GREENING CHINA

The Benefits of Trade and Foreign Direct Investment

Ka Zeng and Joshua Eastin

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For Fei and Ellen; For Allie

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Contents

CHAPTER 1

Theoretical Contentions and Analytical Approaches

The debate over the effects of trade liberalization and foreign direct investment (FDI), or economic "globalization," on environmental protection has generated intense scrutiny from environmentalists, policymakers, and academics alike. On the one hand, many economists and globalization proponents contend that the economic gains captured from free trade and FDI offset environmental damage by increasing host-country wealth. In their view, increased wealth empowers citizens and enables higher levels of domestic investment in environmental protection.[1] On the other hand, environmentalists and trade critics argue that a reduction of trade barriers and an increase in FDI should increase environmental pollution, especially in less-developed countries (LDCs) that lack the willingness or capacity to maintain stringent environmental regulation.[2] They argue that in order to remain competitive in a global environment, developing-country governments have incentive to reduce environmental regulatory standards to attract increased levels of foreign investment and maintain competitiveness in export markets. This process generates a "race to the bottom" (RTB) among political jurisdictions competing for investment and low-cost export production. Investors motivated by cost savings seek out these "pollution havens" (PH) to establish production operations, creating a vicious circle of diminishing regulation and increasing pollution.

China is a key front in this debate. Yet, analysts have generated surprisingly little empirical evidence from China to inform it. It's even more surprising given China's phenomenal economic growth, its increasing integration into the global economy, and its ability to affect both the global ecology and global en-

vironmental negotiations.[3] This project seeks to fill this lacuna through an extensive, multimethod empirical examination of the effects of increasing trade and investment on the Chinese environment.

Our results challenge both the pollution-haven and the race-to-the-bottom hypotheses. We find that foreign firms do not seek out pollution havens in China. Nor do Chinese provinces lower environmental standards to attract foreign investment. We find that trade can actually increase the financial incentives of export-oriented firms to self-regulate environmental performance to developed-world regulatory standards in the mode of the California Effect.[4] Further, we find that FDI from the developed world conveys superior regulatory standards from parent company to subsidiary and facilitates the international diffusion and spillover of environmentally cleaner technology.[5] Ultimately, we expect increasing trade and investment to lead to an overall improvement in Chinese environmental health. However, as our book elaborates, it matters whom the trade is with, and where the FDI originates. The following sections provide an overview of our project and detail our key theoretical contentions.

BACKGROUND AND OVERVIEW OF THE PROJECT

Unfortunately, China's remarkable economic growth in recent decades has been accompanied by considerable environmental externalities. China is currently experiencing environmental degradation on a monumental scale. Industrial, agricultural, and municipal pollution is at or exceeding catastrophic levels for much of the Chinese population. In its rush toward economic modernization, China absorbed the products and processes that fueled similar industrializations in the United States and Europe, but in a world more vulnerable to their costs. The costs, both financial and human, have been high. Recent reports from China's State Environmental Protection Administration (SEPA) claim that environmental pollution costs the Chinese economy approximately 10 percent of annual gross domestic product (GDP), though some estimates measure the actual cost, in terms of human life and livelihood, to be much higher.[6]

Environmental pollution is manifested in different forms, with the most serious threats arising from industrial, agricultural, and municipal air and water pollution. These threats are both local *and* global in nature. According to the Netherlands Environmental Assessment Agency, China is the largest overall emitter of greenhouse gases in the world and emits roughly twice the amount of sulfur dioxide and particulate matter as does the United States.[7] This has se-

rious health consequences for Chinese people, but the problem floats well beyond China's borders. With the right wind directions, air pollution can easily blow across international boundaries and into the atmosphere, driving up global temperatures, fueling acid rain, and affecting the respiratory health of people everywhere.

Putrid water undermines the health and prosperity of the Chinese and those downstream that rely on Chinese rivers for drinking and fishing. For Chinese people, water pollution is catastrophic, as China supports a fifth of the world population with access to only 7 percent of the global water supply. Some 90 percent of Chinese cities and 75 percent of Chinese lakes suffer from some degree of water contamination from effluent discharge. As an example, a Chinese newspaper recently described the pollution in the Yangtze River, the primary water supply for 186 cities and hundreds of millions of people, as "cancerous" and provided warning from Chinese environmental experts that the Yangtze could be dead within five years if it remains untreated.[8] Similar conditions imperil riparian environments across the country. For those downstream that rely on Chinese water, the problem is equally acute. An explosion in 2005 at a petrochemical plant in Jilin province dumped hundreds of tons of benzene, a potent carcinogen, into the Songhua River. The Songhua flows directly into the Heilong River and is the primary water source for the 700,000 people in the Russian city of Khabarovsk. The spill severely contaminated the water supply and is expected to affect fish quality long into the future.[9]

The severity of China's environmental problems raises important questions about sources and potential solutions. While previous studies have focused on the domestic politics of Chinese environmental management,[10] much less scholarly attention has been devoted to the environmental impact of China's growing international economic integration.[11] Nevertheless, given that integration constitutes an important engine of China's economic dynamism, it is imperative to understand how these forces affect Chinese environmental protection. The purpose of this study, therefore, is to seek to understand the ways in which the international market influences both provincial-level environmental policy outcomes *and* the behavior of firms operating in China.

This book links two related conceptual frameworks that have hitherto been treated separately: the pollution-haven hypothesis and the race-to-the-bottom hypothesis. As a common public critique of economic globalization, the race-to-the-bottom hypothesis implies that states or regions compete to attract foreign investment by disregarding environmental standards (or engaging in a race to the bottom). Because the types of industrial investment that find these

sites financially attractive are primarily pollution-intensive, locales that support this behavior become known as pollution havens. Based on this distinction, the RTB and PH arguments represent two sides of the same coin: while the RTB hypothesis illustrates the conduct of government, the PH conjecture depicts the outcome of firm response to that conduct. Researchers of these hypotheses generally frame their arguments around two primary assumptions: first, that the outflow of FDI from developed countries is positively associated with the level of environmental regulatory stringency; and second, the inflow of FDI to developing countries is positively associated with an increase in pollution levels.[12] In this book we empirically examine both of these assertions.

In addition to dissecting the relationship between the firm, the Chinese province, and the environmental outcome of variation in trade and investment flows, this book questions the assumption that all firms are created equal. Research into firm behavior has demonstrated that firms are both products of the environment in which they are created and shaped by the actors they engage.[13] The "trading-up" and "investing-up" phenomena described below help to illustrate these dynamics. According to the trading-up hypothesis, firms that trade with environmentally regulated jurisdictions should have financial incentive to exhibit superior environmental behavior. Vogel uses the case of German automobile exports to California to illustrate how the stringent environmental regulation in importing countries exerts upward regulatory pressure on exporting firms through a threat of diminished market access.[14] Similarly, firms that originate from countries with stringent environmental regulatory norms should be more inclined to convey those norms to countries where they invest. Prakash and Potoski call this "investing up" and find empirical support through a cross-country examination of the impact of foreign investment on firm self-regulation. Using ISO 14001, one of the most well-known environmental self-regulatory programs in the world, they find that ISO adoptions in *invested* states are positively proportional to ISO adoption rates in *investing* states.[15] This indicates that firms can actually transmit constructive environmental policies and operational norms through foreign investment. However, this process can be negative as well. Though little research has been done on the corporate transmission of deficient environmental norms and policies, chapter 7 demonstrates that firms that originate in environmentally unregulated states can convey poor regulatory practices to states in which they invest. The trading-up and investing-up phenomena are important to our analysis because they highlight the consequences of stringent environmental regulation in wealthy states and illustrate the mechanisms by which policy can diffuse through international economic networks.

This book empirically examines the impact of trade and foreign investment on the Chinese environment at the provincial level. It reinforces this examination with an analysis of firm behavior in China. Specifically, we address three questions that directly bear on the PH and RTB hypotheses.

- Do firms engage in pollution-haven-seeking behavior among Chinese *provinces*?
- Does international economic integration exert upward or downward pressure on the environmental behavior of *firms* in China? Moreover, to the extent that firms are the agents driving provincial policy outcomes across Chinese provinces, how does this affect environmental conditions across and deregulatory competition among Chinese *provinces?*
- Are *provinces* that export primarily to countries with stringent environmental regulations and those that receive the bulk of their FDI from such countries more likely to have superior environmental performance? In other words, do the investing-up and trading-up phenomena apply to China?

