Globalization and the Environment: Determinants of Firm Self-Regulation in China

Petra Christmann*
UNIVERSITY OF VIRGINIA

Glen Taylor**
UNIVERSITY OF HAWAII AT MANOA

Critics assert that globalization is detrimental to the environment because it encourages location of polluting industries in countries with low environmental regulations. We suggest that globalization might also have positive environmental effects because global ties increase self-regulation pressures on firms in low-regulation countries. Using survey data from firms in China we find that multinational ownership, multinational customers, and exports to developed countries increase self-regulation of environmental performance.

INTRODUCTION

The environmental impact of globalization is contentious. Critics argue that increased international trade and foreign direct investment (FDI) compel governments to lower production costs within their jurisdiction by neglecting to enact or enforce laws to protect the environment (Drezner, 2000). Even if developing country governments have the intention to protect the environment, they might lack the financial and technical resources to effectively enforce environmental regulations. Multinational enterprises (MNEs), it is often argued, can take advantage of the resulting cross-country differences in environmental regulations by moving production capacity to the country most willing to use lax environmental standards as an invest-

ment inducement (Leonard, 1988). Faced with the prospect of industrial flight, the argument continues, nation states are forced to enter a "race to the bottom" and become "pollution havens" (Walter, 1982) or risk high levels of unemployment and the erosion of their tax base. In this view, globalization undermines governments' ability to protect the environment through regulation of corporate behavior.

In contrast, globalization proponents contend that lower barriers to trade and foreign investment encourage firms to transfer environmental technologies and management systems from countries with stricter environmental standards to developing countries, which lack access to environmental technologies and capabilities (Drezner, 2000). Governmental failure to protect the environment, it is suggested in this line of argument, might also be ameliorated through self-regulation of environmental performance by firms in developing countries. Self-regulation refers to a firm's adoption of environmental performance standards or environmental management systems (EMS) beyond the requirements of government regulations.

Globalization can increase self-regulation pressures in several ways. First, globalization increases MNEs' investment in developing countries where their subsidiaries can be expected to self-regulate their environmental performance more than domestic firms do. MNEs can transfer the more advanced environmental technologies and management systems developed in response to more stringent regulations in developed countries to their subsidiaries. MNEs also face pressures from interest groups to improve their worldwide environmental performance. Second, globalization might contribute to environmen-

tal self-regulation of domestic firms in developing countries. MNEs are changing from foreign direct investors to multinational operators of global networks of suppliers (Dunning, 1993). MNE subsidiaries in developing countries might exert pressure on domestic suppliers to self-regulate environmental performance. Finally, globalization may increase exports from developing to developed countries where customers might use environmental performance as a supplier-selection criterion, which also pressures domestic firms in developing countries to self-regulate.

In the light of these diverse and conflicting contentions, this study examines whether international ownership and customer linkages contribute to environmental self-regulation for a sample of 118 firms in China. While empirical studies have examined determinants of self-regulation in developed countries (Aurora and Cason, 1995; King and Lenox, 2000), few studies address this issue in developing countries (Hettige, Huq, Pargal, and Wheeler, 1996). The effects of globalization on the environment have been extensively discussed in the economics literature at the industry level, yet rarely in the international business literature at the firm level. This study of firm-level self-regulation in a developing country includes two facets of self-regulation: compliance with environmental government regulations and EMS adoption.

GLOBALIZATION AND THE ENVIRONMENT

Globalization has increased due to reduced barriers to trade and FDI. Increasing globalization causes concerns about environmental impacts (WTO, 2000), because the current regulatory framework for environmental protection does not

work effectively in the presence of globalization. Environmental regulations differ across countries because they are primarily designed and implemented by nation states. In a global economy with cross-country differences in environmental regulations, countries with low levels of environmental regulations might become production platforms for pollution-intensive industries, or so-called pollution havens (Walter, 1982). In addition, MNEs can exploit cross-country differences by locating pollution-intensive activities in low-regulation countries. Thus we might see industrial flight from high-regulation to low-regulation countries (Leonard, 1988; Low and Yeats, 1992) resulting in increases in pollution at the global level.

Firm-level environmental strategies in response to variations in country-specific regulatory requirements have received increasing theoretical attention (Nehrt, 1998). Environmental strategy depends on the perceived economic benefit of responding to standards in the home market, versus standards in major foreign markets. Porter and Linde (1995) argue that MNEs benefit from higher environmental standards in their home market because such standards induce them to develop superior environmental management capabilities and technologies, which improve MNEs' international competitiveness once environmental regulations are raised in other countries.

Cross-country Differences in Environmental Regulations

Reasons for cross-country differences in environmental regulations include differences in the domestic valuation of environmental quality. Valuation differences result from differences in countries' capacities to tolerate, dilute, absorb, or ignore pollution, as well as from differences in economic and environmental priorities. However, even if formal environmental regulations are identical across countries, de-facto regulations might differ as a result of differences in countries' capacities to implement, monitor, and enforce regulations (Hettige et al., 1996). Many developing countries lack environmental measurement equipment and trained enforcement personnel and suffer from corrupt inspectors (Dasgupta, Huq, and Wheeler, 1997). Under these conditions, firms might expect their costs associated with discovery of violations and payments of penalties to be smaller than compliance costs, resulting in low compliance rates with formal regulations (Hettige et al., 1996).

