Law & Society REVIEW

Signaling Environmental Stewardship in the Shadow of Weak Governance: The Global Diffusion of ISO 14001

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This article examines how the quality of domestic regulatory institutions shapes the role of global economic networks in the cross-national diffusion of private or voluntary programs embodying environmental norms and practices. We focus on ISO (International Organization for Standardization) 14001, the most widely adopted voluntary environmental program in the world, which encourages participating firms to adopt environmental stewardship policies beyond the requirement of extant laws. We hypothesize that firms are motivated to signal environmental stewardship via ISO 14001 certification to foreign customers and investors that have embraced this voluntary program, but only when these firms operate in countries with poor regulatory governance. Using a panel of 129 countries from 1997 to 2009, we find that bilateral export and bilateral investment pressures motivate firms to join ISO 14001 only when firms are located in countries with poor regulatory governance, as reflected in corruption levels. Thus, our article highlights how voluntary programs or private law operates in the shadow of public regulation, because the quality of public regulation shapes firms' incentives to join such programs.

This article examines how global trade and investment networks encourage firms to join voluntary environmental programs, and how the effects of those networks are mediated by the quality of regulatory governance in the countries in which firms operate. We explore these issues in the context of ISO (International Organization for Standardization) 14001, the most widely adopted private or voluntary environmental program in the world. This program is sponsored by the ISO, the most prominent global standard-setting body. It encourages firms to adopt environmental stewardship practices, not only by obeying environmental laws of the jurisdiction in which they function, but also by adopting policies beyond regulatory requirements (Perez, Amichai-Hamburger, & Shterental

A previous version of this article was presented at the 2011 International Studies Association Annual Convention in Montreal, Canada. We thank three anonymous reviewers, as well as Christopher Adolph, Mark Axelrod, Brad Epperly, Brian Greenhill, Margaret Levi, Victor Menaldo, and the participants in a University of Washington Political Economy Discussion Seminar. Please direct all correspondence to Daniel Berliner, Otto Suhr Institute for Political Science, Freie Universität Berlin, Ihnestr. 26, D-14195, Berlin; e-mail: dberlinr@uw.edu.

Law & Society Review, Volume 47, Number 2 (2013)

2009).[1] To receive the ISO 14001 certification, a firm must adopt and document extensive environmental management systems (EMS), requiring substantial investments in personnel and training, and then receive regular audits from accredited external or third-party auditors in order to demonstrate that their management systems meet the ISO 14001 standards.

ISO 14001 is a certification standard which is supposed to signify the environmental credentials of the certified firm. It can be viewed as a "brand name" that allows firms to signal their commitment to environmental stewardship.[2] Indeed, recognizing that an international "brand" certifying environmental stewardship could allow environmentally progressive firms to differentiate themselves from environmental laggards, the ISO launched the ISO 14001 program in 1996. Although the costs for firms to become ISO 14001 certified are nontrivial, by the end of 2009 there were over 220,000 ISO-14001-certified facilities across over 150 countries (ISO 2011).

There is considerable interest among scholars in understanding the emergence and diffusion of nongovernmental, voluntary, or private authority regimes in global governance (Büthe & Mattli 2011; Cashore, Auld, & Newsom 2004; Cutler, Haufler, & Porter 1999, Haufler 2001; Meidinger 2006; Prakash & Potoski 2006; Vogel 2005). In studying the diffusion of such systems, however, scholars tend to focus on the role of global economic and social networks while paying less attention to the role of domestic institutions.[3] Our contribution is to systematically study the interactive effect of both domestic institutions and international pressures in diffusion dynamics.

Countries vary in the quality of regulatory governance they provide to their citizens. Some countries effectively enforce their own laws and others do not. Indeed, there is considerable evidence that weak regulatory institutions undermine the enforcement of environmental laws and regulations, primarily where widespread corruption makes bribery an attractive alternative to compliance (Desai 1998; Lopez & Mitra 2000; Pellegrini & Gerlagh 2006a, 2006b; Smith et al. 2003). We explore how the poor enforcement of environmental laws by regulators motivates firms to seek ISO

[1] Certification takes place at the facility level. To keep our discussion consistent with the literature, we refer to firms receiving ISO 14001 certification.

[2] For a sociological perspective on voluntary programs, see Rees (1997) and Ruggie (2007). Drawing on Teubner (1983), many scholars view voluntary programs as a manifestation of reflexive law (Fiorino 2001; Orts 1995). On regulatory innovations, see Ayres and Braithwaite (1992), Gunningham and Grabosky (1998), and Coglianese and Nash (2001).

[3] Recent work on international environmental treaties, as opposed to private regimes, has focused on the interaction of domestic and international politics, for example, Kelemen and Vogel (2010).

14001 certification in order to signal their commitment to environmental stewardship to their overseas customers and stakeholders.

This motivation stems from the importance of key stakeholders in shaping the reputations of firms in global supply chains. Fearing that poor environmental governance might besmirch their reputations and even lead to restricted access to some global markets, firms are motivated to look for private or nongovernmental alternatives to emphasize their environmental credentials. While voluntary programs or private regulatory systems can certainly be employed to preempt or weaken public law (Maxwell, Lyons, & Hackett 2000), many firms, especially ones facing environmental scrutiny in global markets, might not favor such regulatory gaps. This is particularly true for firms whose customers are located in countries where environmental norms are well established and environmental laws are well enforced, as corporate customers in importing countries are increasingly concerned about environmental aspects of the production processes of products they import.

If imported products emanate from "dirty countries" that are notorious for poor environmental governance, these customers can face a backlash from environmental groups, consumers, and even environmentally progressive firms in their supply chain. Indeed, poor environmental reputations can undermine what Gunningham, Kagan, and Thornton (2004) term as the "social license to operate." These exporting firms may seek to demonstrate their environmental credentials primarily because they are tainted by the poor environmental reputations of the countries in which they function. Firms can seek certification or membership in a prominent voluntary environmental program as a way to signal their environmental credentials.

Similar dynamics may affect multinational enterprises (MNEs) that have production facilities abroad. MNEs are actors that undertake foreign direct investment (FDI). While MNEs may follow environmental laws in their home countries (i.e., the country in which they are headquartered), the host country institutional context may not encourage law-abiding behavior. Stakeholders in home countries might believe that MNEs are more likely to bribe their way out of compliance instead of following relevant environmental laws when governance in their host countries is poor. MNEs may therefore feel compelled to assure various stakeholders in their home countries that, while they might be operating in countries with poor environmental governance, they are committed to obeying host country environmental laws and exhibiting environmental stewardship.

Importantly, while past work has also identified external pressures via trade and investment linkages as drivers of firm environmental practices (Christmann & Taylor 2001; Heritier et al. 2010;

Perkins & Neumayer 2010; Prakash & Potoski 2007; Vogel 1995), we focus on the quality of governance in exporting and host countries as a key intervening variable—external pressure arguments only hold under certain institutional scope conditions. Environmental practices do not diffuse uniformly via these economic linkages. Rather, we argue that such diffusion depends on both domestic and international factors that combine to create the demand for an effective signal of environmental stewardship by potential adopters.