The empirical evidence presented in this book lends little support to the pollution-haven and race-to-the-bottom hypotheses. Instead, our findings provide considerable support to the following key theoretical conjectures: (1) international investors do not engage in pollution-haven-seeking behavior at the provincial level in China, nor do officials compete to deregulate; (2) Chinese provinces that are more heavily embedded in global trade and production networks tend to have more sound environmental conditions; and (3) a province's environmental regulations are heavily influenced by the level of environmental stringency in primary export markets and FDI home countries. We briefly explain the underlying rationale for each of these theoretical conjectures in the following section.

KEY THEORETICAL CONTENTIONS

This section highlights our key arguments regarding each of the above questions. First, *multinational corporations (MNCs) do not seek out provincial pollution havens in China.* Rather, MNCs often favor the harmonization of corporate environmental policies with those of the most highly regulated markets in response to a variety of social and institutional pressures. By engaging in self-regulation, export-oriented MNCs can avoid reputation costs from increasingly sophisticated consumers who are aware of the environmental destruction

wrought by irresponsible corporate behavior, and import-competing MNCs in the host country can cultivate positive domestic public relations and enhance eco-marketing potential. Pollution-haven-seeking behavior may also be mitigated by the need for MNCs to abide by home-country environmental regulations to streamline operational efficiency and, for exporters, by concerns about regulatory trade barriers in export markets.

Furthermore, it has been argued that both export- and import-competing groups have incentives to lobby for less stringent environmental controls because such measures could confer added cost advantages on both groups.[16] However, in China, exporters already enjoy low-cost advantages against their competitors elsewhere in the market, and there are few groups that directly compete with imports from foreign countries. In other words, in China, and perhaps other large export-dependent developing economies, key domestic business groups lack strong incentives to favor less stringent environmental controls as a way of lowering production and business costs. This should render inoperative another causal mechanism linking trade openness and lax environmental regulation described in other studies.

Second, the same factors that help explain why financial incentives are not lucrative enough to induce MNC pollution-haven-seeking behavior also help us understand why *increasing trade and foreign direct investment in China do not necessarily jeopardize the Chinese environment.* Provincial officials should be reluctant to jeopardize long-term economic growth by engaging in environmental deregulatory competition because it may engender provincial reputation costs that deter future investment and subject Chinese exports to increased regulatory scrutiny in developed markets. In addition, even in absence of reputation costs as a deterrent, provincial officials are unlikely to use this strategy simply because it is not likely to be effective. Overall, we expect that China's provincial governments are more concerned with ensuring the global marketability of their existing export base and the sustainability and effectiveness of existing environmental policies. In a transition economy heavily dependent on exports, the importance of unencumbered access to global export markets outweighs any potential cost benefits of enabling "dirty" production. Because provincial governments are charged with increasing economic growth within their provinces, threats to major export market access can be quite powerful.

At the firm level, we expect firms to transfer environmental standards enshrined in developed-world import markets, such as the United States and the European Union (EU), through trade networks, along the lines of Vogel's trading-up argument.[17] Firms in China that export to environmentally stringent

consumer markets face considerable threats from the erection of environmental trade barriers. Whether or not those threats are great enough to encourage sustainable behavior is likely a function of the level of firm export dependence and the strength of environmental regulation in export markets. Further, similar to Prakash and Potoski's investing-up argument, MNCs originating in environmentally regulated markets are increasingly mandating continuity in environmental regulatory norms between the home office and subsidiary operations in China to avoid increased transaction costs and to streamline international trade. In all but a few heavily polluting industries, the residual cost savings derived from degrading local environments does not outweigh the risk of high reputation costs if an MNC, its subsidiary, or its supplier is linked to environmental destruction. This argument can also be applied to domestic firms, as MNCs could potentially use environmental performance as a supplier-selection criterion. Environmentally conscious supplier selection should instigate domestic firms to self-regulate their environmental performance to meet developed-world standards.[18] In addition, environmental technology developed in response to regulatory pressures in highly developed markets can be transferred to subsidiaries via MNC networks. This can increase both intrafirm operational efficiency and competitive pressure on host-country firms, encouraging them to environmentally innovate.

Taken together, the dynamics described above indicate that globalization may not necessarily lead firms to lower environmental standards or provincial governments to relax enforcement of existing standards to attract investment, as international pressures and technology diffusion via trade openness and FDI contribute to enhanced regulation and policy enforcement. Our statistical tests based on provincial-level pollution emission data, domestic and multinational corporate executive survey, and a case study of an MNC in the paper and paperboard industry lend substantial support to this hypothesis.

Finally, our third proposition finds support for Vogel's trading-up and Prakash and Potoski's investing-up hypotheses, which suggest that trade and FDI can serve to transmit environmental product and production standards through trade and investment networks.[19] However, we contend that not only does the aggregate amount of trade and FDI matter, the export destinations of Chinese provinces and the identity of their key foreign investors matter too. *Chinese provinces that either export to or receive most of their foreign investment from countries with more stringent environmental standards are also more likely to exhibit superior environmental performance.* In other words, trade and investment linkages encourage better environmental protection if a province's

main export markets and foreign investors have progressive environmental standards.

In short, through a thorough examination of the largest developing country in the world with a significantly growing presence in the world economy, this project generates empirical evidence to inform the contentious debate over the environmental effects of globalization. Our empirical findings may also have implications for policymakers as they attempt to harness the power of the market to safeguard global ecology.

THE APPROACH OF THE BOOK

To investigate the research questions laid out above, we focus on both provincial-level policy responses and firm behavior. We adopt multiple methods, including statistical analyses, survey analysis, and a case study, to support our theoretical contentions. The findings derived from these different methodological approaches reinforce one another, further strengthening our confidence in the validity of our main theoretical claims.

Key Analytical Foci

This book locates its analytical foci in both *provincial-level* and *firm-level* responses to the pressures generated by integration into the world market. Our emphasis on subnational policy outcomes at the provincial level is appropriate due to the substantial variation in Chinese provinces' level of integration into the international market and semiautonomy with regard to enforcement of jointly mandated environmental policies. First, the geographical distribution of trade and foreign direct investment in China is highly uneven as coastal provinces were the first to reap the benefits of liberalization policies and were thus a step ahead of inland provinces in attracting foreign trade and direct investment. This asymmetrical distribution produced a dramatic dichotomy of living standards among coastal and inland provinces and led to variation in both supply and demand of environmental policy enforcement. Second, there is also a significant disparity among provincial governments in their willingness to enact or enforce compliance with national environmental laws.[20] This stems in part from the wealth generated by the coastal provinces' geographical advantages in investment and trade attraction and from the ongoing process of power decentralization from Beijing to regional governments. This devolutionary process provided provincial authorities with more autonomy vis-à-vis the

center and enabled regional innovation to contribute to market-oriented reform.[21] It also gave provincial governments a much larger stake in environmental policy implementation and enforcement.[22] Such provincial autonomy can lead to competition in environmental as well as economic performance. Factors such as political leadership, citizen participation, different economic policies, and different degrees of exposure to global environmental practices all play a part in determining the willingness and capacity of a province or municipality to enforce existing environmental regulation.[23] Thus, the substantial variation in Chinese provinces' level of integration into the international market and provincial variation in policy implementation and enforcement provide a suitable testing ground for competing arguments about the linkage between globalization and environmental protection.

Our unique emphasis on subnational policy outcomes distinguishes our work from most existing studies of the impact of trade and foreign direct investment on the environment as well as those dealing specifically with the Chinese environment. Existing analyses of the PH and RTB hypotheses are often grounded in examinations of cross-national variation in environmental policy. To the best of our knowledge, few works have tested these hypotheses on the basis of subnational variation in environmental policy outcomes. Second, while a growing body of literature deals with the environment in China,[24] much of the work has focused on environmental conditions in China as a whole without providing detailed treatment of the diversification of provincial behavior in the realm of environmental protection. Our study fills this lacuna by engaging in a detailed examination of the subnational variation in environmental policy regulation, implementation, and enforcement. In doing so, it contributes to the growing body of literature on decentralization and provincial diversification in China.[25] While our findings are based on analyses of subnational governments in China, they should also have implications for understanding the behavior of subnational governments in other countries. If foreign investors are not driven by disparities in subnational environmental regulatory stringency in their investment decisions in a large developing country such as China, then there is less reason to expect that they should be motivated to do so in developed countries such as the United States, Canada, or Germany.