Pollution Haven and Industrial Flight

Globalization allows firms to take advantage of differences between national environmental regulations. The pollution-haven hypothesis (Walter, 1982) suggests that falling trade barriers induce pollution-intensive industries to relocate to countries with lower levels of environmental regulations. Low-regulation countries become production platforms for pollution-intensive goods and export them to the rest of the world. Empirical support for the pollution-haven hypothesis is weak. Studies have generally concluded that the costs of environmental protection are not a significant determinant of the pattern of trade (Tobey, 1990; Ferrantino, 1997). Only few studies have found the expected negative effect of stringency of environmental regulation or environmental protection costs on net exports (Kalt, 1988; Beers and Bergh, 1997).

Similarly, the industrial-flight hypothesis suggests that MNEs exploit differences in environmental regulations by locating polluting activities in the lowest regulation countries (Leonard, 1988; Low and Yeats, 1992). However, most empirical studies have failed to observe increases in inward FDI of pollution intensive industries in countries with lower levels of environmental regulations and enforcement (Walter, 1982; Leonard and Duerkson, 1980; Leonard, 1988, Jaffe, et. al, 1995).

DETERMINANTS OF SELF-REGULATION

Given the lack of empirical evidence for the pollution-haven and the industrial-flight hypotheses, factors other than environmental regulations must determine the environmental performance of firms in low-regulation countries. Empirical evidence shows large variations in the environmental performance of firms in (low-regulation) developing countries even if these firms are subject to the same environmental regulations (Hettige, et al., 1996; Dasgupta, Hettige and Wheeler, 2000); this evidence strongly suggests that regulation is not the main determinant of firms' environmental performance in developing countries.

In the absence of stringent government regulations, firms might choose to "self-regulate" their environmental performance by selecting higher environmental performance levels than mandated by local governments. Social forces operating in the "institutional environment" constrain the range of choices available to firms by pressuring them to legitimate their behavior and conform to social norms (DiMaggio and Powell, 1983; Oliver, 1997). Globalization expands the field of organizations concerned about firms' environmental performance to include actors beyond the nation state.

Norms for firm-level environmental conduct can emerge through a process in which conflicting interests compete to define the boundaries of acceptable behavior in the global economy. Individual firms respond to global norms to the extent they are pressured to legitimize themselves by adhering to these norms even in the absence of specific government sanctions (Bansal and Roth, 2000). The pressure brought to bear on an individual firm depends on its stake in being accepted as a legitimate participant in the global economy.

We consider two aspects of environmental self-regulation in our analysis: (1) the extent to which firms violate, comply with, or exceed local government regulations, and (2) the implementation of environmental management systems (EMS). Firms can self-regulate their environmental performance by exceeding environmental government regulations as well as by implementing an EMS (Rondinelli and Vastag, 1996; Rondinelli and Berry, 2000), which is a formal set of policies defining how organizations manage their potential environmental impacts.

Metastandards as a Basis for Self-Regulation

"Metastandards" (Uzumeri, 1997) can provide general specifications of what must be included in a management system. The International Standards Organization's (ISO) ISO 14000 series of environmental management standards is an example of a metastandard. The Swiss-based ISO is a worldwide non-governmental organization of national standards bodies from 111 countries. ISO standards are developed through an expert consensus-building process in which member countries contribute to and ratify the standard. The ISO 14000

series was launched in September 1996 to provide all industries with a standardized management process to achieve control over environmental impacts. The backbone of the ISO 14000 standards is the ISO 14001 EMS, which can be certified by successfully passing an independent third-party audit. The ISO is not involved certification beyond setting the standard. Countries lacking environmental regulations or enforcement capabilites might encourage use of ISO 14000 as a means to establish a national policy of self-regulation (Wilson, 1998).

Evidence suggests that EMS implementation improves environmental performance (Montabon et al., 2000). However, EMS implementation does not guarantee that environmental problems are solved just as the implementation of an accounting system does not ensure that a company will be profitable. An EMS merely provides a framework for managing environmental impacts and serves as a starting-point to develop firm-level environmental strategies.

Hypotheses: Determinants of Self-Regulation

Studies suggest that MNEs increasingly self-regulate their worldwide environmental performance by moving towards globally uniform minimum environmental standards that go beyond national requirements for their worldwide operations (Rappaport and Flaherty, 1992; UNCTAD, 1993). Examples of MNEs implementing such standards include H.B. Fuller, Owens Corning, and IBM. In addition, MNEs such as Ford, IBM, and Skanska have adopted ISO 14000 in all their facilities worldwide.

