

The Influence of Foreign Markets on Company-Decisions to Adopt ISO 14001: A Study with Special Reference to Japan, the EU, the US and Australia

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Abstract

The main purpose of this paper is to distinguish specific foreign markets where environmental concern is greatest; all countries have different priorities and ideas with regard to the environment and its management. This paper analyzes the external pressure, particularly from foreign markets in Japan, the EU, the US and Australia, on those companies' initial adoption of ISO 14001, which is the international standard primarily concerned with an environmental management system (EMS), subject to budgetary conditions. Since it is assumed that companies with ISO 14001 have an incentive to renew it, a firm's decision to adopt ISO 14001 is considered from the period in which they initially acquire the certification. To account for the tendency to renew the standard, we assert that we have to focus on the determinants of initial ISO 14001 adoption. The external pressure on the initial adoption of ISO 14001 is analyzed using panel data from 1996 to 2004 on 107 countries with stock markets. We believe that these data represent company data at the macro level. Our analyses showed that scale, economic performance, carbon dioxide emissions and total exports have a positive effect on initial ISO 14001 adoptions, and only exports to Japan and the EU have a positive effect among the total exports. Therefore, our assessment proves that each foreign market has different priorities and ideas with regard to the adoption of ISO 14001 by suppliers. We did not find that exports to Australia had a positive effect. The most remarkable interpretation is that the positive effect of exports to Australia could be statistically hidden behind the effects of exports to Japan, the EU and the US, because the scale of the Australian economy is smaller than those.

1. Introduction

Recently, many companies have regarded environmental management as a top corporate priority. Then, they have actively taken environmental actions such as introduction of environmental management system (EMS) and environmental disclosure. It is usually a response to a number of factors or influences. One of these factors or influences involves foreign customers (or markets), according to various previous studies. They expect companies to follow stricter environmental standards. However, customers of countries such as the EU, the US and China all have different priori-

Table 1 Top 10 Countries for ISO 14001 Adoptions in 2004

| | Country | Number of Adoptions | Share of World Total |
|----|----------------|---------------------|----------------------|
| 1 | Japan | 19584 | 0.218 |
| 2 | China | 8862 | 0.099 |
| 3 | Spain | 6473 | 0.072 |
| 4 | United Kingdom | 6253 | 0.070 |
| 5 | Italy | 4785 | 0.053 |
| 6 | United States | 4759 | 0.053 |
| 7 | Germany | 4320 | 0.048 |
| 8 | Sweden | 3478 | 0.039 |
| 9 | Korea | 2609 | 0.029 |
| 10 | France | 2506 | 0.028 |
| 11 | Australia | 1898 | 0.021 |
| | World | 89937 | — |

Source: ISO (2003 2005)

ties and ideas with regard to the environment and its management. It may be incorrect to say that all foreign customers are more environmentally conscious. Therefore, we need to distinguish specific countries or regions where environmental concern is greater since they would be more mindful of companies' environmental management.

ISO 14001 adoption is the most attractive response for companies who want to achieve more environmental accountability. ISO 14001 is the international standard primarily concerned with an EMS, certified by the International Organization for Standardization (ISO). Since ISO 14001 was released in 1996, the number of companies that have adopted its standards has steadily increased worldwide. By 2004, the number of ISO 14001 adoptions totaled 89,937. The country with the highest number of certifications is Japan, followed by China, some EU countries, the US, Korea and Australia (Table 1).

A common scenario for ISO 14001 adoption is as follows. The majority of 89,937 adoptions are by companies, although any organization (e.g. local government) can decide to adopt the certification. If the objective of a company is to maximize long-term profit, and external preferences of/pressures from stakeholders for environmental responsibility influence the company's profit then, subject to budgetary conditions, it will adopt ISO 14001 to satisfy its stakeholders and maximize long-term profit because such an adoption indicates the company's commitment to environmental management. With this in mind, the objective of this paper is to assess the effects of preferences of /pressures from the stakeholders, particularly foreign customers (markets) in Japan, the EU, the US and Australia, subject to budgetary conditions, on the adoption of ISO 14001. Some previous studies indicated that Japanese and EU markets have a positive effect whereas the US market has a negative effect. We also considered the Australian market, in addition to the other foreign markets, because Australia is also considered an environmentally conscious country. Although using data at the company level is more suitable for the analysis, we use data at the country level because of

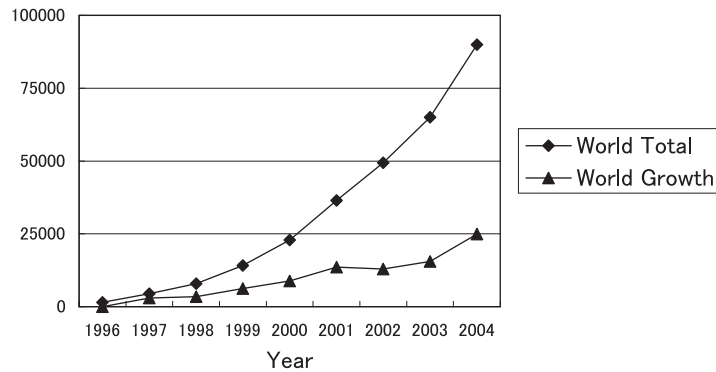


Figure 1 Number of ISO 14001 Adoptions in the World
Source: ISO (2003 2005)

availability. We believe that these data represent company data at the macro level, since country-level data are compiled from company-level data.

Before the analysis, however, it is necessary to discuss a dependent variable, “the increase in the number of ISO 14001 adoptions per listed company”, which is the proxy of companies’ ISO 14001 adoption. First, we applied the increase in the number of ISO 14001 adoptions rather than the total number because Nishitani (2007) suggests that “most companies retain ISO 14001 once they have adopted it because a huge initial cost is required when the company adopts it initially. Hence, the real determinants are during the period of initial adoption, and if the companies that had already acquired the certification were included in the observations, they would falsely influence the results”. Figure 1 illustrates the trend. Secondly, we weighted the number of certifications in a country by the number of listed companies to adjust for the number of companies in a country that could potentially adopt the certification.

