed that export considerations and government requirements were significant drivers of certification as well as a desire to reduce costs and improve the quality of production. An earlier survey conducted by Doling College of Long Island found that 41% of New York City-based companies with ISO 9000 certification reported an increase in European market share as a result of their registration (27). Similarly, a 1996 survey reported by Quality Systems Update reported that 70% of ISO 9000 companies claimed to enjoy competitive advantage, and 29% improved customer demand as a result of the ISO 9000 certification process (28). Studies in New Zealand, Australia, and Hong Kong confirmed the diverse motivations for companies' registration to ISO 9000 standard (29).

The practical and economic reasons why firms might prefer the certainty associated with a product that conforms to international quality control standards are self-evident. Extrapolating from ISO 9000 to the ISO 14000 family of standards, however, has no inherently logical basis. Products produced in facilities that have adopted environmental management programs confer no obvious economic advantage to the importer or purchaser, beyond the implicit "reliability" that environmentally conscientious producers might convey. The existence of multiple environmental management systems and the generally low percentage of firms worldwide that have adopted ISO 14001 suggest that its influence in the procurement process may, in fact, be limited.

The first empirical study to consider the issue of motivational factors among ISO 14001 certified firms was conducted in Spain. A team of researchers first considered the relative advantage of ISO 14001 over the European EMAS system. Of the 373 companies that answered the questionnaire, the "worldwide acceptance" of ISO 14001 was deemed by far to be its primary advantage, implicitly suggesting the importance that respondents attached to importers (some 44.6% of respondents deemed it very important). The study was conducted in 1998 when ISO 14001 was still a very new EMS. Presumably, today, the recognition factor would be even stronger.

Curkovic et al. (30) evaluated the competitive advantage of ISO 14001 in 16 U.S. firms. To capture the ISO 14001 variables across firms and products, each sampled company represented different stages of the ISO 14001 certification and was analyzed extensively. The authors noticed that certification is regarded as a way of responding to the strict environmental demands in foreign markets and as an appealing marketing tool for the foreign client (30). Christmann and Taylor (31) considered ISO 14001 certification among Chinese industries. Their study sampled 118 companies and found that multinational ownership positively affects ISO 14001 adoption. Firms that export a large proportion of their sales were also much more likely to opt for ISO 14001 certification as were firms that sell a large proportion of sales to multinational customers within China (interestingly, the same cohort with domestic sales to multinationals did not exhibit better environmental compliance, which raises questions about the effectiveness of ISO certification in China). In a more recent 2001 survey of 300 Chinese factories, Zeng and Wang (32) did not find the extent of exports to be a dominant factor in ISO certification but cited the environmental awareness of plant managers as the top motivational factor. Quazi et al. (33) reported export advantage as a reason behind ISO 14001 certification in Singapore particularly among the electronic and chemical industries.

A relatively early study in the United States by King and Lenox found a strong association between ISO 9000 certification and ISO 14001 registration, suggesting an institutional "momentum" that motivated firms to continue the ISO process (34). Yet this does not explain why the vast majority of ISO 9000 approved firms chose *not* to follow-up their ISO 9000 certification with a matching environmental standard. The most comprehensive macro-examination of ISO 14001 certification was undertaken by Corbett and Kirsch, who considered the experiences in the United States, Brazil, Uruguay, The Netherlands, Japan, and Taiwan in this context. After speaking with several stakeholders in these countries, ISO 14001 certification in each nation was considered in light of three factors. Two factors were that ISO 14001 adoption levels were found to be dependent on the magnitude of ISO 9000 certification in the country as well as the country-wide tendency to export. The study also considered a third factor: ISO 14001 participation in relation to the country's relative level of environmental commitment (measured by national participation in select international environmental treaties) and found a statistically significant association.

A summary of studies about ISO 14001 suggests a consensus among researchers: firms that have an ISO 9000 standard are more likely to apply for and to receive ISO 14001 certification. Exporting companies and firms with a strong "environmental ethos" are also more likely to adopt an EMS. Yet, the fact that most firms in the world continue to resist ISO 14000 or other EMS certification has not been adequately considered until now. Whether this position constitutes an economically rational position or not is a fundamental question that the present study seeks to answer.

In a recent international survey conducted by Summers (35), the benefits of the ISO 14001 certification were assessed in 15 developed and developing countries, including most of the countries involved in our survey research initiative. This study confirms the claims and conclusions reached after our survey results were analyzed. The main findings in the Summers describe "The majority of the firms were satisfied with ISO 14001's impact on their company's profits and ability to trade internationally ...".

Methodology

The research was conducted between April and July 2003 with follow-up surveys conducted in July 2004. The study

TABLE 1. Response Rates

country	no. of surveys completed	response rate (%)
UK	28	35
Germany	21	34
The Netherlands	22	33
Japan	20	33
Spain	17	26
United States	22	23
total	130	weighted average = 31

was divided into the following stages: (a) review of the literature/determination of major exporting industries in Israel and importing countries of Israeli products; (b) generation of database of companies in the sample countries according to product types; (c) conducting pilot surveys by email and fax; (d) conducting surveys by telephone; (e) data collection and analysis; and (f) follow-up verification surveys.

In the year 2000, the United States and the European Union accounted for 30% and 32% of Israel's exports, respectively, with Japan the leading trade partner in Asia. Exports to Asia (excluding diamonds) increased from 12% in 1998 to 16% in 1999. Accordingly, the importing countries of Israeli products selected for the study were the United States of America, Germany, the United Kingdom, The Netherlands, Spain, and Japan. Table 1 lists the countries included in the survey, the number of surveys completed, and the response rates of the survey.

The industrial sectors selected for sampling were based on both their local importance as well as their potential for negative environmental impacts. Israel's primary exports are manufactured goods and software, which accounted for 97% of total exports in 2000 (excluding diamonds, ships, and aircraft) [ISO 14001 has little relevance to the diamond market and government-owned companies that produce ships and aircraft]. Agricultural exports accounted for 3% in 2000, compared to 16.5% in 1970, illustrating the depth of Israel's structural changes (36).

The following product groups became the basis for the random selection of industries for the survey:

- Chemicals and chemical products: organic and inorganic materials, medical and pharmaceutical products, fertilizers; medium to high technology industry
- Plastic and rubber products: medium low technology industry
- Textiles, wearing apparel, and leather: low technology industry
- Produce and flowers: low to medium technology industry

Among the environmental impacts associated with production of these industrial exports are emissions of air pollutants and discharge of hazardous and conventional pollutants into water as well as the health risks associated with the handling of dangerous materials by workers.