Factors that contribute to the higher degree of self-regulation by MNEs relative to domestically owned firms include better capabilities to self-regulate environmental performance, higher social pressures for environmental self-regulation of their worldwide operations, and efficiency gains from self-regulation. Environmental regulations are a major impetus for the development of environmental capabilities in firms. (Porter and van der Linde, 1995). MNEs have operations in countries with various levels of environmental regulations. This allows them to transfer the environmental capabilities they developed in response to high levels of environmental regulation in developed countries to developing countries with lower levels of environmental regulations (Porter and van der Linde, 1995). In addition, most ISO 14001 certified facilities are located in developed countries (ISO World, 1999). Thus, MNEs can also transfer the ISO 14000 implementation capabilities acquired in developed countries to their facilities in developing countries. Empirical evidence shows that MNE subsidiaries located in more economically developed countries do transfer knowledge to other parts of the MNE (Gupta and Govindarajan, 2000). These knowledge transfers provide MNE subsidiaries in developing countries with access to better environmental technologies, lower costs of environmental protection, and better ISO 14000 implementation capabilities than domestic firms. Domestic firms in many developing countries do not have the financial resources to acquire environmental technologies especially when faced with new entrants and foreign competition. The absence of domestic environmental protection industries requires that environmental technologies must be imported, posing additional challenges for domestic firms in countries such as China where funds are not easily convertible.

Institutional pressures for MNEs' environmental self-regulation originate in a complex legitimating environment, which includes all home and host country institutional environments and supranational institutions (Kostova and Zaheer, 1999). Self-regulation pressures include effects of MNEs' environmental performance in developing countries on their worldwide reputation for environmental responsibility and legitimacy (Christmann, 1998), higher legitimacy standards that some countries hold for MNEs compared to domestic firms resulting in higher expectations for environmental performance of MNEs relative to domestic firms (Kostova and Zaheer, 1999), as well as supranational organizations promoting the internal adoption of global environmental standards such as the International Chamber of Commerce.

Standardized environmental strategies across countries may have financial benefits for MNEs (Dowell, Hart, and Yeung 2000). If MNEs use standardized production technologies across facilities worldwide, it might not be cost-effective or feasible to modify equipment in favor of dirtier processes in less developed countries.

Hypothesis 1: Multinational ownership positively affects compliance with environmental regulations.

Hypothesis 2: Multinational ownership positively affects the likelihood of ISO 14000 adoption.

External pressures on firms to improve environmental performance can also come from customers (Walton and Handfield, 1998). International non-governmental organizations (NGOs) are insisting that a firm's environmental responsibility does not end at its boundaries but includes responsibility for its suppliers

as well. In the related area of human rights issues MNEs such as Nike and Wal-Mart faced criticism from NGOs in the global media for their suppliers' labor practices in Asia (e.g., *Business Week* 2000). Environmental damage caused by suppliers threatens the social legitimacy of foreign customers even when damages are limited to the exporting country. Therefore, customers from developed countries are concerned about their suppliers' environmental performance. Many firms, such as Ford, Shell, and Toyota include environmental performance as a criterion for selecting suppliers.

Strategic network theory suggests that firms are embedded in sets of relationships with suppliers, customers and other entities (Gulati, Nohria, and Zaheer, 2000). Firms operating in developing countries can establish supplier relationships with developed-country firms by exporting to developed countries and by selling to local MNE subsidiaries. Firms in developing countries that are more deeply embedded in developed-country customers' supply chains are more likely to self-regulate their environmental performance because of coercive pressures exerted by these customers and because of contact diffusion by linking adopters in developed countries to non-adopters in developing countries (Abrahamson and Rosenkopf, 1993; Kraatz, 1998).

An additional concern that might induce export-oriented firms in developing countries to pursue environmental self-regulation is the potential use of environmental regulations in developed countries as protective trade barriers. Firms can address this problem by meeting the highest environmental regulations prevailing in the largest export market (Rugman, Kirton, and Soloway,

1999). For export-oriented firms in developing countries, the regulatory and market requirements of major export markets overshadow the regulatory influence of the home market (Rugman and Verbeke, 1998).

Hypothesis 3: Firms operating in a developing country that sell a large proportion of their output to multinational customers within the country comply better with environmental regulations than other firms.

Hypothesis 4: Firms operating in a developing country that export a large proportion of their output to developed countries comply better with environmental regulations than other firms.

Because customers cannot monitor the environmental performance of their suppliers directly, they might require their suppliers to implement an EMS and obtain ISO 14001 certification. As standards become institutionalized, the pressure on smaller firms to adopt an EMS increases and large companies become more intent on requiring certification as a qualifying pre-condition for all of their suppliers (Epstein and Roy, 2000). Firms requiring all or some of their suppliers to be ISO 14001 certified include Ford, General Motors, Volvo, Toyota, and Siemens. ISO 14001 certification might become a de-facto requirement for doing business with companies from developed countries, raising concerns for developing-country firms that ISO 14000 will become a non-tariff trade barrier (Corbett and Kirsch, 2000). As a result of these pressures, firms in many export-oriented Asian countries are rushing to implement ISO 14000 in their facilities (Roht-Arriaza, 1997). Thus, we expect firms that sell a large proportion of their output to developed-country customers to be more likely to adopt ISO 14000.