We further juxtapose our macrolevel analysis of environmental policy outcomes across Chinese provinces with a microlevel analysis of the behavior of firms located in China. Since firms are the main emitters, their behavior bears directly on observed policy outcomes across provinces. In other words, environmental protection of a given province should represent an aggregation of

the responses of firms located within that jurisdiction. By examining firm behavior, we are able to trace the process through which firms affect the implementation of and compliance with environmental rules and regulations. Our empirical work buttresses our key theoretical contentions about the transfer of corporate environmental norms and practices from the developed world to a developing country such as China.

Multifaceted Methodological Approaches

This study draws on both quantitative and qualitative methods to support its contentions. The usefulness of this strategy is enhanced by the data contained in the *China Statistical Yearbook,* published by the China State Statistical Bureau. The *China Statistical Yearbook* provides detailed data about trade, foreign direct investment, and indicators about environmental performance and implementation at the provincial level. While critics might argue that the reliability of the data published by Chinese authorities is very much in doubt, the yearbook represents the only comprehensive and systematic data source at the provincial level that we can draw upon. Moreover, to the extent that there is a bias in the data, such bias should affect all of the provinces in a similar fashion and thus partially allay potential concerns about data reliability.

We supplement our analysis of provincial-level data drawn from the *China Statistical Yearbook* with a survey analysis of business executives' attitudes toward firm self-regulation, the adoption of environmental management systems and technology, and the effect of such environmental attitudes on perceived level of firm competitiveness. This survey analysis demonstrates that the empirical patterns observed in the work derived from the *China Statistical Yearbook* are not statistical artifacts.

Finally, we reinforce our findings with a case study of a foreign-invested company in the pulp and paper industry in China—Asia Pulp & Paper (APP), headquartered in Indonesia. Our case study demonstrates that APP has undergone subtle changes in behavior from a company known for its illegal forestry practices to one that seems to increasingly heed the environmental impact of its Chinese operations. We provide evidence showing that this evolution is due, at least in part, to customer pressure from developed-world markets. This study therefore lends support to arguments about the influence of investor home-country regulatory environment (in this case transmitting poor environmental norms) *and* the impact of exporting to developed-world markets on corporate environmental behavior. Overall, the utilization of multiple methods enables

us to generate strong empirical evidence to support our main theoretical propositions.

CONTRIBUTIONS

This study makes several contributions to the existing literature. First, it adds to the study of how external pressure generated by integration into the world market influences domestic governance in environmental protection. Our analysis points out pathways through which external forces shape domestic policy outcomes. By applying the pollution-haven and race-to-the-bottom hypotheses to an important country case—China—our analysis lends credence to arguments in defense of the impact of trade and foreign direct investment on the global environment.

Second, our empirical findings amount to a strong critique of the race-to-the-bottom argument and its corollary, the pollution-haven argument, suggesting that considerations about the stringency of environmental regulation represent but one of the factors influencing business investment decisions. Instead, our findings suggest that in order to prevent the possibility of "green tariff" retaliation and to minimize operational adjustment costs in case the host country raises regulatory standards, MNCs tend to engage in self-regulation to meet developed-world regulatory standards and to implement environmental management systems and technology that surpass host-country requirements. Not only do these findings refute the RTB argument, they also challenge the view that international trade and multinational corporations serve to undermine global standards of environmental protection. Our findings suggest that environmental activists and nongovernmental organizations (NGOs) may need to revisit their strategies and to more actively involve multinational corporations in efforts to promote environmental protection.

Third, the findings have implications beyond the Chinese case. We argue that the race-to-the-bottom and pollution-haven hypotheses require careful examination of each country context to which they are applied. As indicated by the above discussion, theory and empirics underlie both sides of the PH and RTB arguments. This suggests that rather than pursuing broad, cross-national empirical analyses, the debate about the impact of economic integration on governmental behavior is best pushed forward by studies that examine perspectives with greater contextual emphasis, and by moving beyond the nation-state as a unit of analysis. To the extent that China represents the largest developing country with growing influence not only on the global economy but also

on the global ecology, the evidence presented in this project should cast, at the minimum, further doubt on the RTB and PH arguments and bolster the validity of arguments that tout the positive environmental externalities resulting from enmeshment in global trade and production networks.

ORGANIZATION OF THE BOOK

This project is composed of eight chapters. In chapter 2 we outline our key arguments through an examination of the theoretical debate over the impact of globalization on the environment in the developing world. Chapter 3 provides an introduction to the current state of environmental protection in China and its provinces. This includes an overview of the severity of environmental problems in China, the system of environmental regulation and enforcement adopted by Chinese authorities to combat the problems, and Chinese government regulation of the environmental behavior of foreign investors in China.

Chapter 4 empirically assesses the following questions. First, are foreign investors attracted to pollution havens in China? And second, what is the impact of international economic integration on cross-provincial variation in environmental protection? Since the pollution-haven and race-to-the-bottom hypotheses represent two sides of the same coin, combining our provincial-level statistical analyses of these two hypotheses into a single chapter allows us to better shed light on these theoretical constructs and the linkages among them.

Specifically, this chapter shows that provinces with higher levels of environmental protection actually tend to attract more foreign investment than those with lower levels, controlling for a range of alternative hypotheses. This result directly challenges the pollution-haven hypothesis, indicating that foreign investors tend to take into consideration a variety of factors besides the stringency of environmental regulation in a province in their siting decisions. In addition, our statistical tests provide substantial evidence supporting our key argument that provinces more integrated with the international economy via trade and FDI also tend to have lower levels of pollution emission due to self-regulation and the transfer of environmental technology.

Chapter 5 further examines the question of how the impact of trade and FDI on the environment in China may be mediated by the environmental standards of the export destination or that of the FDI home country. This chapter yields strong evidence in support of the trading-up argument, as well as some empirical support for the investing-up argument.

Chapter 6 supplements the findings presented in chapters 3 through 5 with

survey results of business executives across several industries in China. The survey results presented in this chapter support our theoretical conjecture that trade and FDI do exert a ratcheting-up effect by bringing prevailing corporate environmental norms and regulatory standards in Chinese firms' key export markets and home country of foreign direct investment to bear on the host market.

Chapter 7 supplements our findings derived mainly from quantitative analyses with a case study of Asia Pulp & Paper, a pulp and paper manufacturer originating in Indonesia with home offices in Singapore. We chose this firm specifically because APP has a poor environmental reputation in an industry known for environmental problems. In this capacity, it should present an especially hard case to test our theories. Although in this case, the norms transmitted from the investor's home country, Indonesia, were actually harmful, pressure from developed-world export markets has led to a gradual change in corporate behavior. The evidence from this case study lends additional support to the findings reported in earlier chapters. Chapter 8 concludes by discussing the theoretical and policy implications of this study.

CHAPTER 2

Debunking the "Pollution-Haven" and "Race-to-the-Bottom" Hypotheses

This book grounds its analyses in the "pollution-haven" (PH) and "race-to-the-bottom" (RTB) propositions. In doing so, we provide support for the "trading-up" and "investing-up" arguments, and the general notion that economic globalization can be beneficial to the natural environment.[1] This chapter details our primary theoretical contentions based on a critique of the existing PH and RTB literature and insights from the case of China. Its structure and conclusions are embedded in our three central arguments: *First, firms do not seek out Chinese provincial pollution havens, nor do officials engage in deregulatory competition; second, economic integration can improve environmental pollution outcomes; and third, the regulatory stringency of major export markets and major foreign investors has a significant impact on firm behavior.* Taken together, these propositions suggest that economic globalization does not necessarily have a destructive impact on the Chinese environment and may even be beneficial.

The PH and RTB hypotheses address the linkages between globalization and the environment from the firm and government perspectives, respectively. Though some of our empirical analyses address provincial-level variation, the underlying mechanisms leading to this variation derive directly from firm actions. Thus, nesting our analysis in both hypotheses enables us to provide a more comprehensive view of the impact of globalization on environmental protection in China by clearly delineating the linkages between firm and government behavior.