Our analyses of the effects of stakeholders’ preferences/pressures for environmental responsibility, given budgetary conditions, for initial ISO 14001 adoptions are: 1) we focused on the effects of total exports (all foreign markets) on initial ISO 14001 adoptions in Model 1; and 2) we considered the effects of each foreign market separately instead of total exports for initial ISO 14001 adoptions in Model 2. The main conclusions are as follows. To begin with, scale, economic performance, carbon dioxide emissions and total exports have a positive effect on initial ISO 14001 adoptions in Model 1. Secondly, scale, economic performance, carbon dioxide emissions, exports to the EU and exports to Japan have a positive effect on initial ISO 14001 adoptions in Model 2. Therefore, our assessment proved that each foreign market has different priorities and ideas with regard to the adoption of ISO 14001 by suppliers.

The format for this paper is as follows. First, we provide an overview of ISO 14001 in Section 2. Then, the literature on ISO 14001 adoptions is reviewed in Section 3. The hypotheses about the determinants of ISO 14001 adoptions are discussed in Section 4. In Section 5, the characteris-

tics of our data are introduced. Section 6 is devoted to the estimation results. Finally, our concluding remarks are summarized in Section 7.

2. Overview of ISO 14001

The ISO 14000 series, released in 1996, is the international standard for an Environmental Management System (EMS) and is certified by the International Organization for Standardization (ISO). The series is based on the need for improved environmental quality as defined at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 (Bansal and Bogner 2002). An EMS provides the requirements for an organization's structure, responsibilities, practices, procedures, processes and resources for environmental management, so that a company can reduce its environmental impact while improving its management control (Bansal and Bogner 2002; Bansal and Hunter 2003). In the series, ISO 14001 is the only certifiable and procedural standard for an EMS, whereas other standards are general guidelines on principles, systems and supporting techniques (ISO 14004), guidelines for environmental auditing (ISO 14010–14012), environmental labels and declarations (ISO 14020–14025), and life cycle assessment (ISO 14040–14049) (ISO 2004; Welch et al. 2002).

Since ISO 14001 is directly concerned with the specifications of the EMS and not product standards, for ISO 14001 adoption, a company needs to meet the requirements for five main elements based on the principles of continuous improvement (Plan, Do, Check and Act): environmental policy; planning; implementation and operation; checking and corrective action; and management review, and the company needs to be certified by an accredited third party (Arimura et al. 2005; Church 1996). The company can apply for ISO 14001 certification at the facility level. In Japan, the registration fee is between \$15,000 and \$26,000 depending on the size of the facility and industry. If the company has adopted the certification and wants to renew it, they must undergo a complete recertification audit every three years, which costs half or two thirds of the initial registration fee (Arimura et al. 2005).

Since ISO 14001 compliance is not legally enforced, companies have many choices on how they implement their EMSs. These choices include the following: 1) companies can be certified by other EMSs that are less strict or have cheaper registration fees than ISO 14001, and 2) companies can declare themselves to be in compliance with ISO 14001 or follow only certain elements of ISO 14001 (Bansal and Bogner 2002; Neumayer and Perkins 2004). Indeed, some companies use ISO 14000 guidelines to develop new EMSs or adapt their environmental practices to the international standard without formal ISO 14001 certification (Rondinelli and Vastag 2000). In spite of this situation, by 2004 the number of ISO 14001 adoptions totaled 89,937 worldwide. It is believed that the majority of these adoptions have been by companies, although any organization can adopt the certi-

fication.

There are two possible reasons why such a high number of companies have adopted ISO 14001 certification despite its voluntary nature. One is an internal advantage due to the increased intrinsic worth of the management system (strictness, efficiency, effectiveness and so on); ISO 14001 brings achievement of environmental objectives and cost reduction. Another is an external advantage. ISO 14001 brings the added external benefit of signaling a company's commitment to environmental management to its external stakeholders (Boiral and Sala 1998; Jiang and Bansal 2003). Since companies can follow the outline of ISO 14001 for their EMS without registration, the external advantage can play an even more important role in a company's adoption of ISO 14001. The external advantage and stakeholder influence on adoption are discussed in more detail in Section 4.

3. Review of Previous Studies

In this section, we review previous studies regarding the factors that influence the adoption of ISO 14001. Although there have been many previous studies, our review in this paper focuses on the following studies: 1) studies of the effect of foreign customers (markets) on ISO 14001 adoptions, and 2) studies of the factors that influence ISO 14001 adoptions in Australia.

First, we looked at some empirical studies that focused on foreign customers or markets¹⁾. Bansal and Hunter (2003), using a sample of 92 US companies, examined whether companies adopt ISO 14001 to reinforce their present strategies or to reorient their strategies. They found that environmental legitimacy, environmental crises and international scope have a positive effect on ISO 14001 adoptions. Thus, the hypothesis that companies adopt the certification in order to reinforce their strategies is supported. Arimura et al. (2005) insisted that ISO 14001 adoptions and the publication of environmental reports are driven by similar factors since the two actions stem from a facility's voluntary intent to improve its public image and environmental performance. They used data from a questionnaire survey obtained from 792 facilities in the Japanese manufacturing industry. They found that the scale, number of facilities in a company, stock market listing, identity of primary customers, orientation to international market, implementation of quality management, pressures from headquarters, investors, employees, nongovernmental organizations (NGOs) and consumers, and local governments' environmental policies influenced the adoption of ISO 14001. Nishitani (2007) focused on factors that influence initial ISO 14001 adoptions and not accumulated certifications, since data from the Japanese manufacturing companies listed in the first section of Tokyo Stock Exchange indicated that companies retain ISO 14001 once they adopt it. Companies