Hypothesis 5: Firms operating in a developing country that sell a large proportion of their output to multinational customers within the country are more likely to adopt ISO 14000 than other firms.

Hypothesis 6: Firms operating in a developing country that export a large proportion of their output to developed countries are more likely to adopt ISO 14000 than other firms.

Developed countries differ in their degree of ISO 14000 adoption. The numbers of ISO 14001 certifications indicate that ISO 14000 adoption has been relatively slow outside Western Europe and Asia. As of June 1, 1999, Japan leads the number of ISO 14001 registrations (2124), followed by Germany (1400) and the U.K. (947) (ISO World, 1999). The United States had only 460 registrations. In Japan and the European Union, regulators explicitly support ISO 14000 adoption (Prakash, 1999), while in the United States firms are concerned about the legal consequences of self-incrimination if environmental violations are uncovered in audit reports (Delmas, 2000). Thus, we expect the pressures on suppliers to adopt ISO 14000 to differ across customers from different developed countries with pressures being higher in Japan and Western Europe.

Hypothesis 7: Firms that export large proportions of their output

a. to Japan or

b. to Europe

are more likely to adopt the ISO 14000 environmental management system than other firms.

RESEARCH DESIGN

Research Setting

We test these hypotheses using data from multinational and domestic firms in China, a large rapidly industrializing country with the potential to seriously impact the global environment. Within 25 years, China is expected to overtake the United States as the world's largest emitter of greenhouse gases, a major cause of global warming. China's investment in pollution control was about 0.5 percent of GDP in 1996, which is low compared to most developed countries (Wang and Chen, 1999).

Environmental regulations in China are relatively flexible. Emissions that exceed official standards are not considered legal violations (Wang and Chen, 1999), but a compensation fee is charged for these emissions according to the quantities and concentrations of pollutants released. Because it is often more costly for firms to reduce pollution than to pay the compensation fee many enterprises decide to pay the fee instead of reducing pollution. As a result approximately 500,000 factories have been charged for their emissions since the compensation fee system has been implemented nationally in 1982 (Wang, 2000). Critics of China's environmental regulations claim that enforcement is arbitrary (Qu, 1991) because of the importance of personal ties between regulators and plant managers and other forms of favoritism. In addition, local regulators have considerable discression in judging both compliance and appropriate penalties for non-compliance (Dasgupta, Huq, and Wheeler, 1997) and enforcement differs across provinces (Wang and Wheeler, 1996). This suggests that China's regulatory system for environmental protection does not work effectively.

Chinese firms have started to adopt ISO 14000. But as of June 1, 1999 only 81 facilities had been ISO 14001 certified in China (ISO World, 1999).

The expected accession of China to the World Trade Organization (WTO) will integrate China closer with the world economy, leading to concerns that China might become a production platform for polluting industries. On the other hand, China's accession to the WTO will increase global linkages with firms from developed countries, which might contribute to environmental self-regulation of firms in China.

Data Collection and Survey Design

We collected data through a survey of Chinese managers participating in two seminars on standards-based management practices conducted by Asia Pacific Economic Cooporation (APEC). These seminars were held in Shenzhen and Shanghai in May 1999. Seminar participants were local to these regions.

Shenzhen and Shanghai were selected as data collection sites because they are both located in Special Economic Zones in which the Chinese government promotes openness to FDI and focus on export industries. The Guangdong province in which Shenzhen is located and the Shanghai province rank number one and two in terms of export intensity among all Chinese provinces accounting for 42 percent and 8 percent of China's total exports in 1997 respectively. These provinces might thus be a good illustration for what might happen to self-regulation in other provinces once China joins the WTO and other provinces will open up. However, we also recognize that the relationships uncovered in this

study might not hold in provinces that are less open.

We designed the survey in three steps. First, we designed a preliminary version, translated it into Chinese, and pretested it with several Chinese managers in Beijing in March 1999. We also discussed the survey with employees of the China Quality Certification Center (CQC), the largest ISO certifying agency in China, and with APEC experts and officials. Second, we revised the survey based on comments obtained in the first step and discussed the new version again with APEC experts and officials. Third, we created a final English version of the survey incorporating their feedback. This version was professionally translated into Chinese and back-translated into English in order to assure the accuracy of the translation.

Common method bias can pose problems for survey research that relies on self-reported data (Campbell and Fiske, 1959) by artificially inflating observed relationships between variables. In order to diminish if not avoid the effects of consistency artifacts the dependent variables were placed after the independent variables in the survey (Salancik and Pfeffer, 1977).

Surveys were administered to seminar participants before each seminar to avoid potential response biases resulting from information obtained in the seminar. Seminar participants had one hour to complete the survey. To assure a high response rate and to obtain truthful answers, the survey was administered anonymously and respondents were asked not to identify themselves or their company. Most respondents were high level executives (president, CEO, vice president) or quality assurance managers.