OVERVIEW OF THE ARGUMENT

We base our criticisms of the pollution-haven hypothesis on the logic of firm self-regulation. We argue that rather than seeking out pollution havens to reap residual environmental cost savings, firms are more concerned with the international legitimacy of brand image and the maintenance of consistent environmental regulatory policies for subsidiaries and throughout the supply chain. These mechanisms enable firms to hedge against revenue losses from environmental trade barrier erection and customer dissatisfaction upon exposure of environmentally negligent policies. Further, self-regulation of corporate environmental policies can even increase long-term firm competitiveness by preparing it for inevitable increases in regulatory stringency in host-country and developed markets.

We also argue that Chinese provinces do not race to the bottom with respect to environmental deregulation. The lack of demand for environmental deregulation is simply insufficient to motivate provincial officials to relax regulatory standards. First, the advanced environmental technology and production processes used by firms from highly regulated home countries diminish the pressure these firms might place on officials to deregulate. Second, the manufacturing processes and technologies used by these firms spur competition in local technological development and can produce technology and knowledge spillovers to other firms. This reduces the incentive of provincial officials to comply with the deregulatory demands of local firms, and it increases the environmental benefits of trade and FDI more generally.

Finally, we argue that trade and investment can encourage the development of sustainable business practices when a country or region's key export market or investment source country has rigorous environmental regulations, as predicted by the trading-up and investing-up arguments. We find that fear of trade retaliation by importing countries with stringent environmental standards can prompt exporters in less-regulated states to increase their environmental regulatory stringency. In addition, we find that foreign investors from heavily regulated states tend to replicate their environmental practices in host countries. If these arguments are valid, then we expect Chinese provinces that either export to or receive investment from heavily regulated countries to exhibit relatively more environmentally progressive behavior.

THE POLLUTION-HAVEN AND RACE-TO-THE-BOTTOM PROPOSITIONS

Do foreign firms deliberately seek out pollution havens in China? Do Chinese provincial governments engage in competitive environmental deregulation in order to attract foreign investment? Before elaborating our hypotheses, we first provide a brief survey of the existing PH and RTB literature. We argue that in addition to the criticisms leveled against these propositions, proponents of both views have largely ignored the dynamics of firm self-regulation, the effects of environmental technology transmission and spillover, and the fear of reduced export market accessibility on government officials' environmental policy calculations. The following section provides a basis for the theoretical development that follows.

An Industrial Flight toward Pollution Havens

The pollution-haven hypothesis posits that changes in comparative advantage induce variation in trade flows and industrial location.[2] It also suggests that differences in the stringency of environmental regulation may result in an "industrial flight" of dirty industries from environmentally regulated markets to areas of lax enforcement to reap the benefit of lower pollution abatement costs.[3] Theoretically, the formation of pollution havens is a consequence of an environmental race to the bottom among political jurisdictions that compete by lowering environmental standards to promote trade and attract foreign investment.[4] For government officials, the potential economic benefits of FDI offered by relaxation of environmental regulations are expected to compensate for the resulting damage. Supporters of these propositions argue that in addition to the environmental injury resulting from the expansion of production, consumption, and transportation of goods, trade liberalization could lead governments to privilege market shares over environmental protection.[5] Accordingly, industrialists in an open economy concerned about competition from abroad should fear that stringent environmental regulation may increase their costs, leading to loss of sales, employment, and investment, as well as loss of competitiveness against foreign firms. Under these circumstances, it is expected that domestic producers will apply pressure on their governments to relieve the burden of regulation, and foreign investors will follow suit through investment location decisions.[6] When national governments respond to these pressures by setting marginal abatement costs below marginal damage costs, it can result in

environmental dumping, without compensation for environmental damage. Further, as both source- and host-country governments recognize the potential benefits of FDI, critics stress that irreversible environmental and social deterioration will outweigh the benefits provided by economic growth.[7]

Although the formation of pollution havens can be linked to governmental preferences to deregulate, or to failures to enforce existing regulation, it is a consequence of an aggregation of individual firm-level investment decisions and necessitates a firm-level analysis. The idea that firms should seek out areas of minimal environmental regulation to avoid pollution control costs is theoretically sound, at least superficially. Indeed, there have been numerous examples of MNCs causing excessive environmental damage to host-country environments. However, whether or not this is common or anomalous behavior is very much in question.

Empirical results are mixed. On the one hand, some analyses find evidence that MNCs deliberately seek out areas of lax environmental regulation to avoid pollution control costs in regulated markets.[8] Some studies also find that plant location decisions or other types of FDI are driven at least in part by disparities in environmental regulatory stringency across jurisdictions.[9] For example, in a recent analysis of the investment behavior of European firms in twenty-five countries, Spatareanu discovered that a higher level of environmental regulatory stringency in the investor's home country relative to that of potential host countries indicates a higher probability of outward investment from regulated to less-regulated markets. The investment flows were also positively correlated with investment volume.[10] Alternatively, studies in different contexts have been unable to generate convincing supportive evidence that regulatory stringency is a primary determinant of firms' location decisions.[11] Javorcik and Wei found no evidence that firms engaged in pollution-intensive activities are more likely to invest in locales with weak environmental institutions or institutional enforcement capacity in eastern Europe.[12] Similarly, in an analysis of the investment behavior of Japanese firms in five highly polluting sectors, Kirkpatrick and Shimamoto found evidence suggesting that the quality of regulatory framework actually had a much greater influence on investment decisions than level of environmental regulatory stringency.[13] In Latin America, Birdsall and Wheeler find that more pollution-intensive industries actually tend to be located in more protectionist countries.[14] Using data on U.S. foreign direct investment in both developed and developing countries, Anderson and Kagan suggest that U.S. firms engaging in pollution-intensive production are also more likely to be located in countries with more stringent environmental stan-

dards.[15] In reviewing the existing literature on the PH and RTB propositions, Arik Levinson writes, "The conclusions of both the international and domestic studies of industry location are that environmental regulations do not deter investment to any statistically or economically significant degree."[16] In any case, it is fair to say that previous work has left the issue as an open-ended question.

Even in China, scholars report mixed results. While He finds that increases in environmental regulatory stringency only modestly deter capital inflow into China,[17] a recent study by Shen demonstrates little support for pollution-haven-seeking behavior on a provincial level.[18] In their firm-level study of pollution-haven-seeking behavior in China, Dean, Lovely, and Wang found no evidence that inward FDI from developed countries in the Organization for Economic Co-operation and Development (OECD), regardless of industry-level pollution intensity, engages in pollution-haven-seeking behavior.[19] In contrast, they found that highly polluting industries from Chinese sources (e.g., Hong Kong, Macao, and Taiwan) are significantly deterred by pollution taxes. They note a possible explanation for this, one that is supported in the existing literature, that investment from advanced countries exemplifies newer and cleaner technology suggesting lower pollution abatement costs and a higher probability that a plant will meet emission standards and avoid taxation. Empirical analysis of the proliferation of technology transfer in China through foreign investment channels has also yielded positive conclusions.

Critics of the PH hypothesis highlight several theoretical weaknesses. Importantly, the PH hypothesis ignores the fact that corporate preferences may vary in a way that precludes them from systematically seeking out pollution havens. In some cases, MNCs may even prefer stringent regulation to protect corporate interests.[20] For example, the strong support that the American entertainment, computer, pharmaceutical, and chemical companies have professed toward the establishment of an intellectual property rights (IPR) regime within the framework of the World Trade Organization (WTO) to minimize profit losses due to piracy of IPR products in the developing world is an example of this phenomenon. Although "corporate interest" in this sense speaks to the financial gain, or rather, loss minimization, that results from transparent laws that are reliably enforced, this logic can also be applied toward environmental regulation, as MNCs should be more inclined to invest in areas where competition is untainted by corrupt interests and where laws are equitably enforced. Moreover, in the inevitable case that governments raise regulation on domestic production or imports, MNCs that already abide by stringent regulatory standards will face far fewer adjustment costs. In this capacity, these firms will en-

joy a comparative advantage over firms in countries that fall below the raised bar, as well as the opportunity to expand and capitalize on shares in markets that operate under the highest standards.[21]