ISO 14001 is an important case to study because it outlines process, or management-based, standards for firms to adopt. Environmentalists have criticized the World Trade Organization (WTO) for preventing governments from imposing process standards on imports to their countries, arguing that the WTO's approach undermines domestic regulations because imports from countries with poorly enforced environmental laws (and therefore lower production costs) can flood a country with more stringent laws (Greenpeace 2005). Unlike governments, firms themselves can impose process standards such as ISO 14001 on their suppliers. While political scientists identify instances of private law undermining or preempting public law, this article finds support for Börzel and Risse's (2010) thesis regarding the potential for private law to encourage adoption of superior practices with higher standards among firms in areas of limited statehood.

Using a panel of 129 countries from 1997 to 2009, we find that bilateral export and bilateral investment pressures motivate firms to join ISO 14001 only when firms are located in countries with poor regulatory governance. Our findings suggest that the incentives for firms to adopt environmental stewardship practices may not be located in their own economy, but rather may emanate from export destination countries and the home countries of MNEs, transmitted via bilateral trade and bilateral investment.

Nevertheless, we recognize that voluntary programs have their downsides (Morgenstern & Pizer 2007; Vogel 2005). The Consolidated Supervised Entity voluntary program sponsored by the U.S. Securities and Exchange Commission allowed financial irregularities that precipitated the 2008 stock market crisis (Schapiro 2010). In part, the Deepwater Horizon oil spill in the Gulf of Mexico reflects the poor quality of the voluntary regulation systems promoted by the U.S. Minerals Management Service (*Wall Street Journal* 2010). Activist groups sometimes sponsor voluntary program themselves (such as the Forest Stewardship Council program), but tend to be skeptical of programs sponsored by trade associations, governments, or other bodies that allow for business representation (Steinzor 1998). While research has indeed borne out such concerns for some voluntary environmental programs such as Respon-

sible Care (King & Lenox 2000) and the Sustainable Slope Program (Rivera and deLeon 2004), there is some evidence suggesting that ISO 14001 participation leads firms to pollute less or show superior compliance with public law (Anton, Deltas, & Khanna 2004; Dasgupta, Hettige, & Wheeler 2000; Prakash & Potoski 2006; Russo 2002). While ISO 14001 is not a panacea for environmental governance ills, we provide some evidence on how globalization pressures can enable the diffusion of this voluntary program which seeks to promote environmental stewardship, including compliance with environmental laws in the developing world.

Our article proceeds as follows. Section II outlines our theoretical perspective and describes the ISO 14001 voluntary program. In Section III we describe our data and model. We present the results of our analyses in Section IV, and conclude in Section V.

Theoretical Perspectives

The Demand for Environmental Signals

Poor regulatory enforcement is a major challenge in environmental governance around the world. We argue that global supply chains operating in countries with poor regulatory governance are likely to adopt signaling mechanisms that assure their external stakeholders, who cannot observe on-the-ground operations abroad, that their suppliers and subsidiaries are honoring local environmental laws and not taking advantage of poor enforcement. More broadly, firms sourcing their inputs or products from abroad need to assure activist groups and other concerned stakeholders that their supply chain is committed to environmental stewardship.

Indeed, one finds this increasingly common in a large number of high-profile firms. Leading automobile firms including General Motors, Ford, and BMW require their overseas suppliers to be ISO 14001 certified. Similarly, leading firms in the aerospace industry including Airbus (2012), Boeing (2012), and Bombardier (2012) have aggressively encouraged ISO 14001 in their global supply chains. However, pressure on individual firms to become ISO 14001 certified can come from multiple types of stakeholders. Activists, nongovernmental organizations (NGOs), or concerned consumers or shareholders can observe the activities of firms and seek to influence them to certify, while multinational headquarters and firms at the top of the supply chain can demand certification, either in response to or in anticipation of pressure from other stakeholders.

Demands for certification in global supply chains are an example of the broader issue of how information problems can lead to institutional failure. Faced with lack of information about firms or their products, boundedly rational (Simon 1976) customers and

stakeholders may take cognitive shortcuts, including stereotyping (Kahneman, Slovic, & Tversky 1982). In the international trading context, buyers and sellers tend to be separated by spatial, linguistic, and sociocultural differences. Buyers sometimes infer sellers' product quality partly from the overall reputation of the country in which the sellers are located (Hudson & Jones 2003). Quality of German engineering products is considered uniformly excellent while products from many newly industrializing countries have tended to acquire a reputation for bad quality. Van Ham (2001: 3) observes: "Image and reputation have become essential parts of a state's strategic capital. Like branded products, branded states depend on trust and customer satisfaction."

Such national reputations can work in both positive and negative ways for individual firms. For example, an advertising campaign by the German company Bosch to sell kitchen appliances in the U.S. market relied on the following copy for dishwashers: "So quiet, it screams German engineering" (*Consumer Reports* 2011). On the other hand, in 2007 when the presence of lead paint in children's toys was blamed on lax regulations in China, many firms sought to assure American consumers that they were monitoring their Chinese suppliers (*New York Times* 2007a). These actions came in response to concerns like those of the cofounder of a parenting Web site quoted in the *New York Times* (2007b): "Do I have to look at every toy that has paint on it that comes from China as perhaps suspect?" These examples speak to the existence of powerful country reputation effects that consumers and other stakeholders, in low-information settings, apply to individual firms operating within those countries' borders. Not surprisingly, governments and national trade associations invest substantial resources building or refocusing their country brand (Kotler & Gertner 2002).[4]

While a country may acquire a reputation for poor environmental governance, some of its firms may be capable of producing products by using green technologies, obeying environmental laws, and following principles of environmental stewardship. Exporting firms located in countries with poor environmental reputations face a lemons problem (Akerlof 1970): they get tainted as "dirty" and consequently suffer from a competitive disadvantage in the international market. Corporate customers in countries with strong

[4] While Krugman (1994) has famously argued that the concept of competitiveness applies to firms, not countries, one can find countries routinely investing sizeable sums to project their image and branding themselves in specific ways. One finds such examples in most issues of *The Economist*. Countries also purchase supplements in major newspapers highlighting their competitive strengths. Country-branding campaigns can also be witnessed in major international forums such as the annual World Economic Forum in Davos. Thus, firms may believe that countries' reputations can enhance or detract from their own reputations in international markets.

environmental sensibilities may be wary of importing from such firms. The potential backlash they face, against poor environmental practices, comes not only from final customers but also from a range of other stakeholders. Indeed, stock markets now pay close attention to environmental issues, and there is some research suggesting that they react to news about voluntary certifications (Jacobs, Singhal, & Subramanian 2010). Furthermore, even when stakeholders do not hold strong preferences on environmental issues, they may strategically feign wariness and extract price or other concessions from exporters located in countries with poor environmental reputations.