1) A very early study of the factors determining ISO 14001 adoptions was Nakamura et al. (2001). However, they could not find a relationship between foreign customers and adoption.

decide to adopt ISO 14001 if the expected long-term profit with ISO 14001 is greater with the certification than without it. Additionally, stakeholders' environmental preferences, given budgetary conditions, affect the company profit. Nishitani found that pressures from foreign customers and long-term stockholders, scale and financial performance affect the decision to adopt ISO 14001, and the factors that influence adoption are different according to the year of adoption. The study of Neumayer and Perkins (2004) focused on the export markets of Japan, the EU and the US with regard to ISO 14001 adoptions. They attempted to explain the uneven adoption of ISO 14001 at the global level since the number of ISO 14001 adoptions varies considerably geographically. They examined hypotheses based on previous studies and used data from 142 countries including developing and developed countries. The main findings were that income per capita, stock in foreign direct investments, export of goods and services to Europe and Japan, and pressures from the general public all have a positive effect on ISO 14001 adoptions. In contrast, productivity, levels of state intervention, and exports of goods and services to the US have a negative effect. These studies support the finding that foreign customers influence the adoption of ISO 14001.

Secondly, we examined studies focusing on ISO 14001 adoptions and EMS in Australia. We found support for the view that the Australian market has factors similar to other environmentally sensitive countries that influence Australian companies' decisions about environmental management. A series of studies by Zutshi and Sohal provided an outline. Their first study (2003) examined stakeholder involvement in the EMS adoption process, based on interviews with nine senior or middle managers. They found that 1) customers and final consumers can affect the decision-making process by pressuring companies to prove that their products or services are environmentally friendly, and 2) suppliers' cooperation is invaluable in improving the supply chain for their EMS implementation. The second study (2004 a) examined reasons, benefits and impediments to EMS/ISO 14001 adoption based on a questionnaire survey of 132 organizations in Australia and New Zealand that were ISO 14001 certified and listed on the register of JASANZ. The results indicated that organizations generally preferred to obtain third-party certifications for their standards, rather than simply implement these, because of the expected stakeholder benefits. On this basis, their main conclusions were: 1) the main reason for adopting an EMS/ISO 14001 was to obtain an improved corporate image, and 2) compliance with legislation and reduction in organizational risks were the two main expected benefits, and these benefits were achieved, and 3) one of the major impediments to ISO 14001 was the high cost involved in implementation and external auditors' fees. The third study (2004 b) focused on stakeholder involvement in EMS implementation. The same data that had been collected for the second study (2004 a) were used. That study concluded that employees and suppliers play an important role in the successful implementation of an EMS. Various previous studies concluded that stakeholders are an important factor with regard to a company's environmental management. Hence, the factors affecting the adoption of ISO 14001 by Aus-

tralian companies are similar to those of companies in other environmentally conscious countries, such as Japan, examined by previous studies.

4. Hypotheses

In this section, we frame hypotheses about the adoption of ISO 14001. We consider external advantages in the adoption of ISO 14001. The predominant scenario of ISO 14001 adoption is as follows. If the objective of the company is to maximize long-term profit and this is influenced by stakeholders' environmental preferences/pressures, firms then attempt to satisfy their stakeholders to maximize their profit, subject to their current budgetary conditions. ISO 14001 adoption is a tool to satisfy their stakeholders because it signals a company's commitment to environmental management. Thus, companies with more environmentally conscious stakeholders can obtain a greater advantage from adoption. Hence, it is believed that companies that have more environmentally conscious stakeholders and that can afford to pay the initial cost are more likely to adopt ISO 14001, since their expected long-term profit with ISO 14001 is greater with the certification than without (Nishitani 2007).

Thus, the estimated value of parameters involves the factors in stakeholders' environmental preferences/pressures and budgetary conditions. Based on the above discussion, we frame the hypotheses for the adoption of ISO 14001 as follows.

Scale

Scale, which represents company size, is one of the most significant determinants in the adoption of ISO 14001. There are two major reasons. First, larger companies receive more pressure with regard to their environmental performance from their various stakeholders, since they are more publicly visible and sometimes regarded as the largest polluters. Thus, the larger companies are more susceptible to negative publicity regarding their environmental performance (Gonzalez-Benito and Gonzalez-Benito 2006; Neumayer and Perkins 2004; Welch et al. 2000, 2002). Secondly, ISO 14001 adoption demands comparatively high initial and long-term maintenance costs, since it requires the company to change its production process, organizational structure and/or its employees' responsibilities (Arimura et al. 2005; Chin and Pun 1999; Melnyk et al. 2003; Nakamura et al. 2001; Neumayer and Perkins 2004). In addition, contributing such an enormous cost to adoption is less significant for larger companies than for smaller ones. Therefore, scale has a positive effect on the adoption of ISO 14001.

Economic Performance

Economic performance represents financial performance at the company level. There have been

many discussions in the literature about whether a company's environmental management is related to financial performance. Specifically, the issue is whether companies that make more profit tend to introduce more measures for environmental management (Arimura et al. 2005; Cormier and Magnan 1999, 2003; Cormier et al. 2004; Hackston and Milne 1996; Hibiki et al. 2003; Higashida et al. 2005; Kokubu et al. 2002; Nakamura et al. 2001; Neumayer and Perkins 2004; Patten 1991; Roberts 1992). However, among these previous studies, only a few found a relationship between environmental actions and financial performance. We chose to assume that financial performance is a significant factor in the decision to adopt ISO 14001 since ISO 14001 adoption involves comparatively high initial costs, and a company with higher profitability has more flexibility to finance new programs (Nakamura et al. 2001). Therefore, economic performance has a positive effect on ISO 14001 adoption.