Lists of more than 100 importing companies from each country were randomly selected from the main importing industries mentioned above. A survey questionnaire was designed following consultation with experts from different fields. The survey explored respondents' attitudes toward EMS certified suppliers, the competitiveness of Israeli products, and EMS demand by supplier/corporate policies. The questionnaire contained questions with discrete answering options as well as such open-ended questions as "why does this affect your decision?" to prompt more thorough responses from interviewees. The questionnaire was divided into three parts. Part I included questions designed to elicit respondents' attitudes, perceptions, and opinions concerning company policy regarding EMS and

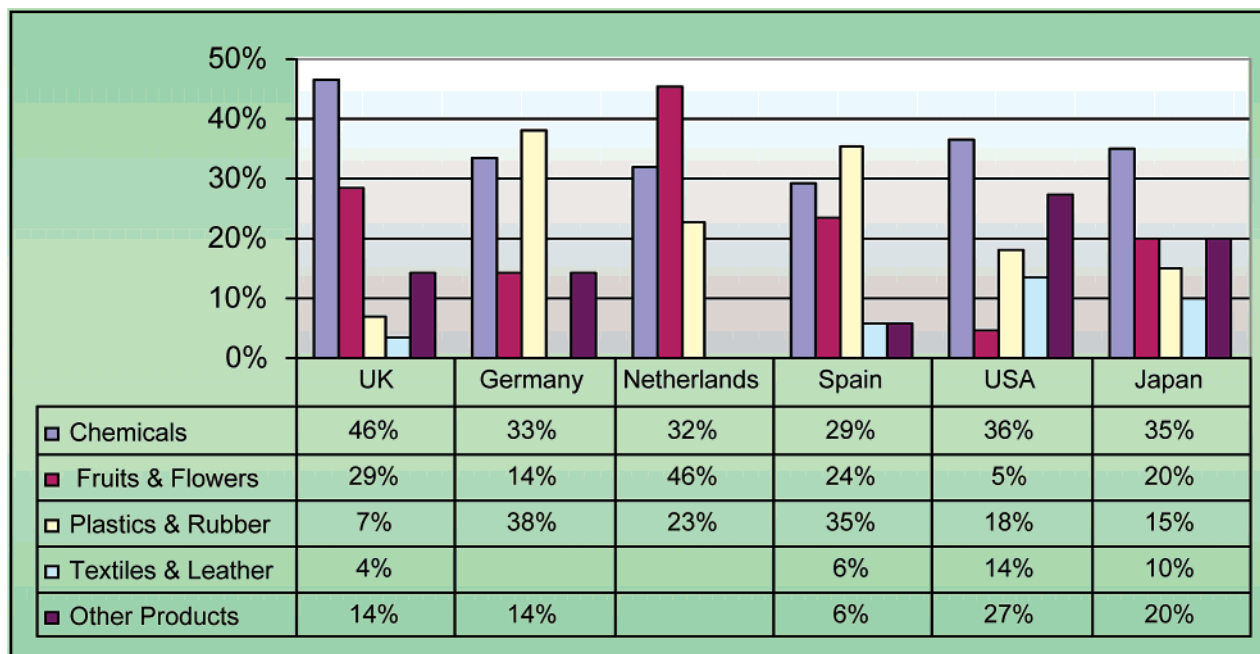


FIGURE 1. Frequency by country and by industry. Incidence of the different industries in each country included in the sample (every country percentage has been calculated individually but have been put together in one single graph for the purposes of comparison).

international trade in general. Part 2 queried respondents about their opinions regarding EMS as well as its effect on competitiveness abroad in general and international trade with Israeli industry in particular. Part 3 elicited background information concerning the respondent's company, size, product, and markets.

A pilot study led to several changes in the survey instrument that were primarily intended to shorten the questionnaire. The extremely low response rate when surveying was attempted via fax and e-mail during the pilot stage led to a decision to conduct the entire study via telephone interviews. This led to the simplifying of answers to multiple choice questions to ease confusion among interviewees. The telephone interviews lasted 20 min on the average.

A total of 400 firms were approached in the operational part of the study. The real or valid response rate of the survey is calculated by counting the total number of companies contacted and the total number of responses obtained, excluding the ineligible units. Consequently, the valid answer rate for the survey is as follows: non-respondents, 69%; and respondents, 31% (Table 1).

The six valid answers accrued during the pilot survey were included to fill out survey results. As expected, this response rate was somewhat higher than previous ISO certification-related surveys of industrial actors, largely because of the reliance on telephone interviews. The definitive nature of most of the findings and the statistical significance confirmed the adequacy of the sample size.

Review of interviewer reports suggest that the primary reasons for non-response were resistance to talking to Israelis; skepticism about surveys in general; belief that this survey provides no benefit to the respondent; no time; and the language barrier, in particular among Japanese and Spanish respondents.

As questionnaires were confidential and for research purposes only, every respondent received an identification number, and each questionnaire was processed anonymously. The results were analyzed using a range of descriptive statistics and a variety of analytical quantitative methods. Data are summarized by topic and presented in tables and graphs.

To ensure the validity of the instrument and to assess the repeatability of the subset of responses, we applied a Quality Assurance Method to conduct follow-up calls 1 year after the initial survey. Interviews in this stage were based on a series of six core questions from the original survey that measured answers according to a Likert 5-point scale instead of the initial ranking system. The results obtained were almost identical to the original survey.

Characterization of Respondents. In order for the information conveyed to be as accurately as possible, it was critical to contact the appropriate person inside the companies surveyed. Corporate officials were contacted in the following order of priority: (a) the person responsible for quality control; (b) CEO; (c) International Business Department; (d) Purchasing or Import Department; (e) Marketing Department; and (f) Environmental Affairs Department and/or Health and Safety Department.

According to the frequency analysis of the completed surveys, the respondents for the survey worked primarily in the Environmental Affairs Department and/or Health and Safety Department of the company (22%); 21% were the President/Managing Director/CEO of the organization. A quarter of the respondents (25%) belonged to the Sales, Product, or Marketing Department. Finally, 14% of the interviewees were responsible for the Import Department.

Of the different industrial sectors surveyed, chemical producers constitute the main import product of the companies surveyed (36%). As seen in Figure 1, the United Kingdom (46%) was the major importing country of chemicals in the sample. Fruits & flowers and plastics & rubber represented 23% and 22% of the importing companies surveyed, respectively, with textiles and leather products representing only 5% of the sampled companies with the United States (14%) as the principal importer. Other types of products, such as electrical machinery and paper, made up 14% of the sampled countries with the United States (27%) as the primary importer of these products.

The vast majority of respondents were themselves manufacturers (only 13% of the sample had no production facilities since they were only importers or distributors). In general, most of the countries surveyed had production facilities in their own country. Twenty-four percent of the respondents

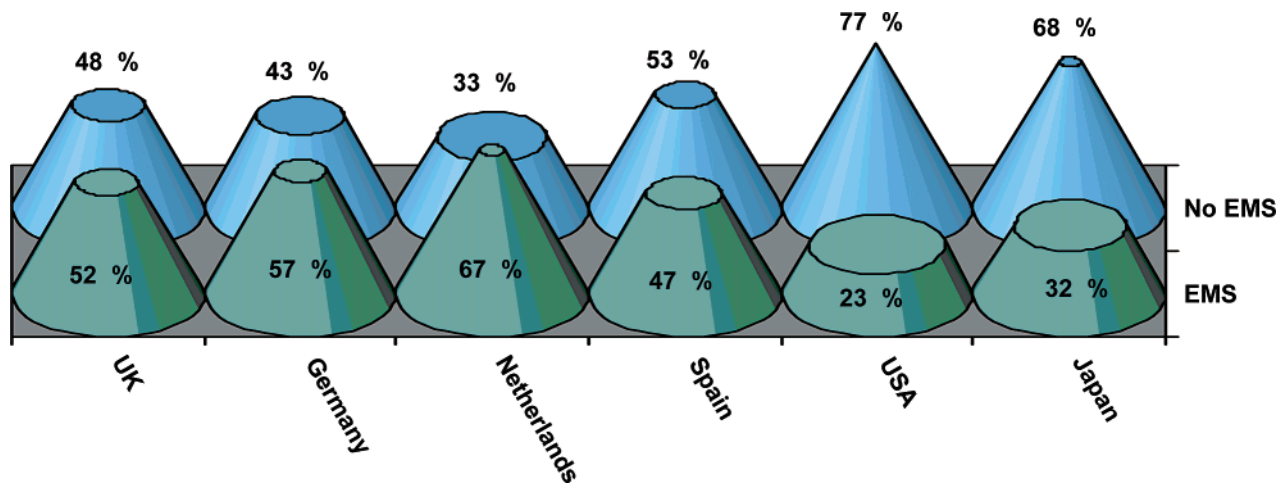


FIGURE 2. EMS certification by country.