This is where branding and reputation become important. Sellers often signal product attributes via branding (Kreps & Wilson 1982; Milgrom & Roberts 1986). We argue that firms located in countries with poor regulatory governance can be motivated to employ ISO 14001 to signal environmental stewardship, effectively rebranding themselves in contrast to the contexts in which they operate. The extent to which this will occur depends on the extent to which those firms are linked with stakeholders abroad who are familiar with ISO 14001 and who value the environmental commitments signaled by certification. Given such circumstances, certification can be seen as part of the "social license" governing the social expectations of firms to undertake beyond-compliance activities (Gunningham, Kagan, & Thornton 2004).[5] The incentives for diffusion are "sent" by stakeholders in importing countries, and "received" by exporting firms in countries with poor regulatory quality, even as signals of environmental stewardship are transmitted in the reverse direction.

MNEs face similar problems to the ones faced by exporters located in countries with poor environmental governance. While exporters have to signal their commitment to environmental stewardship to overseas customers, MNEs need to signal their commitment to environmental stewardship by overseas subsidiaries to home country stakeholders. While MNEs may follow environmental laws in their home country operations, they may not do so in host countries, often simply because extant laws go unenforced by regulators. In response to this possibility, MNEs might feel compelled to assure home country stakeholders that, although they are operating in countries with poor environmental governance, they are committed to obeying host country environmental laws and exhibiting environmental stewardship. Thus, worse regulatory governance in host countries, together with higher environmental sensitivities in home countries, is likely to encourage MNEs

[5] See Thornton, Kagan, and Gunningham (2009) for an analysis of the limits of the social license among small firms.

to explicitly demonstrate their environmental credentials. This dynamic provides the motivation for MNEs to employ ISO 14001 in order to convey this signal to stakeholders in their home countries, by requiring that their subsidiaries and suppliers join ISO 14001. Incentives to join ISO 14001 will be higher where environmental governance in host countries is poor and where home country stakeholders recognize ISO 14001 as a credible assurance of environmental stewardship.

Both global trade and investment networks can encourage the diffusion of ISO 14001 certification in countries with poor environmental governance, but through slightly different mechanisms. While both networks can incentivize firms to become certified in order to signal environmental stewardship, the loci of stakeholder pressures are different. Exporting firms can face pressure from many different stakeholders of multiple types—including activists, consumers, and buyers higher up the supply chain—while multinationally owned firms are likely to face pressure primarily from their corporate headquarters, who are themselves the focus of pressure from stakeholders of other types.

The Supply of Environmental Signals

The origins, sponsorship, and institutional design of ISO 14001 make it a relatively credible signal of environmental stewardship. ISO 14001 has been sponsored by the ISO, an organization whose members are "private sector national bodies" (Mattli & Büthe 2003: 4), such as the American National Standards Institute, the British Standards Institution, and the Deutsche Institut für Normung. The ISO is not an intergovernmental actor; it is a nongovernmental actor that facilitates international commerce by developing standards and codes. Since its inception in 1947, the ISO has developed and launched over 18 000 standards.

The ISO introduced ISO 14001 in 1996, as a management-system-based standard that epitomizes what Coglianese and Nash (2001) term as "regulating from the inside." The assumption behind this regulatory approach is that if appropriate internal management systems are put in place, desired outcomes—improved environmental performance or superior compliance with public law—will follow. To make sure that firms joining ISO 14001 do not shirk their obligations, ISO 14001 requires that firms be audited by external, accredited auditors. Thus, the "enforcement" of ISO 14001 is not predicated on any public regulatory system, but rather is enforced by private inspectors or auditors.

ISO 14001 builds on the earlier ISO 9000 quality control standards by prescribing management practices for firms' internal environmental operations. It requires firms to establish a written

environmental policy approved by senior management. Firms must lay out quantifiable environmental targets, regularly review their progress, and designate a top manager to oversee implementation of their environmental programs. ISO 14001 obligates participating firms to comply with or exceed domestic laws (even when they are not being enforced by public authorities), adopt the best available environmental technology, assess environmental impacts of operations, and establish programs to train personnel in EMS. For most firms, these management systems are extensive, requiring substantial investments in personnel, training, and, most critically, in establishing paper trails for environmental operations. In some ways, such expenses can be viewed as entry barriers that discourage firms not serious about pursuing environmental stewardship from seeking certification.

The institutional design of ISO 14001 includes mechanisms to ensure that participants comply with program obligations, rather than shirking their responsibilities once certified. Many scholars have emphasized the importance of monitoring by third-party auditors in order to achieve these goals (Darnall & Edwards 2006; King & Lenox 2000; Prakash & Potoski 2006). ISO 14001 requires participants to receive an initial certification audit and then annual recertification audits to verify that their management systems remain of ISO 14001 caliber (Morrison et al. 2000). These auditors are approved and certified by the national standards body of their country. Participants incur nontrivial costs to receive and maintain ISO 14001 certification. Establishing a management system and having it audited by a third party can cost from $25,000 to over $100,000 per facility (Kolk 2000). In terms of cost per employee, Darnall and Edwards (2006) report that costs of certification can range from $29 to $88 per employee.

There is debate on the usefulness of third-party auditing in the context of voluntary programs (National Academy of Public Administration 2001). The United Nations Global Compact program, for example, does not provide for such auditing, which has become a point of criticism by many NGOs (Berliner & Prakash 2012). However, Locke and Brause (2007) question the necessity or even desirability of monitoring in the context of voluntary labor programs. The third-party auditing process is not perfect: there is a potential conflict of interest when consulting firms also have divisions offering auditing services. Anecdotal evidence also suggests that auditors typically do not fail firms that employ them.

Notwithstanding the imperfections in ISO 14001's institutional design, there is some evidence that ISO 14001 adopters pollute less and show superior compliance with environmental regulations than nonadopters. In their study of 236 firms belonging to

food, chemical, nonmetallic minerals, and metal industries (which together generate 75–95 percent of Mexico's industrial pollution), Dasgupta, Hettige, and Wheeler (2000) find that ISO 14001 adopters better comply with government environmental regulations, an important finding given that many developing countries have difficulties enforcing government regulations. In his analysis of 316 U.S. electronics facilities, Russo (2002) finds that ISO 14001 membership is associated with decreased toxic emissions. In their study of over 3,000 U.S. facilities regulated under the Clean Air Act, Prakash and Potoski (2006) find that ISO 14001 adopters pollute less and better comply with the law. Anton, Deltas, and Khanna (2004) report that a more comprehensive EMS (the core requirement imposed by ISO 14001) leads to lower toxic emissions, particularly for firms that have higher pollution intensity. There is some evidence that ISO-14001-certified facilities may become important actors promoting green practices in their supply chain. Using Japanese facility-level data, Arimura, Darnall, and Katayama (2011) report that ISO 14001 certification promotes green supply chain management, in that certified facilities are 40 percent more likely to assess their suppliers' environmental performance and 50 percent more likely to require that their suppliers undertake specific environmental practices.

Thus, while adopting ISO 14001 is not a panacea for solving environmental problems in societies with failing regulatory institutions, there is some evidence indicating that ISO certification is associated with tangible improvements in firms' environmental performance, and leads them to better comply with domestic regulations. However, our approach does not depend on ISO certification necessarily leading to such improvements. Rather, we argue that as long as actors in sending countries recognize ISO 14001 as a signal of environmental quality, firms located in receiving countries will have incentives to consider ISO 14001 participation, especially if they are located in countries with reputations for poor enforcement of environmental laws.

