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## ANALYSIS

# An empirical study of the initial adoption of ISO 14001 in Japanese manufacturing firms

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## ARTICLE INFO

## Article history:

Received 7 December 2007

Received in revised form

29 March 2008

Accepted 29 May 2008

Available online 1 July 2008

## Keywords:

ISO 14001

Initial adoption

Stakeholders' environmental preferences/pressures

Financial flexibility

Probit model

Discrete-time proportional hazards model

## ABSTRACT

This paper analyzes stakeholders' environmental preferences/pressures and the financial flexibility that together influence firms to adopt ISO 14001, which is the international standard primarily concerned with an Environmental Management System (EMS). Since firms retain ISO 14001 once they have adopted it, a firm's decision to adopt ISO 14001 is considered from the period that they initially acquire the certification. Therefore, we assert that we have to focus on the determinants of initial ISO 14001 adoption. We analyzed: 1) the determinants of initial ISO 14001 adoptions respective to 1996, 1999, and 2004; and 2) the determinants of initial ISO 14001 adoptions during the period 1996–2004. The estimation results support the view that stakeholders' environmental preferences/pressures and firms' financial flexibility influenced their decision to adopt ISO 14001 in both analyses. Particularly, it is remarkable that we found that: 1) the determinants of the initial ISO 14001 adoption differed among the years of adoption; and 2) there is a positive relationship between economic performance and initial ISO 14001 adoption.

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## 1. Introduction

In the latter half of the 1990s, many firms regarded environmental management as a top corporate priority, since public concern about environment was growing stronger. In light of this, the ISO 14001 adoption was attractive to many Japanese firms. ISO 14001 is the international standard<sup>1</sup> primarily concerned with an Environmental Management System (EMS), and is certified by the International Organization for Standardization (ISO).

According to our survey, 83% of Japanese manufacturing firms had adopted the certification in 2004, although it was not legally required (Fig. 1).<sup>2</sup> Why have so many firms adopted ISO 14001? The objective of a firm is to maximize long-term profit

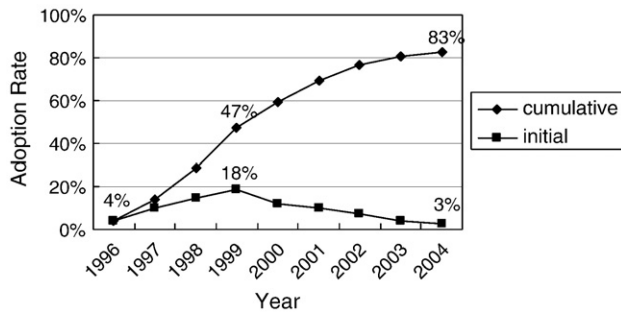
subject to budget constraints, and its stakeholders' environmental preferences/pressures influence its profit. Firms therefore attempt to satisfy their stakeholders with ISO 14001 adoption, since this indicates their commitment to environmental management. However, firms cannot adopt ISO 14001 without sufficient funds. Thus, stakeholders' environmental preferences/pressures and financial flexibility influence ISO 14001 adoption. Hence, the focus of this paper is to analyze stakeholders' environmental preferences/pressures and financial flexibility that influence firms' ISO 14001 adoption.

Before the analysis, however, it is necessary to discuss sample selection. Our sample consisted of 433 manufacturing firms listed on the first section of the Tokyo Stock Exchange.

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<sup>1</sup> There are many international standards of environmental management such as the Global Reporting Initiative (GRI) guidelines for corporate sustainability reports. See [Veleva and Ellenbecker \(2000\)](#) for details.

<sup>2</sup> The Survey of Environmental Friendly Firms ([Japanese Ministry of the Environment, 2006](#)) indicates similar results.