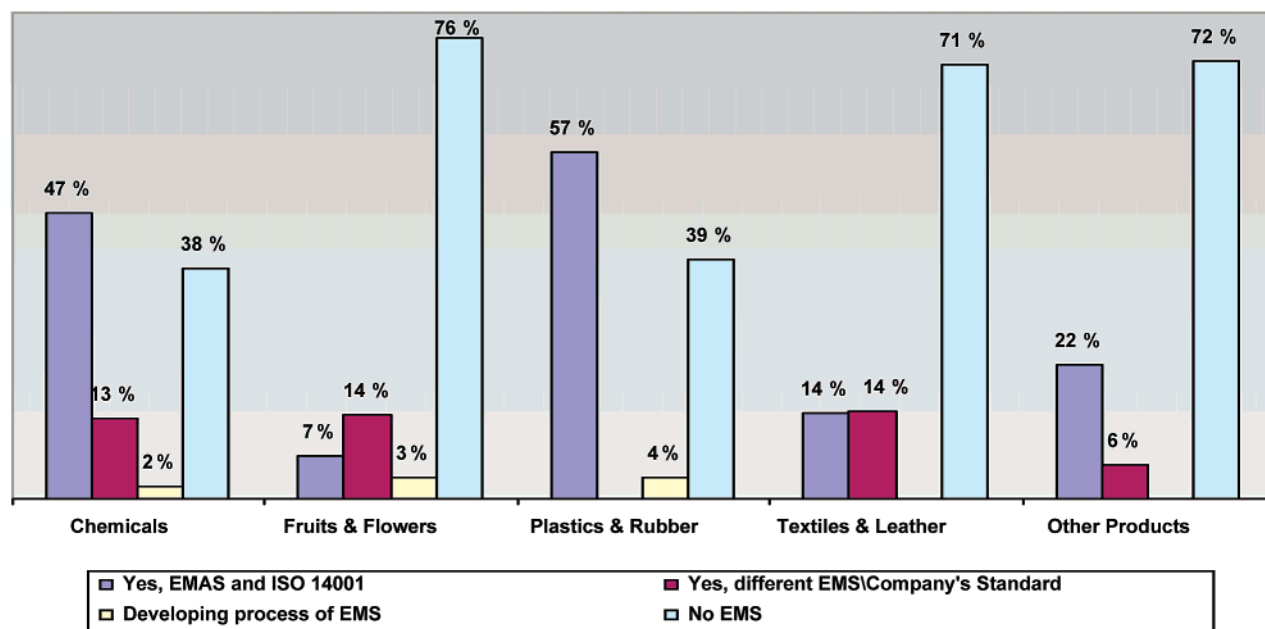


FIGURE 3. EMS certifications by industry and type of EMS certification.

refused to reveal the approximate turnover of their company in the year 2002, either finding the question invasive or unaware of the correct answer. Company size was distributed more or less evenly in the sample. The majority of the companies that replied to the survey had under 100 employees (45%), and 34% had between 100 and 1000 employees. Some 16 firms could be categorized as “large”, with over 5000 employees.

A threshold question for the analysis was whether a respondent company itself had certification for an environmental management certification or not. Since every respondent was randomly chosen from data bases of importers of Israeli products and not from ISO 14001 lists of certified companies, the results were surprising. Unexpectedly, the breakdown was almost even with 46% reporting EMS registration and 54% reporting no EMS. Figure 2 presents a breakdown by country of EMS certification.

As can be seen in Figure 2, Dutch, German, British, and Spanish companies showed the highest percentages of EMS certifications, with far lower rates in the United States and Japan. Spain, Japan, and the United Kingdom showed the fastest growing trends toward EMS certification. It is also interesting to note the type of industries with a propensity for EMS certification. Figure 3 suggests that industries most

likely to acquire ISO 14000 certifications were those whose production involves hazardous materials such as plastics & rubber (57%) and chemicals (47%). In contrast, in this sample, companies in the fruits and flowers (7%), textiles and leather (14%), and other types of products (22%) industries seem to have a lower tendency for EMS certifications.

It can also be generalized from the survey results that the larger the company, the greater the likelihood of EMS certification. For example, from the total number of “no EMS” answers received, 71% were from companies with fewer than 100 employees.

As expected, quality management system (QMS) certification was more common in the sampled countries than EMS certification. Some 64% of the responding companies had a QMS in place and functioning. The greatest percentage of certification was observed in three countries. An overwhelming 86% of the German companies had QMS certification; 77% of the Dutch companies and 71% of the Spanish companies had acquired the ISO 9000 standard as well. Consistent with previous studies, registration under the ISO 9000 QMS was associated with ISO 14001 environmental certification. One frequent explanation provided by respondents is that once the first ISO standard is acquired, the process of attaining an additional ISO standard is much

TABLE 2. Relationship between EMS Certifications and QMS Certification in the Companies of the Sample

relationship EMS/QMS	EMS (%)	no EMS (%)
QMS	42	22
no QMS	5	31

TABLE 3. Results from the Second Round of Surveys

item	n	min	max	mean	SD
V01.1 quality management system certification	26	1	4	1.65	0.89
V01.2 price comparison	26	1	5	1.73	0.96
V01.3 environmental management system certification	26	1	5	2.35	1.13
V01.6 loyalty to historical suppliers	26	1	5	2.58	1.10
V01.5 just in time delivery	26	1	4	2.69	1.01
V01.4 local product preference	26	1	5	3.54	1.03

TABLE 4. Ranking of Factors Importers Take into Consideration when Deciding Upon a Supplier

options provided	avg score	ranking (%)	median	SD
price comparison	1.62	86.2	1	0.73
quality management system certification	1.74	83.1	2	0.70
environmental management system certification	2.43	41.5	3	0.77
just in time delivery	2.59	37.7	3	0.64
loyalty to historical suppliers	2.21	30.0	2	0.80
local product preference	2.50	15.4	3	0.76

simpler and less time-consuming. The requisite frameworks for ISO management systems are already in place and functioning in the company. At the same time, as seen in Table 2, a high proportion of ISO 9000 companies chose not to adopt an EMS. Only 31% of all the companies in the sample had neither QMS nor EMS standards.