A Race to the Bottom

Whereas the PH hypothesis focuses on the investment decisions of individual firms and their aggregate effects on investment locations, the RTB debate illustrates governmental behavior in response to changes in international trade and investment flows. According to the RTB hypothesis, trade barrier reduction and FDI increases should cause relative increases in environmental pollution, especially in less developed countries (LDCs) that lack the motivation or capacity to maintain stringent environmental regulation.[22] In order to remain competitive in a global environment, governments have an incentive to minimize regulation within their jurisdiction to attract foreign investment and offer competitive advantage to domestic producers who may be undercut by foreign rivals upon trade liberalization. The result is a transnational downward convergence of domestic environmental and social standards, ultimately reducing the potential for economic gains in jurisdictions that do not participate, and expediting domestic environmental damage in those that do. Even developed-country regulations could be pulled down by the threat of MNCs fleeing to LDCs with lax environmental standards.[23]

Supporters of the RTB hypothesis argue that if globalization does induce a regulatory race to the bottom, then states more open to trade and investment should have fewer and less rigorous environmental regulations, or inadequate enforcement mechanisms to impose them. Accordingly, in an open economy, governments are compelled to scale back or ignore onerous regulations to prevent capital flight toward less regulated jurisdictions. Once a regulatory body engages in these investment attraction strategies, it is likely to exert a domino effect on states or regions with similar production-factor endowments. The RTB argument, in its strongest form, suggests a bottoming out of environmental protection, as national governments react strategically to international economic competition. It also implies that within a given nation-state, the need for local economic development compels subnational governments to relax environmental standards to the least stringent level.[24] To the extent that businesses can threaten to exit by relocating to areas where the costs of environmental regulations are lower, policymakers at both national and local levels should have incentives to ease regulatory burdens.

Analyses of the trade-environment linkage have also focused on the obligations that the WTO imposes on national governments.[25] Some argue that WTO rulings exhibit a distinct pro-trade bias, without giving due consideration to environmental concerns, in two key ways. First, and perhaps most offensive to environmentalists, is through the disregard of process and production methods (PPMs) of imports. Represented in highly publicized disputes such as the tuna-dolphin and shrimp-turtle cases, governments in developed countries were prohibited from imposing PPM standards on imports, making it difficult for them to use trade restrictions to encourage the adoption of environmental production techniques and to discourage the use of polluting methods. Second, the WTO has guidelines that concern trade in products that might potentially be unsafe for use or consumption, as found primarily in agriculturally related disputes. As an example, in trade disputes such as the EU ban on hormone-fed beef and the imposition of the five-year moratorium on genetically modified food and seeds, the WTO found the EU to be in violation of trade disruption rules citing that no technical or scientific evidence of questionable product safety *currently* exists. The above cases have often been cited by critics of the WTO as evidence of the damaging effect of global trade on the environment.[26]

Scholars criticize the race-to-the-bottom hypothesis on several accounts. Importantly, some argue that rather than leading to a regulatory race to the bottom, globalization can result in a race to the middle. The race-to-the-middle argument suggests that even though businesses may have incentives to locate operations in low-standard havens, the costs of such actions eventually compel states to increase their standards to acceptable levels. For example, in an examination of the impact of globalization on international environmental, safety, and labor standards in the shipping industry, Elizabeth DeSombre suggests that while shipowners tend to move ship registrations to states with low standards, other factors such as trade restriction imposition, dockworker boycotts, and inspection and detention processes targeting states that fail to comply with international regulatory standards all exert pressure on these states to upgrade their standards to the middle range of the regulatory spectrum.[27]

Alternatively, Porter argues that developed and rapidly industrializing countries experience asymmetrical sensitivity to competitive pressures generated by unregulated trade. The absence of political institutions that can effectively respond to public demand for tighter pollution regulation in developing countries accentuates the political drag effect, and results in the perpetuation of low and unenforced standards. This phenomenon creates a "stuck at the bot-

tom" problem where rapidly industrializing countries, rather than countries with rigorous standards, experience the most acute downward competitive pressure on environmental standards. In this view, the accession of low-standard countries (such as China) to the WTO and economic integration into the world trade regime threaten to exert even more intense downward pressure on pollution standards than what the RTB argument would predict.[28]

A primary weakness of the RTB argument is that it assumes that the preferences of capital dominate governmental calculations. Importantly, political institutions can often serve to mediate multiple demands from society and to insulate state decision makers from interest group demands.[29] Indeed, studies have shown that when confronted with globalization pressures, states often respond by increasing resources not only for labor and consumers but also for environmental protection.[30] In addition, the race-to-the-top and the race-to-the-bottom arguments both tend to neglect state heterogeneity and oversimplify cross-national variation.[31] For example, states may be more or less likely to engage in race-to-the-bottom behavior depending on their internal characteristics such as economy size and structure, political system, or the executive decision-making capacity. It is possible that countries' internal characteristics make them more or less likely to engage in race-to-the-bottom behavior.

Finally, the relationship between trade and the environment cannot be determined a priori as the environmental consequences of trade are the result of the combination of multiple effects: the scale effect—the correlation of pollution increases with heightened economic activity; the technique effect—the propensity toward cleaner production processes, management systems, and environmentally friendly technologies as wealth increases expand market environmental demands; and the composition effect—the impact of trade and investment on national industrial composition.[32] Another dimension, the income effect, suggests that as per capita incomes rise, so too should demands on governments to provide more stringent environmental regulation. However, analysts have yet to agree upon the specific threshold at which this occurs, as the effects appear to relate differently to various pollutants.[33] Nevertheless, analyses of the combination of these effects demonstrate that trade openness has positive environmental externalities, although one has to examine the effect of trade along each of these dimensions in order to understand their aggregate consequences.[34]

Scholars have subjected the policy dimensions of the RTB argument to extensive empirical scrutiny. A study by Andonova, Mansfield, and Milner lends support, finding that governments in the postcommunist world of central and

eastern Europe and the former Soviet Union placed less emphasis on the implementation of strict environmental policies as their exposure to trade openness and FDI increased.[35] They argue that stringent environmental regulation results in increased production costs. This leads import-competing firms to be edged out by less expensive foreign products, and exporting firms to lose market share to foreign competitors. These dynamics produce demand by local firms to lower environmental standards, and they hinder economically strapped governments' ability to collect taxes and enforce regulation. However, as Andonova et al. point out, the public salience of environmental concerns in these countries during the period examined was minimal, and existing environmental strategies for these governments were virtually nonexistent. This implies that RTB behavior may exist, but it has the potential to change as consumer environmental preferences evolve toward sustainable practices and as (newly independent) governments learn to manage competing demands within their jurisdictions. It also illustrates that cash-strapped governments may favor short-term solutions to economic difficulties that undermine the long-term health of a state, a hallmark of political "short-termism."[36]

Scholars examining the possibility of RTB behavior in subnational contexts also produce divergent conclusions, though results are generally optimistic. A World Bank study failed to find any meaningful discrepancy between the environmental regulations inside and outside of export processing zones (EPZs) in host countries.[37] If EPZs are established as competitive trade and investment havens, then one would expect them to be primary culprits in RTB behavior. However, this does not appear to be the case. In a study of state-level enforcement of air, water, and hazardous waste pollution control regulation in the United States, Konisky finds that while states do engage in environmental regulatory competition during the period covered by the study, they do not do so in the manner that the RTB argument would predict. Specifically, while states do respond to regulatory policies in other states in cases "where their own enforcement effort may plausibly put them at a disadvantage for attracting economic investment," they also engage in similar behavior when a state's "enforcement efforts (or lack thereof) already put it in a 'better' position than states with which it competes for economic investment."[38] In other words, his study yields evidence in support of both the race-to-the-bottom and the race-to-the-top arguments. Konisky postulates that variation in state size and industry pollution-intensity may help account for the absence of RTB-like behavior.

WHY ISN'T CHINA A POLLUTION HAVEN?