Industrial Sector

The industrial sector can also be an important factor in ISO 14001 adoptions. Because each industry has different polluting potentials, the magnitude of pressure from stakeholders concerning the environment may be different. The manufacturing industries, particularly oil, chemical and paper industries, are associated with poorer environmental performance and greater environmental risk, while, on the other hand, service industries usually represent a reduced environmental impact and the lowest environmental risk (Gonzalez-Benito and Gonzalez-Benito 2006). Therefore, the industrial sector is an influence on ISO 14001 adoption.

Carbon Dioxide Emissions

The quantity of carbon dioxide (CO₂) emissions is highly regulated by the government. Because companies are the greatest dischargers of CO₂, they play a major role in its reduction. Companies anticipate that governments supportive of the Kyoto Protocol will increasingly regulate CO₂ emissions in the future. Such regulations will bring extra costs in terms of financial penalties. The regulatory influence theory postulates that companies are willing to invest in voluntary environmental actions because voluntarism provides the company with greater ability to influence or manipulate the regulatory system (Welch et al. 2002). Therefore, an increase in CO₂ emissions increases the number of ISO 14001 adoptions.

Foreign Customers

It is considered that companies face strong demand-side incentives to adopt ISO 14001 (Neumayer and Perkins 2004). Among these incentives, foreign customers are a considerable factor. Foreign customers may demand more visible commitment to environmental protection because they may have less opportunity to monitor the performance of a company or less knowledge about its

actions and intentions. ISO 14001 is regarded as the international benchmark to assess a company's environmental performance (Nakamura et al. 2001; Rondinelli and Vastag 2000). Therefore, companies having more foreign customers are more likely to adopt ISO 14001.

However, it may be incorrect to say that all foreign customers are more environmentally conscious since customers of different countries have different priorities and ideas with regard to the environment and its management (Neumayer and Perkins 2004; Nishitani 2007). We believe that the influence of markets in Japan, the EU and Australia is for more ISO 14001 adoptions. One reason for this is that these countries have embraced ISO 14001 adoption to the greatest extent. Additionally, customers in these countries demand that not only their domestic but also their foreign suppliers adopt ISO 14001. Previous studies support the view that the markets of Japan and the EU are more environmentally conscious and could have a positive effect on ISO 14001 adoptions (Kollman and Prakash 2002; Bellesi et al. 2005; Neumayer and Perkins 2004). We have previously discussed the positive correlation between Australian company ownership and ISO 14001 adoption (Zutshi and Sohal 2003, 2004 a, 2004 b). In Contrast, some previous studies insist that the US market has a negative effect on ISO 14001 adoptions (Delmas 2002; Neumayer and Perkins 2004). For example, Delmas (2002) concluded that stakeholders in the US do not require companies to acquire ISO 14001 certification. The standard is still questioned and has not yet become "the norm". We agree with the previous studies. Therefore, we hypothesize that 1) total exports (all foreign customers) have a positive effect for initial ISO 14001 adoptions, and 2) exports to Japan (Japanese customers), the EU (EU customers) and Australia (Australian customers) have a positive effect on initial ISO 14001 adoptions, and exports to the US (US customers) have a negative effect for initial ISO 14001 adoptions.

5. Data

Although ISO 14001 adoptions are dependent on a company's decision, which is subject to the stakeholders' preferences/pressures for environmental responsibility and the company's budgetary condition, our data are from the country rather than company level. In this instance, we believe that our data represent company data at a macro level, since country-level data are compiled/derived from company-level data.

We used panel data on 107 countries with stock markets from 1996 (the release year of ISO 14001) to 2004. Because the data were unbalanced, the resulting number of observations was 854. Although we did not choose the sample randomly, we regard these 107 countries as a random sample from all of the countries of the world. That is to say, this study is regarded as a sample survey rather than a complete survey. The list of dependent and independent variables is shown in Table 2, and the descriptive statistics in Table 3.

Table 2 Definition of Variables

| Variable | Definition |
|---------------------------|---|
| ISO 14001 | Increase in the number of ISO 14001 adoptions per listed company |
| Scale | GDP in PPP |
| Economic Performance | GDP per capita in PPP |
| Manufacturing | Value added to manufacturing in GDP |
| CO ₂ Emissions | Volume of CO ₂ emissions per listed firm |
| FDI | Stock in inward foreign direct investment related to GDP |
| Total Exports | Value added to total exports in GDP |
| Japan | Value added to exports to Japan in GDP |
| EU | Value added to exports to the EU in GDP |
| US | Value added to exports to the US in GDP |
| Australia | Value added to exports to Australia in GDP |
| Canada | Value added to exports to Canada in GDP |
| Korea | Value added to exports to Korea in GDP |
| Other Countries | Value added to exports to other countries from Japan, the EU, the US, Australia, Canada and Korea, in GDP |

Units of some explanatory variables are adjusted.