Survey Results

Survey results are divided into seven sections bringing together questions with similar emphasis and to validate the central research hypothesis: that ISO 14001 certification produces a substantial competitive advantage for exporting firms. The sampling error for responses is 8.7% (based on $n = 130$, 95% level of confidence and using the maximum SD based on $p = 0.05$).

To check the validity of the instrument and to assess that no repeatability of the subset of responses were achieved, we used the Quality Assurance Method to conduct follow-up calls. We have used a series of six core questions from the original survey but measured the answers in a different scale, Likert 5-point scale, instead of ranking. The results obtained were almost identical to the original survey. See Table 3 with the results from the second round of surveys.

(1) Three Main Factors That Influence Importers When Deciding upon a Supplier. Interviewees were asked to rank the three most important factors determining selection of suppliers (1, most important; 3, least important; selecting three options from a list of five items provided). The ranking percent is the rate of respondents choosing a certain category as 1, 2, or 3 in level of importance when deciding upon a supplier. Hence, a “low” average score actually indicates the high importance of the factor reported, such as in the case of price comparison and QMS certification (Table 4). First, ranking percent results will be discussed, and then average score results are presented.

Most of the surveyed companies (86%) chose the category “price comparison” as the most important factor in deciding upon a supplier, rating it as 1 (median). Yet, “environmental management system” was also chosen as important, rated third after price and availability of a QMS. It is important to note that whether a respondent itself has a QMS seems to be very influential in prioritizing EMS certification among suppliers, since 83% of them rated this factor as second from the list provided. The results suggest that while price and quality remain the principal determinants in international markets, an EMS also is often an important variable taken into consideration.

The degree of price dominance as a central consideration of importers is not consistent among countries. The vast majority (72%) of the U.S. companies as well as 87.5% of Japanese companies ranked price first. In the case of Japan, respondents suggested that these results may be temporarily skewed by the recent economic recession. Respondents mentioned the economic restraints Japanese companies are experiencing and their need to prioritize cost-savings in order to survive under present market conditions. On the other hand, price appears to be less critical for Spain (47% ranked it first) and Germany (45% ranked it first). Table 4 also shows that loyalty to historical suppliers was ranked second by over half of the plastics & rubber industry (87.50%) and third by half of the chemical companies (50%). Presumably, once a supplier develops a relationship with an importer and gains its trust, the buyer tends to continue to prefer the client, disregarding other attributes, such as being ISO 9000 certified.

In addition, average score indicates the central place where a category was ranked (1, most important; 3, least important). We must note that according to these results, EMS was ranked in 4th place, after price, QMS, and loyalty to historical suppliers. Nevertheless, these averages were obtained only from those respondents who chose those items (as 1, 2, or 3) and not those who disregarded the items (e.g., majority of the sample). Therefore, the averages represent the intensity of attitudes of those who chose an item but not the general attitude of the whole sample, as the proportion measurement does. Further statistical tests were conducted to explore this phenomenon.

Consumer psychology of producers appears to play a role in supplier selection. Loyalty can be regarded as a relatively “emotional” or subjective consideration, indicating a personal connection with a particular supplier. Importers that do not exhibit such an attribute tend to attribute higher importance to EMS certification in procurement decisions, suggesting that this category of importers may be more objective or rational in their decision-making. Statistically, the less loyal to historical suppliers a producer is, the greater importance a product with EMS has for him. This trend is supported by χ^2 testing that assesses the dependence between two variables: preference based on loyalty to historical suppliers and preference for product with EMS certification. The dependence between the variables was significant, χ^2 (df=1) = 5.798, $p = 0.016$. The results are demonstrated in Table 5. Correspondingly, the γ coefficient was also significant, $\gamma = -0.46$, $p = 0.11$. This implies an inverse relationship between being loyal to historical suppliers and valuing an EMS certified supplier.

A series of six *T*-tests was used to assess the difference between those respondents who chose/disregarded any of the six items of question 1, respectively (independent variables), concerning their attitude in question 2 in the survey, “Does the fact that a potential supplier has a certified EMS affect your decision to buy their product?” (The ranking score was 1—a definite effect—to 4—no definite effect.)

As the results demonstrate, there was no significant difference in attitudes concerning EMS between respondents who disregarded QMS and price, respectively. These results

TABLE 5. Relation between Emotional and Rational Suppliers in the Sample^a

loyalty to historical suppliers ^b	products with EMS certification (%)	
	chosen 1, 2, 3 rational	was not chosen
chosen 1, 2, 3 emotional	25.6	47.4
was not chosen rational	48.4	51.6
total	41.5	58.5

^a The more rational the supplier, the more importance a product with an EMS has for him. ^b Count % within loyalty to historical suppliers.

are surprising because one would expect that an importer, who has QMS certification and is familiar with management systems, would place some importance on an EMS certification, but they did not show much consideration with the EMS issue. Regarding price, these respondents do not seem to be prepared to absorb an increase in price as a result of an EMS certification.

In the other four items (EMS, local product preference, just in time delivery, and loyalty to historical suppliers), significant differences were found.

(2) Influence of a Certified EMS in the Importers' Decision To Buy from This Supplier. To measure this factor, respondents were asked the following question: "Does the fact that a potential supplier has a certified Environmental Management System affect your decision to buy their product?" Respondents were provided four answer options with their responses provided in Figure 4.

The study confirms a worldwide trend where first-world industries perceive a certified EMS among potential suppliers as an important attribute affecting procurement decisions. One-quarter of the respondents (26%) believe that EMS influences their decision, while, 42% reported it having some effect in their decision. Moreover, 17% think it has a little effect, and only 15% ignores this feature of potential suppliers.

χ^2 analysis according to countries and industry did not produce statistically significant answers, suggesting that the dynamic is universal and is not especially influenced by the geographical or sectoral distinctions. Significantly, *all* of the importing companies with EMS certifications found EMS certification among potential suppliers to be a factor influencing their decision to buy from a supplier. Even among surveyed companies who themselves lacked EMS certification, 49% reported that they were more likely to buy from an EMS certified supplier.

(3) Why Does a Certified EMS Influence Importers' Decision To Buy from Suppliers? To measure this factor, respondents were asked the following question: "Why does EMS affect or not affect your decision?" Responses to this open-ended question were assigned to one of six categories by a coding process. Each category was allocated a numerical code. The following designed categories represent the most common answers (codes allocated to question 3):

- 1, *Presumption of quality.* An EMS certified company displays stewardship of the product, with high standards of production. In addition, an EMS certification means that all systems and procedures of the potential supplier company have been checked by an independent body, providing us security and reliability (42% of respondents).
- 2, *Internal policy and pressure from customers.* Our company's policy is that the supplier has to fulfill ISO 14000, hence we only purchase from EMS certified companies. Moreover, our customers request suppliers and sub-contractors with EMS, like ISO 14001 certificates. We have an EMS certification and expect suppliers to meet the same

standards. Moreover, in our opinion, it is what the market requires (14% of respondents).