We argue that a key weakness of the PH argument is that it has overlooked firm self-regulation as an important dimension of business behavior. Indeed, perceptions of large, ruthless MNCs seeking out poor less-developed jurisdictions to excessively pollute are, at best, misguided. MNC location decisions are influenced by many factors other than host-country environmental regulatory stringency.[39] Firms tend to invest in foreign markets for one of two reasons: to access host-country markets or to establish export production operations. We argue that in both cases, firms often have strong (and growing) incentives to self-regulate industrial operations to meet or exceed host-country environmental regulations.[40] For firms that establish export operations, the influence of both home and primary export market regulations can outweigh the financial savings associated with "dirty" production. In order to decrease the possibility of "green tariff" imposition in developed markets, or minimize the risk of sales loss resulting from public linkage to environmental damage, firms can self-regulate to maintain overall managerial consistency and create (or retain) public legitimacy as responsible environmental stewards.[41] For firms that invest primarily for host-country market access, the potential gains from establishing positive public relations with consumers outweigh any savings generated by environmentally destructive behavior. For both types of firms, the pervasiveness of the media and growing presence of corporate watchdog NGOs enable consumers to identify poor corporate behavior and punish offenders accordingly. The pressure for firm environmental self-regulation also exists internally as it can be associated with maintaining consistent overall business strategies and streamlined manufacturing techniques, ultimately resulting in an overall increase in production efficiency.[42] The following section provides an overview of the firm self-regulation hypothesis and details specific mechanisms of firm self-regulation.

Export Dependency and Firm Self-Regulation

Empirical research suggests that an important reason that export-oriented firms in developing countries engage in self-regulation is to prevent the use of environmental regulations in developed countries as protective trade barriers.[43] Exporters in developing countries have to weigh the benefits of lax environmental regulation and practice against the potentially devastating costs of importing-country retaliation in the form of "green" tariff imposition or a loss

of export marketability, as well as the potential costs of filing a WTO dispute should such be justified under current WTO rules.[44] To counter the prospect of trade restrictions by importing countries, exporters in less environmentally stringent jurisdictions may be compelled to meet the strictest environmental regulations and product standards prevailing in the largest export markets. For these firms, the influence of environmental regulation and market requirements of major export markets could far outweigh the regulatory influence of home or host countries.[45]

Exports account for over 30 percent of China's GDP, and the North American and European markets account for over 40 percent of Chinese exports. Thus, both foreign and domestic firms in China are clearly dependent on highly environmentally regulated markets for sales. Recent scandals resulting from poor corporate regulatory practices in Chinese-produced goods, such as those associated with pet food, toys, toothpaste, and pharmaceuticals, lend credence to the idea that regulators and consumers in developed markets are paying more attention to imported product content and production methods. Though not directly linked to environmental pollution emission in China, the negative international exposure is indicative of an overall trend toward increased oversight of Chinese (and possibly other LDC) production processes and products. The possibility of tariff imposition, product recalls, and corporate reputation costs due to negative publicity increases the costs of environmentally damaging production and reduces the incentive for firms to seek out pollution havens. Similarly, these processes increase the long-term benefits associated with transparent firm environmental regulations throughout the commodity chain and environmentally sustainable production practices and product standards relative to the short-term savings associated with lax environmental regulation.

David Vogel argues that the level of economic dependence on regulated markets is directly associated with the export of environmental regulatory and product standards to firms in less-regulated economies.[46] Dubbed the California Effect, this argument refers to the role of regulated political jurisdictions in fostering a race to the top among firms with respect to product standards enshrined in governmental regulation. In contrast to the Delaware Effect, which assumes that more stringent regulatory product standards represent a source of competitive disadvantage, the California Effect actually offers a competitive advantage for firms that self-regulate toward higher standards because it is easier for them to meet the regulatory standards in all markets. Although this argument applies primarily to product standards, we expect that increased international visibility of producers in LDCs, fostered by international product

scandals, negative environmental publicity, and increased scrutiny by environmental NGOs, should facilitate an increase in both firm and governmental attention to production processes. As an added benefit of tighter regulation, firms can capitalize on the imposition (either internal or external) of stringent environmental regulations through marketing campaigns designed to promote the environmentally sensitive production of their particular good, or "eco-marketing." If this argument is valid, then firms in LDCs with more stringent environmental product and production standards should have a distinct competitive advantage over LDC "dirty" producers in that they are more responsive to changes in environmental regulation in either market and less susceptible to environmental criticism. The benefits to firms that maintain common standards across diverse national jurisdictions are reinforced by the political power of constituencies in highly regulated markets that advocate superior environmental standards at home and abroad.[47]

Local Market Access and Firm Self-Regulation

Many of the claims made above about the importance of firm self-regulation and the impact of developed-world regulatory stringency and consumer preferences also apply to firms that invest for local market access. First, firms must weigh the financial benefits of excessive environmental pollution against the costs of damaging domestic relations among host-country consumers. The increasing number of corporate watchdog NGOs and environmental activists in China and elsewhere in the developing world are enhancing the power of developing-world consumers vis-à-vis multinational corporations. As foreign firms are especially susceptible to accusations of poor corporate practices from domestic host-country competitors, they must be as rigorous as possible in mandating strict corporate environmental production practices. The resulting increases in corporate accountability reduce the financial attractiveness of pollution-haven-seeking behavior. This is especially relevant in growing economies such as China, where homegrown companies can play off nationalistic sympathies to create competitive advantage.

Second, many MNCs that invest in less-developed economies such as China also have extensive operations in highly regulated developed markets. This implies accountability to consumers in these markets, as well as those in the host market. The omnipresent specter of global media demands that firms cannot easily get away with claims of environmental sustainability in one market while degrading another. Although the extent to which media coverage impacts firm decisions is a function of media freedom in a particular economy, the Chinese

government is increasingly allowing media and NGO corporate watchdogs to assist them in monitoring corporate activity.[48]

Methods of Firm Self-Regulation

The above arguments interpret the logic of firm self-regulation and demonstrate that pollution-haven-seeking behavior undermines corporate legitimacy and profitability. This section details some additional motivations behind self-regulation and methods of implementation of different self-regulatory mechanisms. The arguments touting the methods and effectiveness of self-regulation as a deterrent to unpredictable increases in long-term external costs and international diminution of brand legitimacy are not new. The empirical evidence supports these contentions, suggesting that firms, especially those from OECD countries, may promote environmental ideas and practices or engage in self-regulation in response to existing standards in developed home and export markets, pressure from environmental interest groups, and pressure from consumers facilitated by media attention.[49] *Self-regulation* in this capacity refers to the policies implemented by foreign-invested and domestic firms in developing countries to respond to consumer preferences and product standards in highly regulated export markets (e.g., the California Effect).

Researchers have previously identified several means by which firms self-regulate their environmental performance to hedge losses caused by linkages to poor environmental practices.[50] First, it has been shown that firms self-regulate by developing internal "green" environmental management systems (EMS).[51] They do so in response to both national and international environmental regulations, and apply them transnationally throughout the company. These internal strategies can enable the firm to outperform the competition by maintaining consistency throughout and ultimately creating efficiency-based economies of scope. Strategy development is dependent upon a number of factors, including the home country of the firm, the markets of operation, and the environmental regulatory exposure. Porter and Van Der Linde argue that firms based in countries with strict domestic regulations, such as the United States, Canada, or the European Union (EU), are more apt to develop a management strategy that accommodates a higher level of environmental performance, making it easier to export those strategies to subsidiaries abroad.[52] The implementation of EMS by subsidiaries in countries with less stringent regulation offers them a competitive advantage over domestic host-country firms by making them more efficient in environmentally sensitive manufacturing operations and more responsive to stringent regulation in primary export markets and changes in host-country

regulations. The development of these environmental innovations enables firms to improve resource productivity, thereby offsetting compliance costs.