Sample

Potential seminar participants in Shenzhen and Shanghai were identified and invited by CQC. We asked that the invitees come from a representative group of industries, and that they differ in country of firm ownership and intensity of exports–the variables that we are analyzing. These selection criteria were met by our sample of 118 firms, of which 27% were wholly Chinese owned, 38% were partially foreign owned, and 36% were wholly foreign owned. Foreign ownership included Europe, North America, Japan, and other countries. Of the Chinese and partially Chinese owned firms 38% were state-owned enterprises. Export intensity of sample firms ranges from production entirely for the domestic market to more than 75 percent of sales exported with the majority (60 percent) reporting that they export more than 75 percent of their sales. Sample firms range in size from small firms with under 50 employees to large ones with more than 5000 employees, with the majority having between 500 and 1000 employees.

Of the 118 survey responses 101 were usable for this study. The other responses had incomplete information possibly because some firms had not yet decided on a strategy towards ISO 14000.

Measures

Some measures are adopted from existing surveys, while others are original to this study. The definition of all of the measures is shown the Appendix.

Dependent Variables

Measures of environmental compliance for firms in China are difficult to obtain because such data is not routinely

collected and published by the government. Therefore, we need to rely on respondents' self-assessments of environmental compliance. Respondents might overstate the compliance of their firm in self-assessments. However, even if an upward bias in the environmental compliance assessment exists, this does not affect our results because we are interested in relative rather than in absolute environmental compliance. We use an existing measure of the degree of compliance with environmental government regulations previously used in Mexico where an independent assessment of conditions in the surveyed facilities indicated a high correlation between self-assessment and observable conditions (Dasgupta, Hettige and Wheeler, 2000). This increases our confidence in the validity of this measure.

In our sample, only 12 firms (10 percent) reported they had a certified facility and only 19 other firms (16 percent) had started the ISO 14000 implementation process in China. Because most firms had not yet started the implementation process we use the likelihood of ISO 14000 adoption in China reported by the respondents as a dependent variable. While this is a measure of intentions and not of actual behavior a recent study of recycling (Boldero, 1995) has shown that intentions significantly predict the focal behaviors. We created a measure to capture how likely the respondent firms that had not already started implementation are to begin implementing ISO 14000 within the next year, or whether the firm had already started implementation, or whether it had been certified.

Independent Variables

The multinational ownership variable measures the percentage of multinational ownership on a five-point scale.

We created the sales to MNEs variable from two questions in the survey as described in the Appendix. The export to developed countries variable measures the percentage of total sales exported to developed countries on a five-point scale. Region specific export variables (Western Europe, Japan, and North America) measure the proportion of total sales that are exported to each region on a five-point scale.

Control Variables

Firm size was found in previous studies to have positive effects on environmental performance (e.g., Hartman, Huq, and Wheeler, 1997), because of economies of scale in pollution control equipment. We use the number of employees to control for the effects of firm size.

Because the propensity to export and customer pressures for self-regulation differ across industries it is necessary to control for industry effects. Including industry effects also controls for cross-industry differences in market competition, which might provide an additional impetus for isomorphism (Abrahamson and Rosenkopf, 1993). We include seven industry dummy variables in all equations, which control for the industries with the largest numbers of firms included in our sample.

The enforcement of federal environmental regulations in China differs across regions and provinces have the authority to enact environmental regulations that go beyond federal regulations. Therefore, we need to control for the region (Shanghai or Shenzhen) in which the firm is located.

Firms with superior performance might have more financial resources available for environmental protection than other firms and might be more likely to pursue environmental self-reg-

ulation. We use a self-reported measure of firm performance to control for this effect.

ISO 14000 implementation is easier for firms that have already implemented the ISO 9000 series of quality management systems because these firms have developed capabilities to implement standards-based management practices. Therefore, we control for ISO 9000 certification in China in the models using the likelihood of ISO 14000 adoption as dependent variable.

Method and Preliminary Data Analysis

The hypotheses were tested using OLS regression analysis. Before testing the hypotheses we analyzed the likely extent of multicollinearity in the data by analyzing the correlations between the independent variables. Most of the correlations are below 0.3 indicating no problems of multicollinearity (see table 1). We also evaluated the presence of multivariate multicollinearity using several diagnostic tests suggested by Belsley, Kuh, and Welsh (1980). An examination of variance inflation factors and condition indexes revealed that only mild multicollinearity was present in the data.

RESULTS

The regression results can be seen in Table 2. Equation (1) shows the results for the hypothesis regarding environmental compliance and equations (2) and (3) show the results for the hypotheses regarding ISO 14000 adoption. Overall the equations show good fits with R^2s ranging from 0.24 to 0.44.

Hypothesis 1 states that multinational ownership positively affects environmental compliance. This hypothesis is supported by the data. Equation (1) shows that multinational ownership has a significant positive effect on environmental compliance ($p < 0.05$).