- 3, *EMS a factor only when price is identical.* The price and quality of the product the supplier offers are more important than environmental quality. Economic considerations are still paramount. If price is higher with an EMS, then we will purchase from a cheaper supplier without an EMS. But if our client requires it, we will buy from a supplier with an EMS certification (21% of respondents).
- 4, *EMS unimportant.* It does not affect our decision at all to purchase or not to purchase from a potential supplier and it is not crucial for our customers (7% of respondents).
- 5, *Don't know, unsure of response* (3% of respondents).
- 6, *Other* (13% of respondents).

The responses of nearly half of the interviewees (42%) were classified category/code 1. Importers reported that EMS certification is perceived as demonstrating sound management by the supplier as well as ethical responsibility and commitment toward the environment at all levels. The fact that a supplier was audited and was awarded the ISO 14001 or EMAS certification by an independent entity serves as an indicator for "reliability". As a result, the importer can embrace the new supplier with confidence, saving time and investigation before placing a purchase order.

Nonetheless, approximately one-fifth of the respondents' comments were categorized category/code 3 (21%). These importers feel that economic issues are still more important than environmental ones. At the same time, even within this group, respondents pointed out that when a client requires an EMS certification in the supply chain, they demand an EMS certification from the supplier as well. Additionally, importers mentioned that their ultimate decision can depend on the product the supplier sells. For example, if they have to purchase hazardous chemicals from a new supplier they are much more likely to demand environmental quality certification.

Code 2 represents the group most committed to EMS certification because they possess EMS certifications and expect suppliers to hold the same standards. This position was only given by 14% of respondents, perhaps reflecting a new attitude among producers and importers. Here, company policy requires that suppliers fulfill ISO 14001 or EMAS standards. Accordingly they currently *only* purchase from EMS certified companies. Moreover, importers' customers request suppliers and sub-suppliers with EMS certification. In addition, they strongly believe that the current market requires ISO 14001.

(4) Would Importers Choose an Israeli Product with an EMS Certification over a Local Product without Certification? Respondents were asked the following question (Question 4): "If you know there are two suppliers of a product that are more or less identical in all aspects including price, however one is an Israeli product *with* an Environmental Management System Certification and one is a local product *without* an Environmental Management System certification which product would you buy?"

Presumably, such a question tests the authenticity of previously stated preferences for EMS and represents the ultimate question of interest to exporters contemplating EMS certification. Half of the respondents (50%) answered that they would prefer an Israeli product with EMS and the other half (50%) would still choose a local product without EMS. One can argue that this response reveals a substantial portion of industry for which an EMS certification is not as important as domestic loyalties. Yet, it would seem that this in fact suggests a surprisingly strong commitment to EMS certification. As seen in Figure 5, there were significant disparities between the responses of different countries for this question,

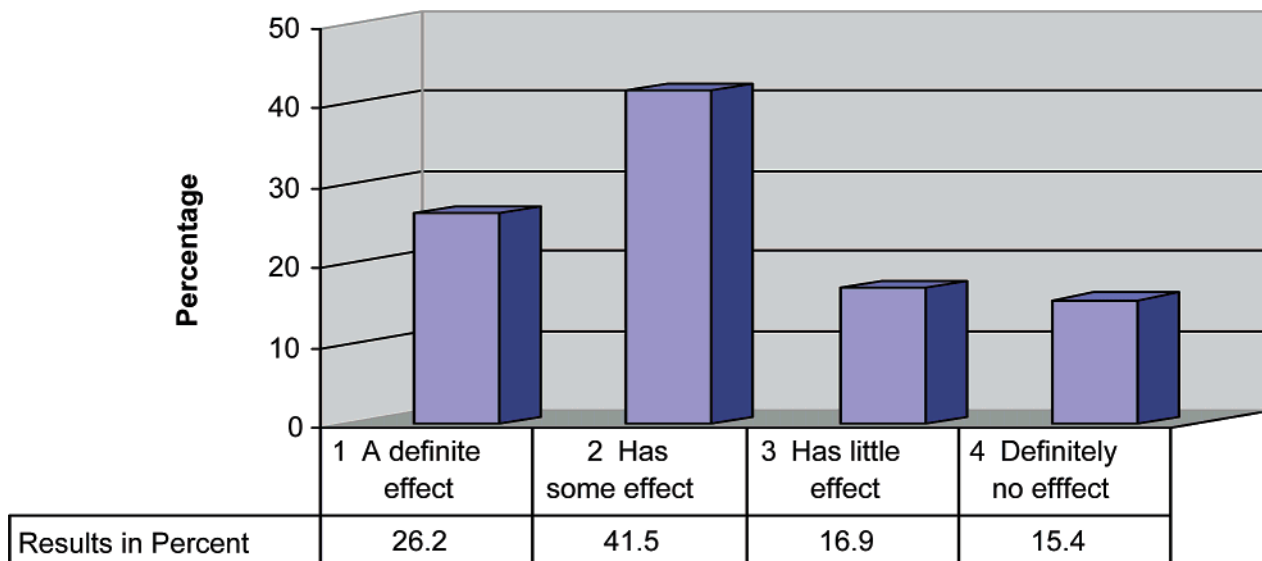


FIGURE 4. Effect of EMS certification on importers' procurement decision.

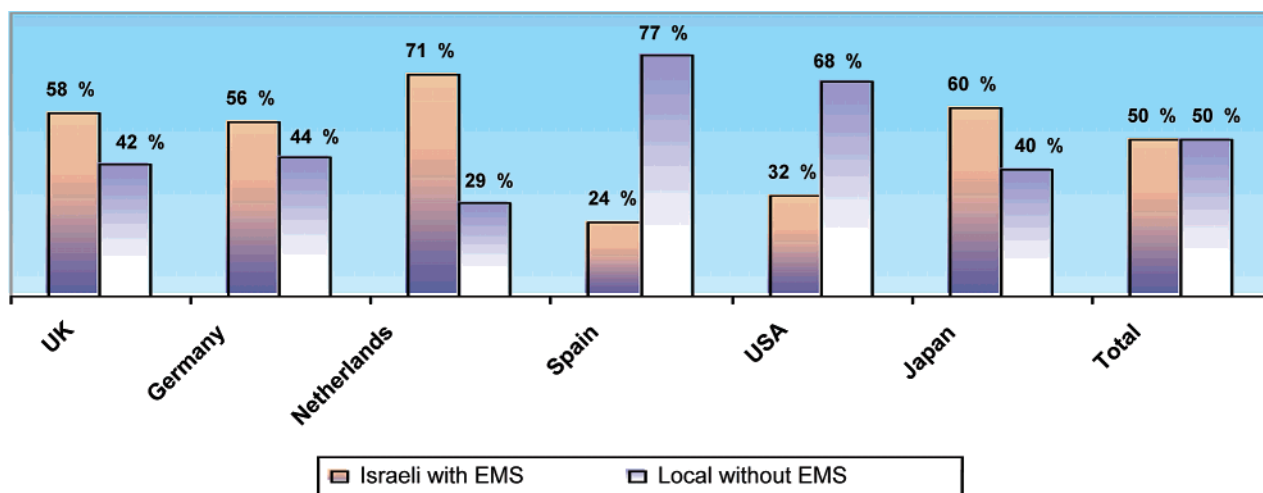


FIGURE 5. Cross tabulation and χ^2 test. Choice between local product without EMS or Israeli Product with EMS (a) and the countries sampled (b).

raising the specter of additional cultural factors. The dependence between variable “a, Israeli or local product” and “b, country”, was significant, χ^2 (df = 5) = 12.245, $p = 0.03$.