Table 3 Descriptive Statistics

| | (1) | | (2) | |
|---------------------------|-------|-------|-------|-------|
| | Mean | S. D. | Mean | S. D. |
| ISO 14001 | 0.247 | 0.824 | 0.258 | 0.847 |
| Scale | 0.431 | 1.153 | 0.447 | 1.166 |
| Economic Performance | 1.106 | 0.946 | 1.140 | 0.931 |
| Manufacturing | 1.735 | 0.638 | 1.776 | 0.653 |
| CO ₂ Emissions | 0.103 | 0.295 | 0.105 | 0.300 |
| FDI | 0.250 | 0.220 | 0.256 | 0.246 |
| Total Exports | 0.291 | 0.163 | — | — |
| Japan | — | — | 0.171 | 0.300 |
| EU | — | — | 1.104 | 0.942 |
| US | — | — | 0.491 | 0.627 |
| Australia | — | — | 0.385 | 1.769 |
| Canada | — | — | 0.034 | 0.077 |
| Korea | — | — | 0.067 | 0.136 |
| Other Countries | — | — | 1.218 | 1.415 |
| 1996 | 0.097 | 0.296 | 0.095 | 0.293 |
| 1997 | 0.103 | 0.304 | 0.104 | 0.305 |
| 1998 | 0.108 | 0.310 | 0.108 | 0.310 |
| 1999 | 0.111 | 0.315 | 0.111 | 0.315 |
| 2000 | 0.116 | 0.320 | 0.115 | 0.319 |
| 2001 | 0.114 | 0.317 | 0.111 | 0.315 |
| 2002 | 0.118 | 0.323 | 0.120 | 0.325 |
| 2003 | 0.115 | 0.319 | 0.118 | 0.322 |
| 2004 | 0.118 | 0.323 | 0.119 | 0.324 |
| Number of Observations | 854 | | 800 | |

For the dependent variables, we used the increase in the number of ISO 14001 adoptions per listed companies. The number of ISO 14001 adoptions at the country level is taken from ISO (2003, 2006), and the number of listed companies from the World Bank (2007).

The explanatory variables are as follows. Gross domestic product (GDP) in purchasing power

parity (PPP) is used as the proxy of scale. Data were taken from the World Bank (2007). GDP in PPP per capita is used as the proxy of economic performance. The larger the GDP per capita, the higher is the level of productivity in the country. Thus, we believe that a higher level of productivity induces better economic performance. As Neumayer and Perkins (2004) suggest, it is important to use income data in PPP to avoid underestimating the effective purchasing power of very poor countries. Data were taken from the World Bank (2007). The value added to manufacturing in GDP was used as the proxy for the industrial sector, for which data were taken from the World Bank (2007) and supplemented by the United Nations (2006). CO₂ emissions were weighted by the number of listed companies to adjust for the number of companies that emit CO₂. Data were taken from the World Bank (2007). The value added to total merchandise exports in GDP is used as the proxy of the total foreign markets (total exports), for which data were taken from the World Bank (2007). The value added to merchandise exports to Japan, the EU, the US and Australia in GDP was used as the proxy for each foreign market²). When our sample countries are Japan, the US or Australia, their variables are coded as zero. When our sample countries are members of the EU, the variables refer to exports to the other fourteen countries. Data were taken from the Organization for Economic Cooperation and Development (OECD) (2007).

The control variables are as follows. 1) The stock of inward foreign direct investment (FDI) related to GDP is included to adjust for the effect of foreign companies operating in the sample countries, since their objective in adopting ISO 14001 might be to meet the host country's regulations (Prakash and Potoski 2006). Data were taken from the United Nations Conference on Trade and Development (UNCTAD) (2007). 2) Because the economic scale in Australia is smaller than that of Japan, the EU and the US, we included the value of merchandise exports to Canada and Korea in GDP since these countries have a similar economic scale to Australia. When our sample countries were Canada or Korea, their variables were also coded zero. In addition, we included the value of the merchandise exports to the other countries in GDP. Thus, total exports are divided into seven areas. However, there might be some allowable margin of error with the value added to the merchandise exports to the other countries since we obtained the value of the total merchandise exports and the value of the merchandise exports to each country from different data sources. Data were taken from the World Bank (2007) and the OECD (2007). 3) Year dummies were included.

6. Estimation Results

Estimation results are shown in Table 4. We estimated two models. The first model estimated the effect of total foreign markets, to retest the previous studies with our data (Model 1). The sec-

2) The EU includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and UK (EU 15 countries).

Table 4 Estimation Results of Increase in the Number of ISO 14001 Adoptions

| Explanatory Variable | (1) | | | | (2) | | | |
|---------------------------|-------------|----------------|---------------|----------------|-------------|----------------|---------------|----------------|
| | OLS | | Fixed Effects | | OLS | | Fixed Effects | |
| | Coefficient | Standard Error | Coefficient | Standard Error | Coefficient | Standard Error | Coefficient | Standard Error |
| Scale | 0.001 | 0.027 | 0.414 | 0.197** | 0.028 | 0.029 | 0.402 | 0.202** |
| Economic Performance | 0.175 | 0.031*** | 0.722 | 0.334** | 0.146 | 0.035*** | 0.692 | 0.352** |
| Manufacturing | 0.198 | 0.044*** | -0.178 | 0.186 | 0.124 | 0.050** | -0.122 | 0.203 |
| CO ₂ Emissions | 0.118 | 0.092 | 0.347 | 0.149** | 0.146 | 0.096 | 0.367 | 0.154** |
| FDI | 0.068 | 0.141 | 0.435 | 0.398 | 0.075 | 0.157 | 0.190 | 0.330 |
| Total Exports | 0.151 | 0.194 | 2.043 | 0.646*** | — | — | — | — |
| Japan | — | — | — | — | 0.113 | 0.188 | 1.011 | 0.576* |
| EU | — | — | — | — | 0.157 | 0.038*** | 0.513 | 0.130*** |
| US | — | — | — | — | -0.032 | 0.053 | -0.163 | 0.224 |
| Australia | — | — | — | — | -0.010 | 0.017 | -0.021 | 0.088 |
| Canada | — | — | — | — | -0.429 | 0.405 | 0.231 | 2.038 |
| Korea | — | — | — | — | -0.228 | 0.416 | -0.227 | 0.811 |
| Other Countries | — | — | — | — | -0.037 | 0.026 | 0.037 | 0.101 |
| 1996 (Reference) | — | — | — | — | — | — | — | — |
| 1997 | 0.061 | 0.119 | 0.034 | 0.112 | 0.075 | 0.126 | 0.090 | 0.121 |
| 1998 | 0.021 | 0.118 | -0.044 | 0.112 | 0.020 | 0.125 | 0.019 | 0.122 |
| 1999 | 0.119 | 0.118 | 0.034 | 0.115 | 0.126 | 0.124 | 0.102 | 0.124 |
| 2000 | 0.152 | 0.117 | 0.018 | 0.118 | 0.150 | 0.124 | 0.087 | 0.129 |
| 2001 | 0.202 | 0.118* | -0.029 | 0.128 | 0.228 | 0.125* | 0.080 | 0.141 |
| 2002 | 0.395 | 0.117*** | 0.159 | 0.130 | 0.400 | 0.123*** | 0.258 | 0.140* |
| 2003 | 0.271 | 0.119** | 0.010 | 0.137 | 0.278 | 0.125** | 0.137 | 0.147 |
| 2004 | 0.537 | 0.119*** | 0.239 | 0.141* | 0.560 | 0.124*** | 0.380 | 0.151** |
| Constant | -0.566 | 0.121*** | -1.209 | 0.485** | -0.487 | 0.128*** | -1.404 | 0.534*** |
| Number of Observations | 854 | | 854 | | 800 | | 800 | |
| Adjusted R2 | 0.104 | | — | | 0.121 | | — | |
| R2: Within | — | | 0.099 | | — | | 0.115 | |
| R2: Between | — | | 0.125 | | — | | 0.179 | |
| R2: Overall | — | | 0.058 | | — | | 0.077 | |
| Hausman Test (p-value) | — | | 0.000 | | — | | 0.001 | |