Second, internal pressure to self-regulate from investors motivated by normative and financial concerns is evidenced by the use of investment screening mechanisms and shareholder advocacy. Screening funds allow investors to "screen" potential investments through a filter, discarding those that do not meet the criteria established by the investment fund. The growth of screened funds has exploded in recent years, rising from $12 billion in 1995 to $202 billion in 2007, in the United States alone. In the same year, socially responsible investing, including screened funds, screened separate accounts, shareholder advocacy, and community investing totaled $2.71 trillion in the United States, a 324 percent increase from 1995.[53] Labor and environmental screens consistently rank in the top four of the most consequential screens.[54] In addition, shareholder advocacy has become an integral part of firm self-regulatory motivation. Through the use of voting rights and direct communiqué in the form of advocacy campaigns, resolutions, and corporate dialogue, shareholders concerned with both environmentally oriented normative issues and financial issues related to decreasing overall firm risk exposure have succeeded in instigating firms to self-regulate their environmental performance through the adoption of changes in international environmental codes and company policies.[55]

Third, in response to external pressure from corporate customers and other market-based incentives, MNCs have substantially increased their adoption of environmental management systems such as the International Standards Organization's ISO 14001, a nongovernmental process-based set of regulations.[56] Numerous studies have assessed the effectiveness of EMS adoption on environmental performance, concluding that their proliferation in recent years suggests that firms often operate with environmental standards that surpass host-country regulation in the developing world.[57] However, the ability of EMSs, such as ISO 14001, to actually act as a vehicle for the transmission of environmental standards abroad via FDI has only begun to be understood. Prakash and Potoski make the investing-up argument that FDI can serve as a mechanism for a ratcheting-up of corporate environmental practices.[58] Examining a panel of 98 countries and a subset of 74 developing countries, they found that high levels of ISO adoption in the home country significantly increase the likelihood of ISO adoption in developing host countries. This result correlates strongly with the case of China: concomitant with a steady stream of investment inflows, the number of registered ISO 14001 certified operations in China has increased from a mere 81 in 1998 to almost 20,000 by 2008, making China the country with the second largest number of such operations in the world, though per

capita adoption in China remains low by comparison.[59] In a survey of 118 foreign-owned and domestic firms operating in China, Christmann and Taylor found that multinational ownership, multinational customers, and exports to developed countries positively affect environmental compliance through an increase in firm self-regulation and ISO 14001 adoption.[60] The above evidence contradicts the pollution-haven or industrial flight argument by suggesting that MNCs with home operations in highly regulated markets encourage, rather than ignore, the adoption of sound environmental policies by their subsidiaries abroad.

Fourth, in response to increased pressure from export consumers, often facilitated by nongovernmental organizations and corporate watchdog groups, MNCs can exert pressure on subsidiaries and suppliers in developing countries to self-regulate their environmental performance to surpass local standards.[61] In the case of China, NGOs such as the China Environmental Protection Foundation (CEPF) are playing an increasingly important role in raising consumer awareness of the importance of firm-level contribution to environmental protection. In 2004 CEPF awarded their first ever China Environment Prize to Otis Elevator Co, a unit of the U.S. multinational United Technologies Corporation (UTX), for its commitment to maintaining environmental regulatory standards and practices that exceed local laws.[62]

Finally, MNCs increasingly incorporate environmental performance and product requirements as supplier-selection criteria. For example, corporations such as Toyota, Ford, and Shell all include certain environmental performance requirements when selecting suppliers.[63] In short, as MNCs increasingly engage in self-regulation of environmental performance, it will follow that global standards of uniformity that go beyond national requirements will develop and supplant themselves as the new environmental norms.[64]

In sum, we argue that the convergence of the dynamics illustrated in this section provides a strong case for the first main proposition of this book: *international investors do not engage in pollution-haven-seeking behavior at the provincial level in China (proposition 1).*

WHY DON'T PROVINCIAL GOVERNMENTS RACE TO THE BOTTOM?

If firm self-regulation mitigates pollution-haven-seeking behavior, then how does this affect the decision-making behavior of governments, the other player in the game? Should we expect provincial governments to compete to reduce

environmental regulatory standards or enforcement to attract foreign investors and increase local firm competitiveness? We argue that increasing reputation, environmental, and economic costs, as well as diminished firm demand, preclude provincial officials from engaging in deregulatory competition. In this section, we elaborate our argument and critical evaluation of the race-to-the-bottom hypothesis.

Our critique of the RTB hypothesis as it applies to China is twofold. First, there is minimal demand from developed-world investment capital and developed-world exporters (both foreign-invested and domestic) on provincial governments to reduce environmental regulatory stringency because of the effects of developed market regulation and consumer preferences on firm behavior, as discussed in the PH section. Furthermore, the development of environmental production technology in regulated markets enables cheaper and cleaner production. We call this the demand effect—as demand placed on provincial governments for environmental deregulation is reduced, so too is supply. Second, despite huge disparities in provincial comparative advantage and industrial output (the composition effect), level of industrial development (the scale effect), per capita income (the income effect), and production methods (the technique effect), the benefits of environmental deregulation in all provinces are diluted by the costs associated with environmentally competitive behavior among provinces. Specifically, provincial leaders charged with maintaining high levels of economic growth find it more advantageous to capitalize on the positive environmental externalities of trade with and investment from environmentally regulated markets than to attract capital and encourage domestic competitiveness through deregulation.[65] The following section details each of these arguments in turn.

The Demand Effect

The RTB argument hinges on the assumption that firms always prefer less regulation. While this may be true in some instances, it is becoming less so in the area of pollution emission, as consumer preferences alter business strategies, and as the evolution of cleaner production methods decreases production costs across industries. We contend that firm self-regulation (as discussed previously) and environmental technology development and spillover reduce the demand that industry places on provincial governments to supply pollution havens. Firms develop production technology in response to market demand and regulatory pressure. In environmentally regulated, developed markets,

both of these causal mechanisms facilitate the development of environmental production technology that decreases the costs of clean(er) production.[66] Further, research has found that FDI from rich countries acts as a conduit for the international diffusion of cleaner environmental technologies and management systems to developing countries.[67] When these firms invest in China or other developing markets, the technology they developed in the home country already gives them a cost advantage over domestic firms. This reduces their incentive to demand less regulation from provincial host governments.

Empirical studies demonstrate that MNC subsidiaries in developed countries engage in information transfer, including both organizational knowledge and technology transfer, with other divisions of the MNC.[68] Ivarsson and Alvstam find that interfirm linkages enhance these transfers.[69] The sharing of environmental technology among developed-world firms and Chinese subsidiaries reduces the incentive for these firms both to demand lower environmental regulation and to credibly threaten exit as a cost-saving strategy. For purely domestic firms that rely on developed-world exports, demands for reduced environmental regulation may be redundant or counterproductive because of the growing importance of cleaner production to regulators and consumers in developed export markets.

A counterargument to the above contention suggests that in response to increased competition from technologically superior developed-world firms, all other firms operating in China should increase pressure on provincial governments to reduce regulation. Because purely domestic Chinese industry composes a substantial proportion of total industry, and because trade with and investment from regulated markets do not constitute the entirety of Chinese trade and investment, the pressure to reduce regulation should induce provincial governments to comply. We believe this is wrong for two reasons: first, although increased competition from technologically superior rivals may encourage calls for deregulation, it should also spur technological development. Understanding this, provincial officials may encourage this process, rather than face increased social and international criticism for lax regulatory stringency. Second, in addition to spurring domestic technological development, there is evidence that investment from regulated markets can engender knowledge and technology spillovers to purely domestic firms.[70] This indicates that some firms may benefit from investment by technologically superior rivals, as worker mobility and product sales facilitate knowledge increases. For example, in their case study analysis of two companies operating in Shanghai, Li and Yeung found that technology transfer has much more of an economic impact than

FDI data has previously suggested, and it extends well beyond the invested region.[71] As an additional example, a 1998 survey of power plants in China indicates that FDI has contributed significantly to an overall increase in power plant energy efficiency as a large number of these plants now use advanced energy-efficient technologies such as combined-cycle gas turbines, integrated gasification combined-cycle turbines, and fluidized-bed combustion.[72] Thus, as a result of increased competition, technological spillover, and the upward thrust of market forces, trade openness and foreign investment can raise the environmental operating standards for all firms in a developing economy, thereby reducing demand on government to lessen environmental regulatory stringency or enforcement.

The Positive Economic Impact of Environmental Regulation

Provincial leaders in China are evaluated and (presumably) retained and promoted based on the economic performance of their province.[73] This creates strong incentives among these leaders to ensure long-term provincial economic growth. Undoubtedly, a primary impetus to growth in many Chinese provinces follows from trade and foreign direct investment. In provinces that are heavily trade dependent, officials should be reluctant to jeopardize the developed-world export market accessibility of local manufacturing industry. We argue that one way to ensure continued export market accessibility of firms in trade-dependent provinces is for provincial officials to guarantee that their provinces can not be categorized as "pollution havens." Environmentally poor production processes may not only diminish the export market accessibility of individual firms but also result in the labeling of a particular province or locale as a pollution haven. Such a moniker could generate reputation costs if international NGOs and corporate watchdog groups link provincial production with excessive environmental damage. These economic and reputation costs could jeopardize both the market accessibility of existing firms *and* future foreign investment decisions from companies that shun linkage to environmental destruction. We argue that this dynamic creates economic incentive among provincial officials to tighten environmental regulatory stringency to mitigate the potential export costs of the pollution-haven reputation. This likely explains (at least partially) why we find that provinces that are more open to trade and investment also tend to be environmentally cleaner.