The results show an association between the nationality of the respondents and their answers. Spain (77%) and the United States (63%) would usually prefer a local product. Consequently, it might be better to start business with these countries as a daughter company of partner with an already established Spanish or American firm. On the other hand, other countries and especially The Netherlands (71%) value an EMS certified supplier much more than ties with local industries per se. Most Dutch companies would choose an EMS certified product with little relation to the country of origin. Companies with EMS certification as well as large companies were much more likely to prefer the Israeli EMS certified product over the domestically produced non-EMS product.

In a separate question that constitutes almost a “bottom line” for the present study, importers were asked whether they believed Israeli companies had a better chance of success in exporting to their country if they had an EMS certification. Results were extremely uniform: 84% of respondents' attitude was affirmative (46% definitely; 38% sometimes). Only 16% doubted that it would improve market opportunities.

(5) Do Importers Believe Local Consumers Care about Environmental Conditions at Plants Where Products Are Made and How Much Are They Willing To Pay for EMS Certification? The majority of importers (71%) believe that local consumers are interested in the environmental conditions under which the products are manufactured. The association between the variables “environmental awareness of consumers” and “country” was marginally significant. At least according to the perception of local industries, American and Spanish consumers care less about the environmental conditions in plant from which they purchase products than do consumers in the other countries surveyed. A greater sensitivity toward the environmental awareness of consumers was observed in industries dealing with hazardous substances, such as chemicals, plastics & rubber, or textile & leather. This association was not, however, statistically significant.

Uncertainty on the part of respondents affects efforts to quantify the “added value” of a product produced in an EMS certified facility, as 20% of respondents were unsure of their answer and opted not to respond to this question. Most of those surveyed believed that although clients in general demand environmentally friendly products, when faced with a choice of purchasing such commodities or a cheaper product with no environmental certification, they will prefer

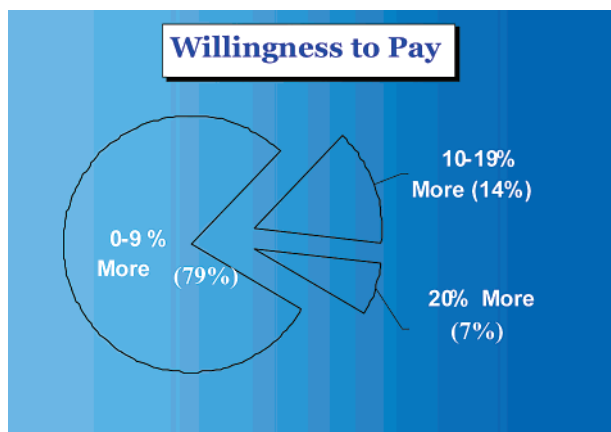


FIGURE 6. Percentage increase in price for an EMS certified product that consumers are willing to pay.

TABLE 6. Cross Tabulation and χ^2 Test^a

answer options provided	chemicals (%)	fruits & flowers (%)	plastics & rubber (%)	textiles & leather (%)	other products (%)	total (%)
definitely yes	49	43	50	42	12	42
sometimes yes	42	50	32	29	76	45
usually no	7	0	11	0	6	6
definitely no	2	7	7	29	6	7

^a This table shows importers' opinion as to whether exporters, in their own countries, have a better chance of exporting products with an EMS Certification. Two factors are tested here (i) answer options provided and (ii) answers provided by respondents belonging to different industry sectors in the sampled countries.

the cheaper one. As a result, importers largely share the view that consumers cannot be expected to pay more for green products. Consequently, production costs in environmentally conscientious plants need to be absorbed by the producers. In the event that the costs of an environmentally friendly production process are passed on to consumers, 50% of the respondents believe that consumers would only be willing to pay 0.5–1% more for it (see Figure 6).

(6) Do Importers Believe That Exporters in Their Country Have a Better Chance of Exporting Products with an Environmental Management System Certification? A full 42% of the respondents definitely believed that an EMS certification contributes to the international trade competitiveness of exporters in their country. Another 46% reported that it sometimes contributes favorably. Only 12% of the respondents believe that it does not contribute to increased export sales abroad at all. Table 6 reflects the perception that “potentially polluting” industries will reap relatively greater benefits from a veneer of environmental responsibility than other sectors.

Explanations given for this position focused on the international trends and the increasing number of firms, particularly in Europe, whose internal policies require EMS certification. The majority of importers responded in open-ended questions that ISO 14001 and/or EMAS are well recognized in the market and can often provide a valuable advantage in the extremely competitive international market. Presumably, a supplier will reach more markets with an EMS than without because of the cleaner image and perceived reliability.

Frequency results by country provided interesting outcomes. First, 30% of American companies explained that their clients still are largely not concerned with environmental matters and that environmental consciousness is still minor. Rather, they reported industry's attention as primarily focused on compliance with U.S. Environmental Protection Agency's

regulations. Moreover, American respondents alleged that there are so many U.S. EPA laws and prescriptions by which companies need to abide that there is little room left for voluntary initiatives by industry. As long as an EMS is not required by law, many respondents predict that ISO 14001 will not reach the popularity in the United States that it presently has in Europe. German companies (39%), in contrast, described a different dynamic. Companies in Germany predominantly said that their clients care about environmental matters and desire products with ISO 14001 certification. German importers, who participated in the survey, explained that they require EMS certified companies (ISO 14001 or EMAS) because of the policies established by the European Union. Likewise, 20% of the Dutch companies expressed a similar view.

Discussion

Increasingly, in the international market a company needs to be capable of demonstrating sound business management acumen. This study suggests that in many countries this has come to include concern for the environment. An EMS, such as ISO 14001, when properly overseen and applied provides a flexible tool that has the potential to improve environmental performance for organizations of varying sizes. Particularly in countries where enforcement infrastructure and capabilities are weak, governments have an interest in the widespread adoption of the ISO 14001 standard. But they need to do a better job convincing industry that it stands to benefit from adoption of an EMS.

The survey results confirm that while the international market still considers price and quality as the determining factors for selecting suppliers, EMS certification for many firms is an important product feature that is also taken into consideration. EMS certification appears to imply a supplier who is managing its business well and is showing ethical responsibility. The fact that a supplier was awarded the ISO 14001 or EMAS certification by an independent entity enhances perceived reliability. Importers feel more confident engaging a new supplier, saving time and effort associated with clarification and research prior to placing a purchase order.

There are of course important geographical nuances. Europe clearly leads the world in EMS use and registration. European decision-makers and the European Commission have embraced voluntary initiatives to improve industry's environmental performance in the region. This creates a momentum where EMS certification spawns additional certification among suppliers. The results of this survey also reveal that European customers are typically more environmentally conscious than consumers in other industrialized parts of the world (yet even in Europe, companies generally did not believe that consumers would be willing to pay greater than 0.5–1% more for EMS/environmentally friendly production processes).