Some authors have argued that incentives to join voluntary programs like ISO 14001 depend on the "shadow of hierarchy"—the credible threat of government intervention in the case of inaction—in order to be effective and sustainable (Heritier & Lehmkuhl 2008). On the other hand, Börzel and Risse (2010) argue that even in areas of limited governance, external forces and norms of appropriate conduct can sometimes substitute for the shadow of hierarchy. Thus, the potential role of external forces—in our case, demands of stakeholders in export markets and MNEs' home countries—in driving the spread of ISO 14001 adoption in countries with poor regulatory quality can serve as a test of this issue. If the shadow of hierarchy is indeed a requirement for firms

to join ISO 14001, then we should find little evidence that the international diffusion of ISO 14001 certification extends to countries with poor environmental governance. If it is not, then ISO 14001 adoption will be facilitated in countries with poor environmental governance if such countries export predominantly to overseas destinations where ISO 14001 is widely adopted.

In summary, our discussion suggests that (1) exporting firms tend to acquire the reputation of the country in which they are located, (2) firms with high environmental performance in countries with poor governance need a mechanism to purge negative country-of-manufacture reputational effects and establish themselves as environmental stewards, (3) multinationals investing in countries with poor governance need to convince their home country stakeholders that they will obey host countries' laws even when enforcement is poor, (4) ISO 14001 can serve as a mechanism for both exporters and MNEs to signal commitment to environmental stewardship to relevant stakeholders located abroad, (5) because ISO 14001 adoption is expensive, firms need incentives to join this program, and (6) the incentives for exporting firms and MNE subsidiaries (the receivers of diffusion pressures) to adopt ISO 14001 will be high if ISO 14001 is considered credible in the sending countries, that is, export markets (for the exporters) and home countries (for the MNEs). Based on the above discussion, we propose to test the following hypotheses:

> H_1: ISO 14001 adoption rates are higher in countries that export to destination countries where stakeholders value certification, but only when domestic environmental governance in the exporting country is poor.
>
> H_2: ISO 14001 adoption rates are higher in host countries that receive FDI from home countries where stakeholders value certification, but only when domestic environmental governance in the host country is poor.

Data and Model

To test our hypotheses, we examine a panel of 129 countries for the period 1997–2009.[6] We also check our results on a panel of 103 developing countries only. Our dependent variable is the count of

[6] We do not believe our article suffers from the problems of ecological fallacy: the attribution of group characteristics to individuals in that group. We are testing diffusion hypotheses on the role of country-level factors (corruption, and bilateral trade and investment in particular) in influencing country-level ISO 14001 adoption levels. We are not claiming that all firms in a given country will show "average characteristics" of the group and will therefore be susceptible to such diffusion dynamics.

ISO-14001-certified facilities in each country in each year (ISO 2011).[7] As with many count variables, ISO 14001 certification levels have a highly skewed distribution with a median of 18 and a mean of 735.4. For reference, in 1997, the first year of our panel, 52 countries in our sample had no ISO-14001-certified facilities, while the highest number of 713 was found in Japan. In contrast, by 2007, only 3 countries in our sample still had no certifications, while the highest number of 55,316 was found in China.

Our key independent variables are the quality of domestic regulatory governance and two different spatial lags of ISO 14001 adoption reflecting important international economic connections—bilateral exports and inward FDI stock. We focus on corruption as a proxy for the poor quality of environmental governance. We therefore expect that perceptions about corruption levels can be expected to modify the effects of international economic linkages.

We recognize that shortfalls in environmental governance may be the result of many factors in a given country. The country may lack relevant laws. Even when laws are in place, they may not be adequately stringent; or even when stringent on paper, they may be insufficiently enforced. Enforcement problems, in turn, may stem from a lack of state capacity, or from corruption that allows bribery of regulators as an alternative to compliance. Given the proliferation of environmental laws, agencies, and treaties around the world (Frank, Hironaka, & Schofer 2000), the lack of enforcement stands a key challenge, especially in developing countries. Indeed, many scholars have identified poor institutional quality as a key contributor to poor environmental governance (Desai 1998; Lopez & Mitra 2000; Pellegrini & Gerlagh 2006a, 2006b; Smith et al. 2003).

Lopez and Mitra (2000) argued that corruption not only leads to higher pollution levels, but also shifts the inflection point of an inverted-U environmental Kuznets curve to a higher level of per capita income. Pellegrini and Gerlagh found that corruption is strongly associated with less stringent environmental policy, both worldwide (2006a) and among new European Union members (2006b). Studying issues of biodiversity protection, Smith et al. (2003) found that the quality of governance measured as corruption was associated with several conservation outcomes. In a comparative analysis of 10 countries, Desai (1998) concluded that:

[7] Ideally, the dependent variable would be the ratio of certified facilities to all potentially certifiable facilities. Unfortunately, such data are not available for all countries in our panel. Consistent with prior literature, we include GDP adjusted for purchasing power parity as a proxy for the scale of the economy (Prakash & Potoski 2006). Importantly, our key substantive results hold even when we employ an alternative specification of the dependent variable: the ratio of logged ISO 14001 certifications and PPP adjusted GDP.

"Corruption is a major culprit in environmental degradation. In many industrializing countries, petty corruption by mid and low level officials and bureaucrats both at the center and local level is widespread and endemic. Environmental regulations often are observed only in the breach" (Desai 1998: 300). In a study of environmental policy in India, Sapru (1998: 172) noted that:

> The practice of large scale corruption and other forms of bribery among officials has stalled the implementation of pollution control laws to a significant extent. Industry owners commonly perceive that public servants can be bought by monetary incentives. Therefore, industrial polluters reason that they have recourse to cheaper ways than to comply with regulations that may entail significant cost.

Further, while the quality of environmental governance itself is likely to be difficult for external stakeholders to observe, corruption is a more easily observable feature of a country's institutional structure. Corrupt countries are likely to be viewed by environmental groups and other stakeholders as pollution havens where businesses pay scant attention to the law and externalize production costs to the environment. These dynamics can lead firms investing in or sourcing from corrupt countries to have similar concerns, for fear of bad publicity or other reputational problems.