*, **and*** imply that the coefficient is significantly different from zero at the 10%, 5% and 1% levels, respectively.

The Hausman test compares fixed effects and random effects models.

ond model estimated the effect of each foreign market—Japan, the EU, the US and Australia—to examine whether customers' preferences/pressures for environmental management were different from those of countries (markets) (Model 2). Both models were estimated by ordinary least squares (OLS) and fixed effects.

First, we examined Model 1. Economic performance and manufacturing were positively significant at the 1% level in the OLS model. This implies that better economic performance and greater manufacturing orientation increases the number of initial ISO 14001 adoptions. However, scale, CO₂ emissions, FDI and total exports did not have a significant effect. On the other hand, total exports were positively significant at the 1% level and scale, economic performance and CO₂ emissions were positively significant at the 5% level in the fixed effects model. This result implies that larger scale, better economic performance, more CO₂ emissions and an orientation towards increasing exports increases the number of initial ISO 14001 adoptions within a country, as the dif-

ferences among the countries are fixed. Again, FDI did not have a significant effect. In the latter model, in contrast to the OLS model, manufacturing was not significant, whereas economic performance was still positively significant. This was interpreted to mean that the effect of manufacturing became positively significant in the OLS model because an individual effect increased that of manufacturing as well as the number of initial ISO 14001 adoptions.

Secondly, we examined Model 2. Exports to Japan, the EU, the US, Australia, Canada, Korea and other countries were included instead of total exports, to estimate the difference in customers' environmental preferences/pressures among the exporting countries. Economic performance and exports to the EU were positively significant at the 1% level and manufacturing was positively significant at the 5% level in the OLS model. This implies that better economic performance, a greater manufacturing orientation and more exports to the EU increase the number of initial ISO 14001 adoptions. However, scale, CO₂ emissions, FDI and exports to Japan, the US, Australia, Canada, Korea and other countries did not have a significant effect. On the other hand, exports to the EU were positively significant at the 1% level, scale, economic performance and CO₂ emissions were positively significant at the 5% level, and exports to Japan were positively significant at the 10% level in the fixed effects model. This result implies that larger scale, better economic performance, more CO₂ emissions and more exports to Japan and the EU increase the number of initial ISO 14001 adoptions within a country. We found that the effect of customers' environmental preferences/pressures is different among the different export countries. FDI and exports to the US, Australia, Canada, Korea and other countries had no significant effect in either econometric model. Here again, a manufacturing orientation was not significant, whereas economic performance and exports to the EU were still positively significant compared with the OLS model. This interpretation is similar to that for Model 1.

7. Concluding Remarks

We have discussed the adoption of ISO 14001 based on the following concepts: 1) the influence of stakeholders' preferences/pressures for companies to be environmentally responsible, subject to budgetary conditions; 2) the real determinants are revealed when we consider the period of initial adoption; and 3) the effects of foreign customers (markets). Our data involve panel data at the country level, and we believe that they represent company data at the macro level.

The interpretation results are as follows. When we focus on total exports, economic performance and manufacturing have a positive effect on initial ISO 14001 adoptions in the OLS model. On the other hand, scale, economic performance, CO₂ emissions and total exports have a positive effect on initial ISO 14001 adoptions in the fixed effects model. Because we confirmed the effect of total exports in Model 1, we estimated the effects of separate exports to Japan, the EU, the US

and Australia instead of the total exports in Model 2. Economic performance, manufacturing and exports to the EU have a positive effect on initial ISO 14001 adoptions in the OLS model, and scale, economic performance, CO₂ emissions, exports to Japan and exports to the EU have a positive effect on initial ISO 14001 adoptions in the fixed effects model. Given the results of Model 1 and Model 2, we concluded that: 1) scale, economic performance and CO₂ emissions have a positive effect on initial ISO 14001 adoptions within a country; 2) among the total exports, exports only to Japan and the EU have a positive effect, although total exports itself has a positive effect on initial ISO 14001 adoptions within a country; and 3) the positive effect of manufacturing on initial ISO 14001 adoptions is explained by an individual effect. These results support our hypothesis, which is that stakeholder preferences/pressures for companies to be environmentally responsible subject to budgetary conditions generally influence a company's adoption of ISO 14001. Particularly remarkable points are as follows. 1) We proved that each foreign customer has different priorities and ideas with regard to the environment and its management. Our results indicate that, with regard to foreign customers, only the preferences/pressures for environmental responsibility from customers who are environmentally sensitive influence ISO 14001 adoption. 2) We found a positive relationship between CO₂ emissions and initial ISO 14001 adoptions. This implies that CO₂ reduction is very important to companies in terms of future legislation. 3) We found a positive relationship between economic performance and initial ISO 14001 adoptions, which means that better financial performance was required for initial ISO 14001 adoptions at the company level. 4) The positive relationship between scale and initial ISO 14001 adoptions accords with previous studies.