**Fig. 1 – ISO 14001 adoption rate by Japanese manufacturing firms.**

Although firms can freely decide whether to adopt or renew ISO 14001 in each period, our data indicate that firms retain ISO 14001 once adopted. This is because firms with ISO 14001 have an incentive to renew it (at least in the short term) because of a huge initial cost for adoption (including not only registration fees but also initial implementation costs) (Chin and Pun, 1999; Nakamura et al., 2001; Jiang and Bansal, 2003; Melnyk et al., 2003; Neumayer and Perkins, 2004; Arimura et al., 2005). Therefore, a firm's decision to adopt ISO 14001 is considered from the period that it initially acquires the certification, with no circumstances after this period influencing its decision. Accordingly, we assert the necessity to focus on the determinants of the initial ISO 14001 adoption. Fig. 1 shows that the initial adoption rate increased until 1999 and thereafter decreased, whereas the cumulative adoption rate increased until 2004. Thus, the initial adoption rate in each year was different, and the peak in initial adoptions was in 1999. However, many previous studies that analyzed the decision of environmental action by firms did not consider this characteristic of initial adoption. Most used accumulative data for the cross-sectional analysis of a period. Consequently, their results might have had some sample selection bias, since the firms that had already implemented their environmental actions were included in the observations. To resolve this issue, we eliminated the observations if the firm concerned had already adopted the certification in the previous year. This means that we modified the data of the cumulative ISO 14001 adoption to focus on the data of the initial ISO 14001 adoption, since we could not directly estimate the determinants of a cumulative ISO 14001 adoption as many previous studies did. This allowed us to estimate the intrinsic determinants of ISO 14001 adoption.

The objective of this paper is to analyze the determinants of initial ISO 14001 adoption in Japanese manufacturing firms by focusing on stakeholders' environmental preferences/pressures and financial flexibility. We analyzed: 1) the determinants of the initial ISO 14001 adoptions respective to 1996, 1999, and 2004; and 2) the determinants of the initial ISO 14001 adoptions during the period 1996–2004. The former was to test whether the determinants of the initial ISO 14001 adoptions were different among these years. The latter was to use a larger sample of data to analyze the determinants of initial ISO 14001 adoptions.

The main conclusions are as follows. First, in 1996 the firms with larger size and lower debt ratios were more likely to adopt ISO 14001. In 1999, firms that had higher export ratios, higher proportions of stock held by other corporations, larger size,

and better economic performance were more likely to adopt ISO 14001. The positive relationship between economic performance and the initial ISO 14001 adoption is a new finding. However, no variables could be validated to explain initial ISO 14001 adoptions in 2004. Consequently, the determinants of initial ISO 14001 adoption differed among the years of adoption. Second, firms that had higher export ratios, higher proportions of stock held by financial institutions, higher proportions of stock held by other corporations, larger size and better economic performance were more likely to adopt ISO 14001 earlier during the period 1996–2004. Of especial interest was that we also found a positive relationship between economic performance and the initial ISO 14001 adoption in this analysis.

The structure of this paper is as follows. In Section 2, we provide an overview of ISO 14001. The literature on firms' environmental management is reviewed in Section 3. The hypotheses of the determinants of ISO 14001 adoption are discussed in Section 4. In Section 5, the econometric models and data are presented. 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 and revised in 2004, is the international standard for an Environmental Management System (EMS) published by the International Organization for Standardization (ISO). The series is based on the need for improved environmental quality as expressed at the United Nations Conference on Environment and Development 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 firm can reduce its negative environmental impact while improving management control (Bansal and Bogner, 2002; Bansal and Hunter, 2003).

ISO 14001 is the only specific standard for an EMS in the series, and the other designations are as follows: 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) (Welch et al., 2002; ISO, 2004). For ISO 14001 adoption, a firm 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. Besides, the firm must be certified by an accredited third party (Churche, 1996; Lamprecht, 1997; Boiral and Sala, 1998; Kruit and Gleckman, 1998; Zutshi and Sohal, 2004). Third party certification incurs costs. Firms usually decide to adopt ISO 14001 at the facility level, and the registration fee costs between \$15,000 and \$26,000, depending on facility size and industry in Japan. To renew its certification, the firm must undergo a full recertification audit every 3 years, which costs half or two-thirds of the initial registration fee (Arimura et al., 2005). In addition to the registration fee, the firm incurs initial implementation and maintenance costs. According to an estimate by the Global Environmental and Technology

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