We measure corruption using the *Control of Corruption* indicator from the World Bank World Governance Indicators. This measure is based on an unobserved components model of multiple governance indicators drawn from numerous different data sources, including several perception-based corruption measures. By extracting a latent variable from multiple measures, this variable seeks to avoid the potential for bias inherent in many corruption measures. It captures the "perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests" (Kaufmann, Kraay, & Mastruzzi 2009). By design, this variable has mean 0 and ranges from roughly –2.5 to 2.5. In a robustness check, we also employ Transparency International's *Corruption Perceptions Index*, which ranges from 0 to 10. Transparency International bases this index on surveys of expert perceptions of public sector corruption. For both corruption measures, higher values reflect less corruption, or rather higher control of the corruption problem, while lower values reflect greater perceptions of corrupt behavior.[8]

[8] We also control for other factors that may shape the quality of environmental governance. The inclusion of country fixed effects automatically controls for any country-

We model international economic diffusion processes pertaining to exports and FDI flows with spatially lagged variables measuring the extent to which each country is economically linked with countries where stakeholders value ISO 14001 certification. Following Greenhill, Mosley, and Prakash (2009), *bilateral export context* is a weighted average of levels of ISO adoption among a country's export destinations, weighted by the salience of exports to each country. Salience is treated as the proportion of exports to each destination to the total exports of the country in question in each year. This variable is designed to capture the California effect (Vogel 2005), by which the practices of the importing destinations influence the domestic practices of the exporting countries. For a given country in a given year, this variable will take a higher value when that country exports to destinations with greater numbers of ISO 14001 certifications. The *bilateral export context* is calculated as follows:

$$\text{Bilateral Export Context}_i = \sum_j \text{ISO 14001}_j \times (\text{Exports}_{ij} / \text{Total Exports}_i),$$

where ISO 14001_j is the number of ISO-14001-certified facilities in each destination country j, Exports_{ij} is the volume of exports sent from country i to country j, and Total Exports_i is the total volume of exports sent from country i to all destinations. Bilateral export data come from the Correlates of War project (Barbieri, Keshk, and Pollins 2008).

Regarding diffusion via bilateral FDI, we calculate the *bilateral investment context* as the weighted average of the ISO adoption levels of FDI home countries, weighted by the salience of each home country in the host country's total FDI stock (Prakash and Potoski 2007). The argument is that what matters for ISO adoption is not the total level of FDI, but the home country from which it originates. ISO 14001 adoption will be higher in a given host country if it receives the bulk of its FDI from countries with high levels of ISO 14001 certification. The *bilateral investment context* is calculated as:

$$\text{Bilateral Investment Context}_i = \sum_j \text{ISO 14001}_j \times (\text{FDI}_{ij} / \text{Total FDI}_i),$$

specific features which do not change over time. We also include GDP per capita, which has been used in other studies as an indicator of the capacity of the state for enforcement (Lim & Tsutsui 2012). While no data are available on the stringency of environmental regulations for all the countries in our model, in a robustness check an additional control is measuring the number of international environmental treaties signed or ratified by a country, as a proxy for de jure stringency (Cao & Prakash 2012). Inclusion of this additional control does not alter the substantive or statistical significance of our main findings. See Addition Supporting Information online.

where ISO 14001_j is the number of ISO-14001-certified facilities in each destination country j, FDI_{ij} is the stock of inward FDI from home country j to host country i, and Total FDI_i is the total stock of inward FDI in host country i from all home countries. We use FDI stock rather than FDI inflows, as FDI location decisions are not one-time affairs but rather long-term commitments. If a MNE opens a factory in a given year, the expectation is that it will continue to function over a period of time. Thus, its effect on economic, social, and industrial policies of the host country will not be a one-shot impact. Because FDI tends to accumulate, its effect on ISO 14001 adoption levels in the host country will depend on its total value, not the inward FDI inflow in a given year. We combine information from two sources of bilateral FDI data in order to maximize coverage. Where available, we rely on data from UNCTAD (2011), supplemented with data from the Organization for Economic Cooperation and Development (OECD) (OECD Statistics 2010).

To examine how domestic governance conditions the cross-national diffusion pressures transmitted along bilateral trade and investment linkages, we are primarily interested in the results of interaction terms between the measures of corruption and of each bilateral context variable. The results from models including these interaction terms will indicate whether the effects of bilateral trade context and of bilateral investment context differ systematically depending on the level of corruption in a given country.

We also control for several international and domestic variables that might affect ISO 14001 adoption levels. We control for *export openness* (aggregate exports as a percentage of gross domestic product [GDP]), with data from the World Development Indicators (World Bank 2010), and *FDI stock* (total inward *FDI stock* as a percentage of GDP), with data from OECD Statistics (OECD 2010). Both these variables test the aggregate effects of international trade and investment, irrespective of practices in destination countries (for trade) and home countries (for FDI). We also control for two other international diffusion effects, *language context* and *neighborhood context*, since ideas, norms, and practices may flow more readily via shared cultural ties or between contiguous states. Our language context variable measures the average level of ISO 14001 adoption among countries sharing a common official language with a given country, with language data from the CIA World Factbook (CIA 2008). Neighborhood context measures the average level of adoption among countries sharing a border, with contiguity data from the Correlates of War project (Stinnett et al. 2002).

Intergovernmental organizations and international NGOs may serve as networks transmitting new ideas, norms, and practices about the environment (Boli & Thomas 1999; Frank, Hironaka, &

Schofer 2000). To account for their role in the cross-national diffusion of norms, practices, and policies, we control for the count of *intergovernmental organizations* in which a country is a member of each year, and the count of *international NGOs* with members in a given country in each year, with data from the Yearbook of International Organizations (Union of International Associations 2009).

Domestic factors should also influence ISO 14001 adoption levels. We control for total *GDP* and *GDP per capita*, each adjusted for purchasing power parity (PPP). Since the relationship between wealth and stakeholders' environmental preferences may be nonlinear, as in the environmental Kuznets curve, we include the term *GDP per capita squared*. Additionally, different industrial sectors may have different propensities for ISO 14001 adoption. Extractive sectors, for instance, may not place as much salience on their reputations among export market consumers. We measure *primary sector export composition* as the percentage of exports comprised by fuels, ores and metals, and agricultural raw materials. Finally, since ISO certification practices may spill over from similar programs, we control for the count of *ISO 9000* certifications (ISO 2011), a quality control program on which ISO 14001 was modeled.

We estimate a negative binomial model of the count of ISO 14001 certifications in each country in each year. ISO counts have zero as an obvious lower bound, and a variance far greater than their mean. Because a Poisson model would vastly underestimate the model's standard errors, we employ a negative binomial model that allows for overdispersed counts by estimating a dispersion parameter. We also employ an alternative model using ordinary least squares (OLS). This model uses an alternative dependent variable: the logged ratio of ISO 14001 certifications to GDP adjusted for PPP. We first add one to each certification count to avoid the mathematical impossibility of logging zero. We also recalculate all spatial lags in this model to incorporate the ratio ISO 14001 variable, and omit total GDP from the right-hand side of the model as it already appears in the dependent variable.

In response to concerns about reverse causality, we lag all independent variables by 1 year. Temporal lags of spatially lagged variables help mitigate potential simultaneity bias. We include a lagged dependent variable to account for any temporal dependence of ISO certifications. Our use of multiple spatially lagged variables should account for any spatial autocorrelation of ISO certifications. We also include country fixed effects to account for any unobserved heterogeneity at the country level.[9] Finally, to

[9] We recognize the potential problems of using lagged dependent variable with country fixed effects, the so-called Nickell bias. Our main results hold even when we drop the lagged dependent variable.

address any issues of heteroskedasticity, we employ robust standard errors clustered by countries.