Although we could not find a relationship between exports to the US and Australia and initial ISO 14001 adoptions, there are some implications from this result³⁾. First, in contrast to Neumayer and Perkins (2004), our results did not indicate a negative effect of the US market. The important findings are as follows. 1) The effect of the US market is truly insignificant. It is possible that US results had some sample selection bias because they did not consider our theory regarding initial ISO 14001 adoption. 2) Stakeholder preferences/pressures for environmental responsibility might have strengthened to the degree that the negative effect became insignificant. For example, after some major companies such as General Motors and Ford announced that they would require suppliers to certify at least one manufacturing site to the ISO 14001 standard, the total number of ISO 14001 adoptions in the US increased rapidly (Babakri et al. 2003; ISO 2003, 2006). If we estimate the effect of the level of exports to the US in the long term, it might be possible that it has a positive effect. Secondly, we did not find that exports to Australia had a positive effect. The most remarkable interpretation is as follows. Because the scale of the Australian economy is smaller than

3) All control variables do not have a significant effect for ISO 14001 adoptions. Prakash and Potoski (2006) indicated that the FDI from the countries with more ISO 14001 adoptions have a positive effect on ISO 14001 adoption.

those of Japan, the EU and the US, the positive effect of exports to Australia could be statistically hidden behind the effects of exports to these other countries. Similarly to Australia, the effects of exports to Canada and Korea, which have comparable economic scale, are insignificant also.

In conclusion, we would like to provide a possible issue for future study: the availability/use of company-level data. For example, we could not find a positive correlation between exports to Australia, which is one of the most environmentally conscious countries, and initial ISO 14001 adoptions, because Australia has a smaller economic scale. Restriction to country-level data limited our analysis. It might have been possible to find a positive correlation if we had obtained access to company-level data. Company-level data could be obtained from a questionnaire survey, for example. For results that are more accurate, we would suggest a deeper analysis and data availability at the company instead of the country level.

References

- Arimura, T., Hibiki, A., and Katayama, H. (2005) "Is a Voluntary Approach an Effective Environmental Policy Instrument? A Case of Environmental Management Systems" Paper presented to 32th Kobe University Environmental Economics Workshop, August 22 2003, Kobe University, Kobe.
- Babakri, K. A., Bennett, R. A. and Franchetti, M. (2003) "Critical Factors for Implementing ISO 14001 Standard in United States Industrial Companies", *Journal of Cleaner Production*, vol. 11, no. 7, pp. 749–752.
- Bansal, P. and Bogner, W. C. (2002) "Deciding on ISO 14001: Economics, Institutions, and Context", *Long Range Planning*, vol. 35, no. 3, pp. 269–290.
- Bansal, P. and Hunter, T. (2003) "Strategic Explanations for the Early Adoption of ISO 14001", *Journal of Business Ethics*, vol. 46, no. 3, pp. 289–299.
- Bellesi, E., Lehrer, D. and Tal, A. (2005) "Comparative Advantage: The Impact of ISO 14001 Environmental Certification on Exports", *Environmental Science and Technology*, vol. 39, no. 7, pp. 1943–1953.
- Boiral, O. and Sala, J. (1998) "Environmental Management: Should Industry Adopt ISO 14001?", *Business Horizons*, vol. 41, no. 1, pp. 57–64.
- Chin, K. and Pun, K. (1999) "Factors Influencing ISO 14000 Implementation in Printed Circuit Board Manufacturing Industry in Hong Kong", *Journal of Environmental Planning and Management*, vol. 42, no. 1, pp. 123–134.
- Churche, M. (1996) "ISO 14000: Standards for Environmental Management Systems and the Multilateral Trading System: Synergies or Conflicts?", *ISO 14000: Regulation, Trade and Environment*—Hyatt Hotel, Canberra, July 2, Australian Centre for Environmental Law, Canberra, pp. 1–11.
- Cormier, D. and Magnan, M. (1999) "Corporate Environmental Disclosure Strategies: Determinants, Costs and Benefits", *Journal of Accounting, Auditing and Finance*, vol. 14, no. 4, pp. 429–451.
- Cormier, D. and Magnan, M. (2003) "Environmental Reporting Management: A Continental European Perspective", *Journal of Accounting and Public Policy*, vol. 22, no. 1, pp. 43–62.
- Cormier, D., Gordon, I. M. and Magnan, M. (2004) "Corporate Environmental Disclosure: Contrasting Management's Perceptions with Reality", *Journal of Business Ethics*, vol. 49, no. 2, pp. 143–165.
- Delmas, M. (2002) "The Diffusion of Environmental Management Standards in Europe and in the United States: An Institutional Perspective", *Policy Sciences*, vol. 35, pp. 91–119.
- Gonzalez-Benito, J. and Gonzalez-Benito, O. (2006) "A Review of Determinant Factors of Environmental Proactivity", *Business Strategy and the Environment*, vol. 15, no. 2, pp. 87–102.
- Hackston, D. and Milne, M. J. (1996) "Some Determinants of Social and Environmental Disclosures in New