Ultimately, a pervasive cultural impulse to “do the right thing for the environment” carries through to employees and managers of companies. Even more significant is Europe's legislative framework, with many countries, especially Germany and The Netherlands, enacting laws that affect all aspects of environmental management. These along with advanced European regulatory frameworks for recycling, packaging, and resource conservation provide a highly supportive groundwork for establishing EMS. As a result, companies who wish to export to the European market, especially to Germany, The Netherlands, and the United Kingdom would do well to consider participation in an ISO 14001 program.

According to the survey results, American companies are far less affected by the fact that a potential supplier is ISO 14001 certified, although many of them recognize the fact

that ISO 14001 constitutes an objective, international standard that enhances reliability. American respondents on the whole tend to view the standard with skepticism, and the number of ISO 14001 certifications in the United States remains low as compared to other countries in the world. This phenomenon of low ISO 14001 participation is linked to the distinctly American environmental culture and its reliance on a complex, almost labyrinthian regulatory system. Companies surveyed in the United States often appeared so concerned and absorbed with complying with domestic environmental legal obligations and U.S. EPA negotiations that precious little corporate energy was left for voluntary initiatives such as ISO 14001. Many American interviewees expressed the opinion that as long as ISO 14001 is not compulsory for international trade under the U.S. regulatory rules, they do not need to demand it from their suppliers overseas.

As an island with limited natural resources, Japan tends to take a practical approach to environmental management, simply to be able to continue to grow economically. Moreover, many Japanese interviewees mentioned that environmental quality has become an important cultural element of life in the country and that ISO 14001 is perceived as a tool to promote this end. Almost every Japanese interviewee mentioned his respect and admiration for ISO 14001 certification and for the International Standards Organization. However, as a result of the recent recession that has slowed the Japanese economy, focus has turned from ISO 9000 and ISO 14001 to price as the decisive factor. Once the economic situation improves, ISO registration appears likely to increase in Japan, which will probably affect the selection of suppliers as well.

As a result of these trends, some companies may reach the conclusion that to expand exports to the United States and Japan they need to focus solely on competitive prices and quality. ISO 14001 at present might not appear to be a determining factor for success in the American and Japanese market. Nevertheless, the situation may change soon, as government agencies begin to give cautious support to an EMS approach and as a result of business, economic benefits, and the competitive pressures of the international market. For example, some interviewees stated that requirements by multinational companies for their suppliers to register under ISO 14001 are providing new motivation for U.S. companies to adopt the standard.

Beyond these regional distinctions, there are several general insights that government and industry might extract from the present study that appear universal.

- When choosing a supplier, the greater importance an importer ascribes to EMS certification, the less importance the importer tends to assign to the price of the product offered or to the fact that the potential supplier has a QMS certification.
- When choosing a supplier, if the importer knows the supplier and trusts him, the importer will usually continue to buy from him even if a cheaper alternative exists.
- The more that an importer believes that local consumers are environmentally conscious, the greater the likelihood that he/she will choose EMS certified companies as suppliers.
- The larger the enterprise surveyed, the greater the significance its representatives attribute to environmental management systems and the more they believe EMS certification will contribute to exporting profitably abroad.

The language used in the standard guidelines has caused misunderstanding as to what ISO 14001 does and does not proscribe. It is a common but erroneous assumption that ISO 14001 requires companies to fulfill all legal requirements of state and national environmental laws. Under the ISO guidelines, companies are required to promote the goal of compliance and demonstrate how they are working toward that goal, rather than actually achieve compliance. This has

of course fueled skepticism about the merits of the voluntary standard, and several environmental protection agencies have been reluctant to grant regulatory relief to ISO 14001 certified companies (35). ISO 14001 proponents argue that while adoption of EMS does not guarantee that environmental performance will be improved, it can considerably increase the likelihood of achieving better performance (37).

Being a voluntary scheme, participation in ISO 14001, depends on the decisions of individual companies. Such decisions will invariably be based on the net benefits companies expect from ISO 14001 participation. There is growing evidence that companies that go beyond economics to consider the environmental and social factors surrounding their business ultimately show better financial performance than those that fail to manage all three (9). According to Roy and Vezina (38), it has been increasingly suggested that "environmental leadership can lead to competitive advantages through cost reduction, increased market share and technological leadership".

The survey results, as well as other available literature, corroborate the view that ISO 14001 accreditation confers economic benefits. These include a standard of worldwide recognition, organizational efficiency, better waste management resulting in costs reduction, marketing advantages, and competitiveness by reducing risk and exposure to costly litigation. One immediate benefit is the possibility of selling to customers that require an ISO 14001 certification from suppliers. IBM, Xerox, Honda, Toyota, Bristol-Myers Squibb, and Quebec Hydro have encouraged their suppliers to get ISO 14001 certified, while Ford and General Motors have even demanded their suppliers to get certified.

The costs of ISO 14001 certification to be sure are not trivial, and the process is not always easy. Estimates of actual costs to producers vary widely and depend on several factors. These include the size of the company, the number of employees, the amount of sites to be certified, the level of preparation required to implement an EMS, and whether the company has been previously certified to ISO 9000. In one study about ISO costs, Bansal and Bogner (39) detail: "Smaller sites may be certified for as little as US \$10,000, while a large industrial site may cost as much as US\$ 200,000. However there are significant economies of scale as subsequent sites within the same firm seek certification, since learning and certification costs diminish with each effort". In addition, the Global Environmental Technology Foundation has estimated costs of auditing and maintaining the documentation to be US\$ 5000 to US\$ 10 000 annually per facility (40). Companies with ISO 9000 systems in place will reduce costs inasmuch as ISO 14001 and ISO 9000 have common elements for auditing and maintaining procedures that may be combined.

Notwithstanding an ISO 14001 registration costs, this survey conclusively supports the position that firms wishing to expand their world markets will improve their competitiveness abroad by receiving ISO 14001 certification. The enhanced competitive advantage conferred by ISO 14001 constitutes an important message that needs to be disseminated by policy-makers and industrial trade organizations to companies around the world. Governments can also consider additional incentives by offering various forms of regulatory relief for certified industries. In doing so, agencies may be able to improve local environmental performance with relatively little expenditure of public resources and coercive enforcement activities.

Acknowledgments

This research was funded by the Israel Ministry of Environment. This study would not have been completed without the collaboration of the British, Dutch, German, and Japanese trade representatives and embassies in Israel, as well as the

Israel Export Institute. We would like to thank Rotem Amir, Dr. Oren Kaplan, Dr. Ted Sasson, Dr. Moshe Schwartz, Dorit Kerret, and Abby Lutman for their assistance during the implementation of the study as well as the staff of the Arava Institute Policy Center who assisted in conducting the survey.