Results

Our analyses suggest that ISO 14001 adoption should be understood as an interactive effect of domestic and international factors. That is, ISO 14001 adoption is encouraged in corrupt societies only when these countries' bilateral export and bilateral investment contexts recognize ISO 14001 branding. This lends support to our argument that firms located in corrupt countries (a proxy for poor reputations for environmental governance) face reputational problems only when exporting to foreign markets with high levels of environmental sensibilities. This is due to these customers who attribute the characteristics of the country of origin—poor environmental governance—to the individual firm and its products. ISO 14001 can help firms signal their commitment to environmental stewardship and purge the negative reputation of their country of manufacture. Similarly, foreign investors from home countries with high levels of ISO 14001 locating their facilities in host countries with high corruption levels are likely to be more sensitive about their environmental profile. Hence, they are likely to encourage their subsidiaries and suppliers—particularly the ones located in corrupt societies—to adopt ISO 14001. Eventually, local firms concerned about their environmental reputations may mimic the practices and systems of MNEs, leading to ISO 14001 spillovers in the domestic economy as well.

Importantly, we do not expect to find these motivations to join ISO 14001 among exporters and foreign investors when corruption levels in their country of manufacture are low (i.e., where our indicators of control of corruption and freedom from corruption have higher values). Such societies are likely to have well-functioning environmental institutions, and extant environmental regulations are likely to go enforced. Indeed, we find that the bilateral export context and the bilateral investment context have no significant impact on certification levels, or even have a negative effect, under such circumstances.

Our results from negative binomial count models of ISO 14001 certification are presented in Table 1. Model 1 is a baseline model with no interaction terms. Model 2 includes an interaction term between bilateral export context and corruption while Model 3 includes an interaction term between bilateral investment context and corruption. Model 4 includes both interaction terms simultaneously. Our theoretical expectations are tested by the sign and statistical significance of the interaction terms between corruption

Table 1. Results of Negative Binomial Count Models of ISO 14001 Certifications. Intercept and Country Fixed Effects Not Reported to Save Space

	Model 1	Model 2	Model 3	Model 4
Control of Corruption	0.55**	0.91***	0.95***	0.97***
	(0.21)	(0.21)	(0.22)	(0.21)
Bilateral Export Context	0.00021***	0.00023***	0.00019***	0.00020***
	(0.000041)	(0.000035)	(0.000031)	(0.000036)
Export Context * Corruption		–0.00015***		–0.000069†
		(0.000024)		(0.000042)
Bilateral Investment Context	0.000066	0.000048	0.000062	0.000057
	(0.000043)	(0.000041)	(0.000039)	(0.000041)
Investment Context * Corruption			–0.00018***	–0.00011*
			(0.000028)	(0.000049)
Exports/GDP	0.021***	0.017**	0.017*	0.017*
	(0.0061)	(0.0065)	(0.0068)	(0.0067)
FDI Stock/GDP	–0.00052	0.0024	0.0027	0.0028
	(0.0029)	(0.0030)	(0.0031)	(0.0031)
Language Context	0.0000062	0.000032	0.0000048	0.000017
	(0.000032)	(0.000023)	(0.000022)	(0.000023)
Neighborhood Context	–0.000031	–0.000038	–0.000028	–0.000032
	(0.000051)	(0.000046)	(0.000047)	(0.000046)
Intergovernmental Organizations	–0.00093	–0.012	–0.016	–0.016
	(0.014)	(0.013)	(0.013)	(0.013)
International NGOs	0.0020***	0.0025***	0.0028***	0.0027***
	(0.00055)	(0.00067)	(0.00068)	(0.00068)
GDP	0.00015	–0.000080	0.0000896	0.000011
	(0.00016)	(0.00020)	(0.00024)	(0.00022)
GDP per Capita	0.47***	0.35***	0.38***	0.36***
	(0.080)	(0.079))	(0.078)	(0.078)
GDP per Capita Squared	–0.0079***	–0.0047***	–0.0052***	–0.0047***
	(0.0015)	(0.0014)	(0.0013)	(0.00013)
Primary Sector Exports	–0.0094	–0.0061	–0.0081	–0.0070
	(0.0088)	(0.0080)	(0.0082)	(0.0081)
ISO 9001 Adoption	0.000018**	0.000013†	0.000013†	0.000013†
	(0.0000059)	(0.0000070)	(0.0000070)	(0.0000070)
ISO 14001 Adoption$_{t-1}$	–0.000099**	–0.000045	–0.000075*	–0.000060†
	(0.000031)	(0.000039)	(0.000032)	(0.000035)
N	1,449	1,449	1,449	1,449
AIC	12,473.7	12,329.5	12,320.6	12,313.2

Significant at †$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Notes: Country fixed effects included in all models. Clustered standard errors in parentheses.

ISO, International Organization for Standardization; GDP, gross domestic product; FDI, foreign direct investment; NGO, nongovernmental organization; AIC, Akaike Information Criterion.

and the spatially lagged variables. In Models 2 and 3, which include each interaction term in turn, both interaction terms are negative and statistically significant at $p < .001$ level. This indicates that the effects of bilateral export and bilateral investment context are stronger when corruption is high (when control of corruption is low), and become attenuated as corruption becomes less severe. Even in Model 4, which includes both interaction terms simultaneously, both retain their negative sign and their significance.

Interaction terms are best interpreted graphically (Brambor, Clark, & Golder 2006), so we display our main results from Models 2 and 3 in Figure 1. Since coefficients in negative binomial models

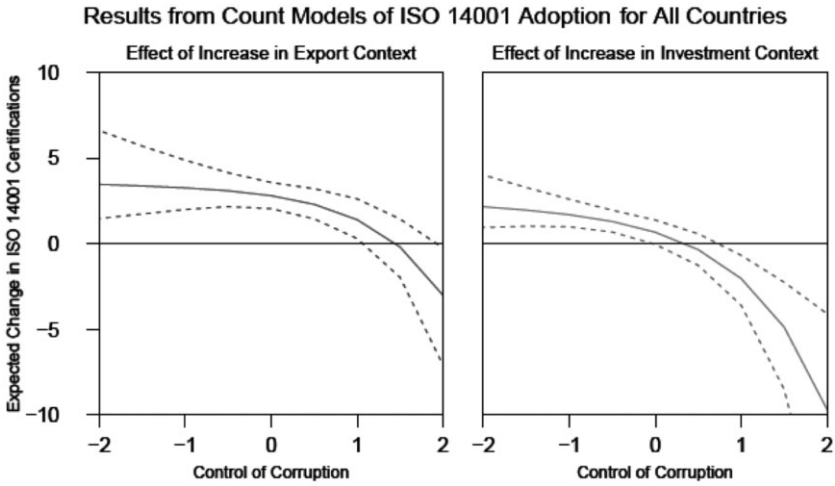

Figure 1. Graphical Presentation of Results from Models 2 and 3. The line reflects the expected change in ISO 14001 certifications when export or investment context increases from one standard deviation below the mean to one standard deviation above the mean, as this expected change varies over different levels of corruption. Results are simulated for a hypothetical country with all other independent variables at their means. Dashed lines indicate 90% confidence intervals.

are not directly interpretable as are OLS coefficients, simulating marginal effects from our model results also allows us to present our main results in substantive terms. In Figure 1, we plot the marginal effect that an increase in the bilateral export context or investment context has on ISO 14001 certifications for different values of domestic corruption, holding all other independent variables at their mean values. We present the expected changes in ISO certifications when the trade or investment context variable moves from one standard deviation below its mean to one standard deviation above its mean.