- Zealand Companies”, *Accounting, Auditing & Accountability Journal*, vol. 9, no. 1, pp. 77–108.
- Hibiki, A., Higashi, M., Matsuda, A. (2003) “Determinants of the Firm to Acquire ISO 14001 Certificate and Market Valuation of the Certified Firm”, *Department of Social Engineering Discussion Paper*, no. 3–6, Tokyo Institute of Technology, Tokyo.
- Higashida, A., Kokubu, K. and Kawahara, C. (2005) “Environmental Disclosure in Environmental Report and its Determinants: the Case of Japanese Firms in 2003 (in Japanese)”, *Shakai Kanren Kaikai Kenkyuu*, vol. 17, pp. 29–38.
- International Organization for Standardization (2003) *The ISO Survey of ISO 9000 and ISO 14000 Certificates-2003*, Available: <http://www.iso.org/iso/survey2003.pdf>, [Accessed July 18 2007].
- International Organization for Standardization (2004) *Environmental Management – The ISO 14000 Family of International Standards 2002 edition*, Available: <http://www.iso.org/iso/en/prods-services/otherpubs/iso14000/index.html>, [Accessed July 18 2007].
- International Organization for Standardization (2006) *The ISO Survey of Certifications 2005*, Available: <http://www.iso.org/iso/survey2005.pdf>, [Accessed July 18 2007].
- Jiang, R. J. and Bansal, P. (2003) “Seeing the Need for ISO 14001”, *Journal of Management Studies*, vol. 40, no. 4, pp. 1047–1067.
- Kokubu, K., Noda, A., Ohnishi, Y., Shinabe, T. and Higashida, A. (2002) “A Study for the Determinants of Environmental Disclosure in Japanese Firms – Analysis of Environmental Reports Publishing and its Quality (in Japanese)”, *Kigyuu Kaikai*, vol. 54, no. 2, pp. 74–80.
- Kollman, K. and Prakash, A. (2002) “EMS-based Environmental Regimes as Club Goods: Examining Variations in Firm-level Adoption of ISO 14001 and EMAS in U. K., U.S. and Germany”, *Policy Sciences*, vol. 35, pp. 43–67.
- Melnyk, S. A., Sroufe, R. P. and Calantone, R. (2003) “Assessing the impact of environmental management systems on corporate and environmental performance”, *Journal of Operations Management*, vol. 21, no. 3, pp. 329–351.
- Nakamura, M., Takahashi, T. and Vertinsky, I. (2001) “Why Japanese Firms Choose to Certify: A Study of Managerial Responses to Environmental Issues”, *Journal of Environmental Economics and Management*, vol. 42, no. 1, pp. 23–52.
- Neumayer, E. and Perkins, R. (2004) “What Explains the Uneven Take-up of ISO 14001 at the Global level? A Panel-Data Approach”, *Environment and Planning A*, vol. 36, no. 5, pp. 823–839.
- Nishitani, K. (2007) “An Empirical Study on the Adoption of ISO 14001 in Japanese Firms”, Paper presented to Annual Conference on Society for Environmental Economics and Policy Studies, October 7–8 2007, Shiga University, Shiga.
- OECD (2007) *International Trade by Commodity Statistics*, Available: http://www.oecd.org/document/18/0,3343,en_2825_293564_1906706_1_1_1_1,00.html, [Accessed August 2 2007].
- Patten, D. (1991) “Exposure, Legitimacy, and Social Disclosure”, *Journal of Accounting and Public Policy*, vol. 10, no. 4, pp. 297–308.
- Prakash, A. and Potoski, M. (2006) “New Dependencies: FDI and the Cross-Country Diffusion of ISO 14001 Management Systems”, Paper for First Annual Conference on Institutional Mechanisms for Industry Self-Regulation, February 24–25 2006, Tuck School of Business Dartmouth College, Hanover.
- Roberts, R. W. (1992) “Determinants of Corporate Social Responsibility Disclosure: An Application of Stakeholder Theory”, *Accounting, Organizations and Society*, vol. 17, no. 6, pp. 595–612.
- Rondinelli, D. and Vastag, G. (2000) “Panacea, Common Sense, or Just a Label? The Value of ISO 14001 Environmental Management Systems”, *European Management Journal*, vol. 18, no. 5, pp. 499–510.
- UNCTAD (2007) *Foreign Direct Investments Statistics*, Available: <http://stats.unctad.org/FDI/ReportFolders/ReportFolders.aspx>, [Accessed August 2 2007].
- United Nations Department of Economic and Social Affairs (2006) *National Accounts Statistics: Main Aggregates and Detailed Tables*, 2004, United Nations, New York.

- Welch, E. W., Mazur, A. and Bretschneider, S. (2000) "Voluntary Behavior by Electric Utilities: Levels of Adoption and Contribution of the Climate Challenge Program to the Reduction of Carbon Dioxide", *Journal of Policy Analysis and Management*, vol. 19, no. 3, pp. 407–425.
- Welch, E. W., Mori, Y. and Aoyagi-Usui, M. (2002) "Voluntary Adoption of ISO 14001 in Japan: Mechanisms, Stages and Effects", *Business Strategy and the Environment*, vol. 11, no. 1, pp. 43–62.
- World Bank (2007) *World Development Indicators* [CD-ROM], World Bank, Washington DC.
- Zutshi, A. and Sohal, A. S. (2003) "Stakeholder Involvement in the EMS Adoption Process", *Business Process Management Journal*, vol. 9, no. 2, pp. 133–148.
- Zutshi, A. and Sohal, A. (2004a) "Environmental Management System Adoption by Australasian Organisations: Part 1: Reasons, Benefits and Impediments", *Technovation*, vol. 24, no. 4, pp. 335–357.
- Zutshi, A. and Sohal, A. (2004b) "A Study of the Environmental Management System (EMS) Adoption Process within Australian Organisations – 2. Role of Stakeholders", *Technovation*, vol. 24, no. 5, pp. 371–386.