Hypothesis 2 states that multinational ownership positively affects ISO 14000 adoption. This hypothesis is supported by the data. Equation (2) and equation (3) both show significant positive effects of multinational ownership on the likelihood of ISO 14000 adoption ($p < 0.05$ and $p < 0.01$).

Hypothesis 3 states that firms that sell a large proportion of their sales to multinational customers within China have better environmental compliance than other firms. This hypothesis is not supported by the data. Equation (1) shows a positive, but insignificant coefficient for the multinational customer variable.

Hypothesis 4 states that firms that export a large proportion of their output to developed countries have better environmental compliance than other firms. This hypothesis is supported by the data. Equation (1) shows that the coefficient for exports to developed countries is positive and significant ($p < 0.10$).

Hypothesis 5 states that firms that sell a large proportion of their sales to multinational customers within China are more likely to adopt ISO 14000 than other firms. This hypothesis is supported by the data. Both equations (2) and (3) show a significant positive coefficient ($p < 0.01$) for this variable.

Hypothesis 6 states that firms that export a large proportion of their output to developed countries are more likely to adopt ISO 14000 than other firms. This hypothesis is supported by the data. Equation (2) shows that the coefficient for exports to developed countries is positive and significant ($p < 0.05$).

Hypothesis 7 states that firms that export high proportions of their output to Japan or Europe are more likely to adopt

TABLE 1
DESCRIPTIVE STATISTICS AND CORRELATION MATRIX

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 MNE Ownership	2.2	1.60	1.00																		
2 Multinational Customers	1.41	1.41	-.07	1.00																	
3 Exports to Developed Countries	2.45	1.34	.09	-.53***	1.00																
4 Exports to Japan	1.17	1.23	-.04	-.19†	.43***	1.00															
5 Exports to Europe	1.08	1.04	.03	-.26**	.41***	-.20*	1.00														
6 Exports to North America	1.44	1.21	.09	-.35***	.55***	-.20*	.19*	1.00													
7 Firm Size	5.00	1.04	-.03	-.33***	.24*	-.20*	.21*	.33**	1.00												
8 Region	0.37	0.49	-.11	.30**	-.15	.11	-.20*	-.34**	-.31**	1.00											
9 Electronics	0.34	0.48	.21*	-.26**	.25*	.12	.29**	.12	.15	-.21*	1.00										
10 Toys	0.12	0.30	-.16	-.22*	.01	-.08	.03	.12	.11	-.29**	-.27**	1.00									
11 Apparel	0.10	0.30	-.04	-.24*	.29**	.28**	-.09	.13	.12	-.30**	-.24*	-.12	1.00								
12 Food	0.08	0.27	-.13	.17†	.01	.05	-.06	-.20*	-.11	.31**	-.21*	-.11	-.10	1.00							
13 Paper	0.04	0.20	.13	.28**	-.22*	-.11	-.12	-.12	-.07	.16	-.15	-.08	-.07	-.06	1.00						
14 Steel	0.04	0.20	.03	.06	-.07	-.20†	.03	-.03	.05	-.05	-.15	-.08	-.07	-.06	-.06	1.00					
15 Cable	0.03	0.17	-.10	-.03	-.14	-.17	-.19†	-.02	-.00	-.01	-.13	-.07	-.07	-.06	-.04	-.04	1.00				
16 Performance	5.83	1.45	.02	.03	-.13	-.29**	.17	.07	.13	-.02	.02	.04	-.01	-.33***	-.01	-.01	.10	1.00			
17 ISO 9000 Certification	0.65	0.48	.25*	.05	-.02	-.05	.12	.03	.07	-.08	.31**	.02	-.10	-.17	.04	-.06	.01	.12	1.00		
18 Environmental Compliance	3.80	0.56	.16	.00	.17	-.01	.13	.00	-.02	.23*	.07	-.05	.06	-.09	-.15	-.11	.07	.17†	.10	1.00	
19 Likelihood of ISO 14000 Adoption	4.33	2.07	.39***	.14	.14	.15	.07	-.01	.17	-.02	.32**	-.19†	-.05	-.17	.28**	-.03	-.13	.15	.17	.28*	1.00