Literature Cited

- (1) Stenzel, P. L. Can the ISO14000 series environmental management standards provide a viable alternative to government regulation? *Am. Business Law J.* **2000**, *37*, 237–296.
- (2) Resources for the Future. *Regulating from the Inside—Can Environmental Management Systems Achieve Policy Goals?* 2001.
- (3) Dahlstrom, K.; Skea J. *Modernizing Regulation: the Role of Environmental Management Systems*; Report of Final Workshop, London; Environmental Agency, London, 2002; www.psi.org.uk/docs/2003/research/.
- (4) Ball, J. Can ISO 14000 and ecolabelling turn the construction industry green? *Build. Environ.* **2002**, *37*, 421–428.
- (5) Automakers Require Supplier Certification. *Pollut. Eng.* **1999**, *31*, 63.
- (6) Wall et al. Agriculture and ISO 14000. *Food Policy* **2001**, *26*, 35–48.
- (7) Matuszak-Flejszman, A.; Bramorski, T. Factors influencing the implementation of environmental management systems at Amica Wronsky SA. *Int. J. Technol. Manage.* **2001**, *21*, 463–474.
- (8) ISO environmental standards have had two names until now: “ISO 14001” or “ISO 14000 Family of Standards”. In its last survey (*The ISO Survey of ISO 9000 and ISO 14001 Certificates. Twelfth Cycle: up to and including 31 December 2002*; International Organization for Standardization: Geneva, Switzerland), to avoid confusion, the ISO management decided to discontinue calling the standards ISO 14000. Accordingly, ISO 14001 is primarily used in this paper.
- (9) International Organization for Standardization (ISO). *Environmental Management—The ISO 14000 Family of International Standards*; ISO: Geneva, Switzerland, 2002; 2002-07/10 000; pp 1–13.
- (10) Zackrisson, M.; Enroth, M.; et al. *Environmental Management Systems—Paper Tiger or Powerful Tool*; Industrial Research Institutes in Sweden: Stockholm, 2000.
- (11) Fredericks, I.; McCallum, D. International Standards for Environmental Management Systems: ISO 14000. *Can. Environ. Prot.* **1995**, *5*.
- (12) Ofori, G.; Gang, G.; Briffet, C. Implementing environmental management systems in construction: lessons from quality systems. *Build. Environ.* **2002**, *37*, 1397–1407.
- (13) International Organization for Standardization (ISO). *The ISO Survey of ISO 9000 and ISO 14000 Certificates*; ISO: Geneva, Switzerland, 2000; www.iso.org.
- (14) Mohammed, S. T. The impact of ISO 14000 on developing world businesses. *Renewable Energy* **2001**, *23*, 579–584.
- (15) Martincic, C. J. *The ISO 14000 Series of Standards, IT Standards*; School Of Information Sciences, University of Pittsburgh, 1997; http://www.sis.pitt.edu/~mbsclass/standards/martincic/iso14000.htm.
- (16) Coglianese, C.; Nash, J. *Bolstering Private Environmental Management*; J. F. Kennedy School for Government, Harvard University, Faculty Research Working Papers Series RWP-011: 2001.
- (17) Transformation Technologies (1996–2002). *ISO 14000 Concepts*; http://www.trst.com.
- (18) Coglianese C.; Nash J. *Regulating from the Inside—Can Environmental Management Systems Achieve Policy Goals?* Resources for the Future: Washington, DC, 2001.
- (19) Baeke, S.; et al. *The Nature of Voluntary Approaches: Empirical Evidence and Patterns. Literature Survey*; CAVA Working Paper 99/08/3; 1999.
- (20) Angel del Brio, J.; Esteban, F.; Beatriz, J.; Camilo, J. V. Motivations for adopting the ISO 14001 standard: a study of Spanish industrial companies. *Environ. Qual. Manage.* **2001**, *10*, 4.
- (21) Wilson, R. C. Dispelling ISO 14000 fears. *Pollut. Eng.* **2001**, *33*, 38.
- (22) Delmas, M. A. The diffusion of environmental management standards in Europe and in the United States: an institutional perspective. *Policy Sci.* **2002**, *35*, 91–119.
- (23) International Organization for Standardization (ISO). *The ISO Survey of ISO 9000 and ISO 14000 Certificates*; ISO: Geneva, Switzerland, 2000; pp 24–25.
- (24) Moeller, F. ISO 14000 compliance demanded by Ford and GM. *Plat. Surf. Finish.* **2000**, *87* (February), 65–66.
- (25) Metzbaum, S. H. *Information, Environmental Performance, and Environmental Management Systems, Regulating from the Inside—Can Environmental Management Systems Achieve Policy Goals?* Resources for the Future: Washington, DC, 2001; p 147.
- (26) Anderson, S. W.; Daly, J. D.; Johnson, M. F. Why firms seek ISO 9000 certification: regulatory compliance or competitive advantage. *Prod. Oper. Manage.* **1999**, *8*, 28–43.
- (27) *New York Finds More Customer Satisfaction If Not Market Share*; Quality Systems Update, December; Dun and Bradstreet Information Services: Fairfax, VA, 1995; p 9.
- (28) *The ISO 9000 Survey*; Quality Systems Update, January; Dun and Bradstreet Information Services: Fairfax, VA, 1996.
- (29) Brown, A.; Van Der Wiele, T.; Loughton, K. Smaller enterprises' experiences with ISO 9000. *Int. J. Qual. Reliab. Manage.* **1998**, *15*, 273–285. (b) Lee, T. Y. The development of ISO 9000 certification and the future of quality management: a survey of certified firms in Hong Kong. *Int. J. Qual. Reliab. Manage.* **1998**, *15*, 162–177. (c) Terziovski, M.; Samson, D.; Dow, D. The business value of quality management systems certification: evidence from Australia and New Zealand. *J. Oper. Manage.* **1997**, *15*, 1–18.
- (30) Curkovic; et al. Identifying the factors which affect the decision to attain ISO 14000. *Energy J.* **2004**.
- (31) Christmann, P.; Taylor, G. Globalization and the environment: determinants of firm self-regulation in China. *J. Int. Business Stud.* **2001**, *32*, 439–458.
- (32) Zeng, S. X.; Wang, H. C. Determinants of environmental management system. 2001; http://www.systemicbusiness.org/digests/sabi2002/2002-206_Zeng_Wang.pdf.
- (33) Quazi, H. A.; Khoo, Y. K.; Tan, C. M.; Wong, P. S.; Motivation for ISO 14000 certification: development of a predictive model. *Omega* **2001**, *29*, 525–542.
- (34) King, A. A.; Lenox, M. J. Lean and green? An empirical examination of the relationship between lean production and environmental performance. *Prod. Oper. Manage.* **2001**, *10*, 244–256.
- (35) Summers, R. S. Implementing ISO 14001—An international survey assessing the benefits of the certification. *Corporate Environ. Strategy* **2002**, *9*, 4.
- (36) Central Bureau of Statistics. *Stat. Abstr. Isr.* **2001**, *52*, 16.3–16.18.
- (37) Shah, G. (1997). Use of ISO 14000 as a compliance and productivity tool. *Hydrocarbon Proc.* **1997**, *76*, 75–77.
- (38) Roy, M. J.; Vezina, R. Environmental performance as a basis for competitive strategy: opportunities and threats. *Int. J. Corporate Sustainability, Corporate Environ. Strategy* **2001**, *8*, 4.
- (39) Bansal, P.; Bogner, W. C. Deciding on ISO 14001: economics, institutions, and context. *Long Range Planning* **2002**, *35*, 274.
- (40) Global Environmental Technology Foundation. 1996; http://www.iso14000.net/.

Received for review February 9, 2004. Revised manuscript received December 19, 2004. Accepted December 22, 2004.

ES0497983