The results presented in Figure 1 show that the effects of our international diffusion variables are highly contingent on the level of domestic corruption. For a hypothetical country with all other independent variables held at their means but with a value of corruption of −1, roughly one standard deviation below the mean, an increase in export context from one standard deviation below to one standard deviation above the mean is associated with additional 3.27 firms securing ISO 14001 certifications (for 2009, countries with a value of corruption of roughly −1 included Azerbaijan, Nigeria, and Paraguay). To provide some context, 23 of the 129 countries in our panel still had 3 or fewer certifications in 2007, and 8 countries still had 3 or fewer in 2009, the final year of our panel.

A similar increase in the bilateral investment context is associated with additional 1.69 firms securing ISO certifications. These are not trivial changes: the sample median count of ISO 14001 certifications in our dataset is only 18.

Importantly, as the control of corruption increases, the effects of bilateral export context and investment context on ISO 14001 adoption decrease. The threshold level of control of corruption above in which the effects of export context are no longer positive and significant is roughly 1. In 2009, countries with roughly this value of the corruption measure included Botswana, Slovenia, and Uruguay. The threshold above in which the effects of investment context are not significant is roughly 0. In 2009, countries with roughly this value of the corruption measure included Ghana, Brazil, and Turkey. For countries that are more corrupt than these threshold values, the effect of the increases in bilateral adoption context is to drive ISO 14001 certifications upward. Importantly, for countries that are less corrupt than these thresholds, bilateral context has no significant effect. For the bilateral investment context relationship shown in the second plot of Figure 1, the effect actually becomes negative and statistically significant at high levels of the control of corruption—that is, where corruption is at its least severe.

Results from OLS models with an alternative dependent variable—the logged ratio of ISO 14001 certifications to PPP adjusted for GDP—are presented in Table 2 and graphically presented in Figure 2. We similarly find negative and statistically significant interaction terms between corruption and bilateral export and investment context in Models 6 and 7. Figure 2 shows that the effects of the international diffusion variables vary over the range of corruption values in a manner similar to the results of the negative binomial models. In Model 8, which includes both interaction terms simultaneously, the export context interaction term remains negative and statistically significant, while the investment context interaction term is no longer significant.

We now return to the negative binomial model results presented in Table 1 to discuss the results for the other variables in the model. In the baseline model without any interaction terms, control of corruption has a positive and significant effect on ISO 14001 certifications. That is, there is more ISO 14001 adoption in less corrupt countries and less adoption in more corrupt countries. Greater control of corruption, and thus more effective environmental regulatory enforcement, means that firms will face lower adjustment costs to become ISO 14001 certified because they are already likely to be in compliance with domestic law. This represents a different process than the one by which corruption modifies the effect of international diffusion effects—with stronger regula-

Table 2. Results of OLS Models of ISO 14001 Certifications. Intercept and Country Fixed Effects Not Reported to Save Space

	Model 5	Model 6	Model 7	Model 8
Control of Corruption	0.18**	0.049	0.10	0.025
	(0.070)	(0.077)	(0.076)	(0.074)
Bilateral Export Context	0.062	–0.023	0.032	–0.059
	(0.042)	(0.040)	(0.039)	(0.044)
Export Context * Corruption		–0.084***		–0.15**
		(0.021)		(0.045)
Bilateral Investment Context	0.021	0.047	0.0097	0.077*
	(0.037)	(0.034)	(0.036)	(0.037)
Investment Context * Corruption			–0.069**	0.065
			(0.021)	(0.047)
Exports/GDP	–0.0023	–0.0029	–0.0028	–0.0029
	(0.0024)	(0.0024)	(0.0024)	(0.0025)
FDI Stock/GDP	–0.0019	–0.00065	–0.00088	–0.00067
	(0.0017)	(0.0014)	(0.0014)	(0.0014)
Language Context	0.035	0.034	0.033	0.035
	(0.037)	(0.033)	(0.033)	(0.033)
Neighborhood Context	0.096*	0.13***	0.12***	0.14***
	(0.039)	(0.035)	(0.035)	(0.036)
Intergovernmental Organizations	0.0030	–0.0052	–0.0032	–0.0055
	(0.0053)	(0.0051)	(0.0053)	(0.0051)
International NGOs	0.000085	0.00033†	0.00027	0.00033
	(0.00019)	(0.00020)	(0.00020)	(0.00020)
GDP per Capita	0.089**	0.081**	0.085**	0.079**
	(0.029)	(0.026)	(0.026)	(0.025)
GDP per Capita Squared	–0.0018**	–0.0011*	–0.0014**	–0.0010*
	(0.00059)	(0.00048)	(0.00050)	(0.00047)
Primary Sector Exports	0.00046	–0.000053	0.00013	–0.00013
	(0.0017)	(0.0017)	(0.0017)	(0.0017)
ISO 9001 Adoption	0.00000095	0.0000011	0.00000093	0.0000012
	(0.0000016)	(0.0000011)	(0.0000013)	(0.0000011)
ISO 14001 Adoption$_{t-1}$	0.66***	0.67***	0.67***	0.67***
	(0.030)	(0.029)	(0.029)	(0.029)
N	1,447	1,447	1,447	1,447
Adjusted R-squared	0.948	0.950	0.949	0.950

Significant at †$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Notes: Country fixed effects included in all models. Clustered standard errors in parentheses.

OLS, ordinary least squares; ISO, International Organization for Standardization; GDP, gross domestic product; FDI, foreign direct investment; NGO, nongovernmental organization.

tory governance attenuating the effects of bilateral export and investment contexts by signaling sound environmental governance to external stakeholders. In countries with stronger governance, firms may become ISO 14001 certified for other reasons, but signaling environmental stewardship to export markets and multinational home countries is not likely to be among them.