†p < .10
*p < .05
**p < .01
***p < .001

TABLE 2
REGRESSION RESULTS

	Dependent Variable		
	Environmental Compliance (1) n = 97	Likelihood of ISO 14000 Adoption	
		(2) n = 86	(3) n = 86
Intercept	2.76***	−1.27	−2.30
	(0.41)	(1.39)	1.49
Explanatory Variables			
MNE Ownership	0.07*	0.33*	0.38**
	(0.03)	(0.13)	0.13
Multinational Customers	0.03	0.66**	0.57**
	0.05	(0.20)	0.20
Exports to Developed Countries	0.09[†]	0.39*	
	(0.05)	(0.19)	
Exports to Japan			0.55**
			(0.20)
Exports to Europe			0.20
			(0.22)
Exports to North America			−0.03
			(0.19)
Control Variables			
Firm Size	0.05	0.34[†]	0.45*
	(0.06)	(0.20)	(0.20)
Region	0.51***	−0.16	−0.21
	(0.15)	(0.48)	(0.48)
Electronics	−0.09	1.56*	1.49*
	(0.17)	(0.64)	(0.63)
Toys	−0.04	−0.07	0.06
	(0.21)	(0.78)	(0.77)
Apparel	−0.33	0.34	0.59
	(0.26)	(0.93)	(0.93)
Food	−0.37	−0.40	−0.11
	(0.24)	(0.84)	(0.83)
Paper	−0.72*	2.79*	2.72*
	(0.34)	(1.12)	(1.11)
Steel	−0.37	−0.11	0.39
	(0.29)	(1.10)	(1.16)
Cable	0.21	0.10	0.48
	(0.33)	(1.14)	(1.18)
Firm Performance	0.05	0.16	0.27[†]
	(0.04)	(0.14)	(0.15)
ISO 9000 Certification		−0.45	−0.51
		(0.44)	(0.44)
R^2	0.24	0.41	0.44
Adjusted R^2	0.13	0.30	0.31

Standard errors are in parentheses.

$^†p < .10$

$^*p < .05$

$^{**}p < .01$

$^{***}p < .001$

ISO 14000 than other firms. This hypothesis is partially supported by the data. Equation (3) shows that exports to Japan have the expected positive and significant (p<.01) coefficient (H7a), while exports to Europe have a positive coefficient, but are not significant (H7b).

DISCUSSION AND CONCLUSION

Globalization does not necessarily have negative effects on the environment in developing countries to the extent suggested by the pollution-haven and industrial-flight hypotheses. Our study suggests that globalization increases institutional and customer pressures on firms to surpass local requirements, even when they may be tempted by lax regulations and enforcement in countries offering themselves as pollution havens (Hoffman, 1999; Rugman and Verbeke, 1998). Our results show that firms' international linkages contribute to environmental self-regulation. MNE ownership and exports to developed countries contribute significantly to environmental compliance as well as to the likelihood of ISO 14000 adoption. In addition, firms selling a large proportion of their output to multinational customers within China were found to be more likely to adopt ISO 14000.

While the pollution-haven and the industrial-flight hypotheses focus on government regulations as the determinant of environmental strategies, we argue that for firms participating in the global economy local government regulation is only one consideration in selecting an environmental strategy. These firms face institutional and customer pressures for environmental protection from abroad, and these pressures contribute to self-regulation of the firms' environmental performance. While globalization may provide opportunities for firms to take advantage of cross-country differences in environmental regulations, globalization also increases institutional pressures for environmental self-regulation from abroad, which reduce firms' benefits from taking advantage of these opportunities. This effect can explain the lack of empirical evidence for the pollution-haven and the industrial-flight hypotheses.

Our findings indicate that the environmental effects of FDI in developing countries can be less negative than the industrial-flight hypothesis suggests. Our study finds positive effects of multinationality on environmental compliance (H1) and the adoption of ISO 14000 (H2) relative to domestic companies. This can explain the lack of empirical support for the industrial-flight hypothesis. In addition to the competitive and institutional forces discussed in the development of our hypotheses, the fact that MNE subsidiaries often face more scrutiny than domestic firms (Kostova and Zaheer, 1999) can also contribute to self-regulation by MNEs.

We explored whether MNEs serving different customer groups differ in their propensity to self-regulate. Our findings indicate that non export-oriented MNEs, which produce for the domestic market and are likely to follow multidomestic strategies, self-regulate their environmental performance significantly less than export-oriented MNEs do, which are likely to follow more global strategies. Thus, further research is needed to explore how MNE strategies affect the extent of self-regulation. The variation in self-regulation of MNEs targeting different customers also indicates that MNE subsidiaries as a group might not be subject to more scrutiny than domestic firms.

Our findings also suggest that FDI has secondary benefits for environmental

protection in developing countries by leading to the diffusion of EMSs. Our results show that customer linkages to MNEs increase the likelihood that firms in developing countries adopt ISO 14000 (H4). While firms that sell a high proportion of their output to multinational customers within China did not have higher environmental compliance than other firms (H3), we expect that EMS adoption will improve firms' environmental compliance in the future.

Finally, our findings indicate that increased trade linkages between China and developed countries contribute to environmental self-regulation of Chinese industry, which reduces the likelihood that access to the WTO will turn China into a pollution haven. Our results show that exports to developed countries positively affect environmental compliance and likelihood of ISO 14000 adoption (H5 and H6). This finding can explain the lack of empirical support for the pollution-haven hypothesis.

Our results, furthermore, show differences between customers from different developed regions in their pressures on suppliers to adopt ISO 14000 (H7). These differences can be expected to disappear as ISO 14000's worldwide acceptance increases. Although the United States has lagged in the implementation of ISO 14000, industry support for its adoption is growing (Montabon, et al., 2000). We expect that increasing numbers of customers from developed countries will make ISO 14000 a criterion in their purchasing decisions.

What Role for Self-Regulation?

Many groups participating in the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 agreed that business self-regulation was an essential element in achieving sustainable development (UNCTAD, 1993). In many developing countries the traditional tools of environmental regulation fail, largely due to lack of government enforcement capabilities. Self-regulation by MNEs and their suppliers complements traditional government regulation and might even be an alternative in the countries where the traditional regulatory system is not working. Governments in developing countries can potentially extend their enforcement capabilities by having MNEs and other foreign customers require higher environmental performance from their suppliers and by having these firms monitor their suppliers' environmental performance. In addition, developing countries are aware that ISO 14001 certification may become a de-facto requirement for exporting to developed countries. Thus, many developing countries' governments are promoting ISO 14000 adoption rather than joining a "race to the bottom" by lowing their environmental regulations.

Despite their potential role in self-regulation, metastandards such as ISO 14000 have important limitations. Standards imply adoption of a generic common-denominator approach, which might lead to satisficing rather than optimizing behavior on the part of managers (Uzumeri, 1997). Metastandards might also reinforce a bias toward rule-based command-and-control decision-making rather than innovation. This could have the unwanted effect of reducing the ability of organizations to respond to anything beyond the most routine situations (Marcus, 1988).

ISO 14000 is a management standard that does not specify the level of environmental performance other than requiring compliance with local government regulations. There is no guarantee

that formal adoption of management metastandards results in effective implementation and self-regulation. Concerns about the lack of rigor in the firm-level implementation of metastandards are fueled by doubts about the firms' motivations—namely that firms have an incentive to appear to be adhering to strict self-regulation regimes to which they are only superficially committed. Institutional conformance pressures from a variety of stakeholders such as customers, home and host governments, and NGOs can lead firms to attempt to gain legitimacy by appearing to adhere to strict self-regulation. Certification to an international metastandard such as ISO 14001 can be an end in itself, with little commitment to long-term company-wide environmental self-regulation. The stakeholders who pressure firms to become certified may themselves have no deeper motivation than to safeguard their own reputations and legitimacy. To have effective metastandards, the organizations that promulgate standards must create auditing systems capable of distinguishing between truly effective and merely symbolic implementation. Political consensus on these issues beyond the level of the lowest common denominator can be difficult to achieve in member-based organizations such as ISO.

Despite these limitations, metastandards offer a foundation for self-regulation in a global economy. Because of their generic specifications, metastandards do not prescribe specific managerial solutions and thus leave wide latitude for creative implementation, but at the same time they ensure that some minimal form of management system is in place. Adoption of metastandards is a first step towards establishing a systematic basis for making decisions to man-age the environmental impact of the firm.

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APPENDIX
MEASURES

Dependent Variables	
Environmental Compliance	Which of the following descriptions best captures the current compliance with environmental government regulations of your company?
	(1) We seldom comply with domestic environmental regulations.
	(2) We occasionally comply with all domestic environmental regulations.
	(3) We usually comply with all domestic environmental regulations, however sometimes we fail to comply in specific areas.
	(4) We consistently comply with all domestic environmental regulations.
	(5) We have a world-class environmental program and exceed all domestic environmental regulations.
Likelihood of ISO 14000 Adoption	How likely is your company to *start* implementing ISO 14000 in the next year?
	(1) Not at all likely (2) Very unlikely (3) Unlikely (4) Neither likely nor unlikely (5) Likely (6) Very likely (7) Already started (8) Already certified
Independent Variables	
MNE Ownership	What proportion of your company is foreign owned?
	(0) none, (1) 1-25%, (2) 26-50%, (3) 51-75%, (4) more than 75%.
Multinational Customers	Square root of the product of two questionnaire items: 1. What percentage of your total sales do you sell to China? 2. For your sales within China, what percentage is sold to wholly or partially foreign owned companies? (Scale for both questions: (0) none, (1) 1-25%, (2) 26-50%, (3) 51-75%, (4) 76-100%)
Exports to Developed Countries	Percentage of total sales sold to developed regions (Japan, Europe, North America)?
	(0) none, (1) 1-25%, (2) 26-50%, (3) 51-75%, (4) 76-100%
Exports by region (Japan, Europe, and North America)	What percentage of your total sales do you sell to a. Japan? b. Europe? c. North America?
	(0) none, (1) 1-25%, (2) 26-50%, (3) 51-75%, (4) 76-100%
Firm Size	Number of Employees
	(1) less than 10 (2) 11-50 (3) 51-100 (4) 10-500 (5) 501-1000 (6) 1001-5000 (7) more than 5000
Industry Controls	Dummy variables for the seven industries with the largest numbers of firms included in the sample:
	Electronics, Toys, Apparel, Food, Paper, Steel, Cable
Region	Dummy Variable "1" if Shenzen and "0" if Shanghai
ISO 9000 Certification	Dummy Variable: "1" if the company has received ISO 9000 certification, "0" otherwise.
Firm Performance	In your opinion, how does your current performance of your company compare to five years ago?
	7 point scale from (1) worsened significantly to (7) improved significantly