In the baseline model, the unconditional effect of bilateral export context is positive and significant, while the unconditional effect of bilateral investment context is positive but not statistically significant. Each of these unconditional relationships, however, simply reflects the mean level of an effect that actually varies substantially over different values of corruption. Export openness has a positive and statistically significant effect on ISO 14001

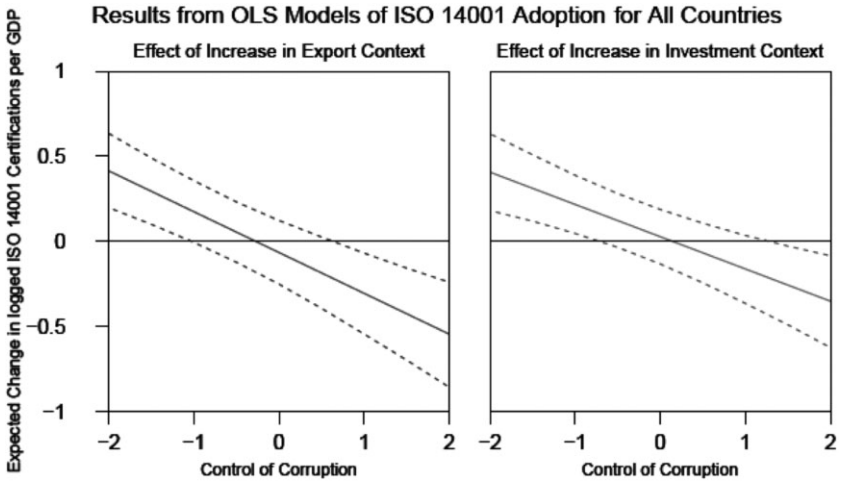

Figure 2. Graphical Presentation of Results from Models 6 and 7. The line reflects the expected change in ISO 14001 certifications when export or investment context increases from one standard deviation below the mean to one standard deviation above the mean, as this expected change varies over different levels of corruption. Results are simulated for a hypothetical country with all other independent variables at their means. Dashed lines indicate 90% confidence intervals.

certifications, while inward FDI stock as a percentage of GDP has no significant effect. Neither geographic diffusion nor diffusion through cultural networks of shared language plays a significant role in ISO 14001 adoption, highlighting the importance of international economic linkages as the primary diffusion channel. Embeddedness in networks of intergovernmental organizations also does not play a significant role. Embeddedness in networks of international NGOs, however, has a consistent positive and significant effect, suggesting that firms are responding to the actual or perceived demands from NGOs for environmental stewardship.

Among the domestic controls, total GDP (to control for the scale of the economy) is not significant, while GDP per capita has a significant and curvilinear relationship with ISO 14001 certifications. The effects of increasing GDP per capita are positive for countries with lower GDP per capita, but negative for countries with higher GDP per capita, reflecting an inverted U-shaped relationship. Primary sector composition of exports has no effect on ISO 14001 adoption. The effects of ISO 9000 adoption are positive and statistically significant, indicating spillover effects from high levels of adoption of other ISO standards. Finally, the lagged dependent variable is negative and, in some models, statistically significant. This reflects that increases in ISO 14001 certifications

tend to proceed intermittently in each country, with little serial correlation across time that is not due to other factors. In a robustness check that omits the lagged dependent variable (Models 13 and 14), the model results are highly similar, and our main variables of interest retain their expected sign and significance.

We also conduct several further checks to ensure that our main results are robust to different modeling choices. Models 9 and 10 restrict the panel to developing countries only. Models 11 and 12 use Transparency International's Corruption Perceptions Index as an alternative corruption measure. As mentioned before, Models 13 and 14 omit the lagged dependent variable. Finally, Models 15 and 16 include year fixed effects to account for the global time trends in ISO 14001 adoption patterns. In each of these models, the interaction terms between the corruption measure and the bilateral and context variables remain negative and statistically significant at $p < .001$ levels (see Supporting Information Tables S1–S4).

Finally, it is important to note that our results are not consistent with an alternative explanation whereby firms adopt ISO 14001 in greater numbers in corrupt countries because there the costs of certification are lower. The unconditional effect of the corruption indicator, in models without any interaction terms, shows that there is less ISO adoption in more corrupt countries. This is the opposite of what we would expect if corruption leads to greater adoption because certification is cheaper. Further, if certification costs were lower in countries with weak regulatory institutions, thereby encouraging ISO 14001 uptake, we would find greater rates of adoption across all such countries. However, once we include interaction terms, our results show that the effect of weak regulatory institutions is relevant for ISO uptake only where there is a "demand" for the ISO signal from external markets. Thus, we find that among countries with weak regulatory institutions, adoption is greater in those that are more strongly linked via global supply chains to destination countries that value ISO certification, relative to those that are not so connected.

Conclusion

Domestic institutions shape global diffusion processes because the pressures and pulls of global markets and global investors are refracted through domestic institutions. Firms do not necessarily favor poor environmental governance; some firms might favor institutions that allow them to proclaim their environmental credentials. Furthermore, when public law cannot provide such

environmental assurances, these firms might look for private alternatives.

Specifically, we find that firms in countries where environmental regulations are poorly enforced will have incentives to adopt private regulatory programs such as ISO 14001 certifications only if their overseas customers and stakeholders recognize the value of this voluntary program. Where public regulation is credible, stakeholders in wealthy countries with strong preferences for environmental standards will apply their perception of a country's environmental regulations to firms producing in that country. These firms will thus see less need to adopt environmental management standards like ISO 14001. In countries where public regulation is not credible, due to the ability of producers to bribe officials to avoid enforcement of environmental regulations, external stakeholders are likely to apply that country's "dirty" reputation to firms producing there, unless those firms take steps to bolster their reputations with costly signals, like ISO 14001 certification.

Our results also have implications for discussion of the role of the "shadow of hierarchy" in the diffusion of voluntary programs. Some scholars suggest that only where a credible threat of state action exists will firms "voluntarily" adopt private standards—implying a residual role of the state even in nonstate regulatory programs (Heritier & Eckert 2008). Our results, however, support the argument made by Börzel and Risse (2010) that external forces and social norms can encourage adoption, suggesting substitution for the shadow of hierarchy even in areas of limited governance. We find that it is *only* in corrupt countries—precisely those where the potential for the shadow of hierarchy to drive adoption of private standards is at its *least*—where the preferences of external stakeholders drive the adoption of private standards.

Finally, our results raise potentially troubling questions about future trends—questions that cannot be answered by the present study but should be addressed by scholars in the future. If private standards driven by supply chain or MNE relationships with external stakeholders are filling the gap left by poor quality of state institutions, what does it mean for the future ability of the state to take on the role of providing public standards in a credible way? The increase in the use of private standards in precisely those areas of least state capacity to enforce environmental regulations may perpetuate such abdications of "responsibility" by the government, and deter efforts by future policy entrepreneurs from strengthening state capacity in those areas. Alternately, increased levels of environmental performance and compliance with de jure regulation may decrease the potential adjustment costs, and thus political opposition, to future attempts to strengthen state capacity. Given the tendency of institutional quality in general, and specific variables

like corruption in particular, to remain stubbornly stable over time, many may still conclude that the substitution of private for public standards remains a good outcome despite these concerns.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1. Robustness checks of model results. Models 9 and 10 are negative binomial count models using a panel of developing countries only. Models 11 and 12 use an alternative corruption measure, Transparency International's Corruption Perceptions Index. Intercept and country fixed effects not reported to save space.
Table S2. Robustness checks of model results. Models 13 and 14 omit the lagged dependent variable. Models 15 and 16 include year fixed effects. Intercept, country fixed effects, and year fixed effects (for Models 15 and 16) not reported to save space.
Table S3. Robustness checks of model results. Models 17 and 18 include spatial lags based on ISO 9001 adoption in trade and investment partner countries. Models 19 and 20 include spatial lags based on GDP per capita in partner countries. Models 21 and 22 include an additional control variable for the logged number of international environmental treaties a country has signed or ratified. Intercept and country fixed effects not reported to save space.
Table S4. List of countries included in the analysis.