Although some foreign investors may eschew investment in provinces with substandard environmental policy enforcement to avoid reputation costs out

of ideological considerations or to prevent unfair competition from local firms that maintain negligent business strategies,[74] it is not clear that this applies to all investors equally. Provincial officials may be less concerned (broadly speaking) with the consequences of environmental deregulation or poor policy enforcement on foreign investment decisions. In the absence of concerns by provincial officials about the effects of reputation costs on investment, we find that firms investing in China do not have generalizable financial incentives to seek out provincial pollution havens. Rather, we find little evidence that firms predicate investment decisions on provincial environmental regulatory stringency. The fact that China is the largest FDI destination in the developing world indicates that there are many factors beyond environmental regulation that entice inward foreign investment. Further, when determining where to direct investment flows within China, MNCs also face a wide array of locational differences that may affect investment decisions. There exist substantial provincial discrepancies in infrastructure, education level, income level, market size, geographic advantage, and level of economic development that may account for the uneven distribution of FDI. Even in the most pollution intensive of industries, factors such as land and labor cost differentials and available infrastructure also play heavily into location decisions.

Along the same lines, it has also been argued that firms operating in LDCs, regardless of environmental regulatory stringency, tend to have lower pollution control costs than those operating in developed nations because the labor and materials used for pollution abatement cost less.[75] In particular, heavy polluters tend to have lower per unit pollution costs because pollution abatement is subject to economies of scale.[76] This suggests that the financial incentive for pollution-haven-seeking behavior might be minimal to all but the heaviest polluters. Moreover, the use of environmental regulatory stringency as an explanation for international capital flows is inherently endogenous. As income increases with trade and FDI inflows, so too should environmental regulation, making pollution havens a transient phenomenon.[77] These dynamics indicate that even in the absence of strong provincial official attention to the effects of regulation on investment decisions, regulatory disparities do not induce investment shifts to pollution havens and thus do not motivate RTB behavior.

In sum, we argue that Chinese provincial officials do not engage in regulatory competition as a means for investment attraction and growth encouragement. Although the thrust of our work is aimed at the firm perspective of the RTB and PH debate, our analysis of the impact of economic integration on pollution outputs in chapter 4 lends insight into the deregulatory demands placed

on Chinese provincial governments. The empirical evidence presented in this chapter indicates that increasing levels of trade and investment are not harmful to the Chinese environment and may actually be beneficial. This, coupled with the positive environmental externalities of foreign investment discussed previously, leads us to expect that *Chinese provinces more dependent on trade and FDI should environmentally outperform those with fewer international economic linkages (proposition 2).*

DO FIRMS (AND PROVINCES) TRADE UP AND INVEST UP?

While the bulk of this book addresses the pollution-haven and race-to-the-bottom hypotheses, we also address and empirically test the closely associated trading-up and investing-up arguments. We contend that the same factors that account for the absence of evidence for PH and RTB types of behavior in China also help us to understand the ratcheting-up effect of trade and investment on local environmental regulatory stringency.

According to the trading-up or California Effect argument, trade can elevate environmental standards in exporting countries when key import markets have stringent environmental standards.[78] Vogel argues that the threat of trade-barrier erection in importing markets on exporters in less-regulated states encourages a ratcheting-up of product standards in export markets.[79] In this sense, the total volume of trade is not as important as the specific pattern of trade among nations. Previous studies have also investigated how the trading-up argument may explain the impact of trade on cross-national variation in the diffusion of nongovernmental environmental regulations such as ISO 14001.[80] We argue that the trading-up logic can help us understand how *patterns of trade,* not simply the total volume of trade, can affect the cross-provincial variation in environmental performance in China, and that this dynamic can also apply to production standards.

We find that foreign direct investment generates a comparable effect. Similarly dubbed, the investing-up argument illustrates the positive impact of business strategies developed by firms in the highly regulated markets on investment locations in less regulated economies. Prakash and Potoski argue that FDI can generate incentives for firms to improve their environmental performance beyond host-country requirements by encouraging them to adopt self-regulatory environmental regimes like the ISO 14001 and by facilitating positive production knowledge and technology spillovers.[81] This dynamic is certainly applicable to MNC subsidiaries in less-regulated markets but can also apply to

MNC suppliers and other firms as MNCs demonstrate the positive externalities of these regimes and engage in worker training in areas with a mobile labor supply.[82] This dynamic lends credence to those who posit that FDI can lead to a divergence (rather than convergence) in global corporate practices, as distinct regulatory environments can be partially replicated through MNC investment decisions.[83] In adapting insights from the investing-up argument to the case of China, we argue that FDI from environmentally regulated markets is likely to result in improved provincial environmental protection, especially when it originates from countries that maintain stringent environmental regulations.

We expect that the environmental behavior of Chinese firms *and* provinces should be heavily influenced by the environmental standards of the external actors with which they interact. Specifically, *Chinese provinces that export to or receive investment from countries or regions with stringent environmental regulations should engage in more rigorous environmental regulation (proposition 3).*

DISCUSSION

We contend that rather than relocating to areas of lax environmental regulatory stringency, firms often environmentally regulate themselves and their subsidiaries and encourage the self-regulation of their suppliers based on consumer preferences in export markets and the environmental norms and policies developed from home-country operations. In some instances, MNCs, even in highly polluting industries, lobby host governments to elevate environmental standards in their jurisdiction to increase competitiveness against less-regulated domestic rivals.[84] At the same time, provincial governments face dwindling demand from private industries to relax environmental regulation and are compelled by the need to provide unimpeded export-market accessibility for local firms to maintain rigorous environmental standards.

Though there have certainly been cases of MNCs polluting host-country environments or anecdotal evidence of environmental deregulation by host governments, the theoretical and empirical substantiation in this book presents strong evidence that firms and governments do not engage in such behavior systematically.

The thrust of our argument rests on forces and mechanisms external to the firm itself. Although chapter 7 of this book is a case study of a foreign firm operating in China, the processes highlighted in that chapter are illustrative of our overall argument and do not attempt to "unpack the firm" in order to demonstrate internal processes that lead to divergent outcomes. This limitation, while

purposive, does not diminish the importance of research that attempts to explain firm environmental outcomes through internal mechanisms, as does Prakash, or the cascade of environmental business norms among international firm networks, as does Kollman.[85] Indeed we believe the exploration of internal firm dynamics is another fruitful avenue for future research. However, in approaching this project, the generalizability, or breadth, offered by external arguments and basic assumptions of profit-seeking motives outweigh the gains in depth one might achieve from making arguments specific to the inner workings of individual firms.

In addition, our argument about the positive environmental impact of trade and foreign investment rests in large part on the logic of industry self-regulation. Questions may therefore arise as to the effectiveness of such practices, especially in developing countries. Given that firm self-regulation remains voluntary, with rather minimal requirements in certain areas, such practices are likely to produce little positive environmental impact in the long term.

In response, we argue that certification costs, particularly for non-developed-country firms, are not insignificant and therefore represent a fairly clear commitment to sustainable business practices. Furthermore, existing theoretical and empirical literature suggests that the adoption of voluntary environmental programs such as ISO 14001 does result in improved corporate environmental conduct that conforms to broader societal objectives. For example, the literature on nonstate environmental governance suggests that voluntary environmental programs can mitigate against shirking of members' environmental commitments either through sociological pressures from other firms or stakeholders that prod members to comply with program requirements or through institutional designs that ensure more effective monitoring and sanctioning programs.[86] By participating in a voluntary program, a firm can signal its commitment to environmentally friendly policies, thus earning the goodwill of stakeholders and lowering its perceived risks of environmental misconduct as assessed by banks, insurers, and stock markets.[87]

While existing empirical studies have not reached definitive conclusions about voluntary environmental program efficacy, there is some evidence that they are effective in improving members' environmental record. For example, a study by Dasgupta, Hettige, and Wheeler indicates that Mexican firms that have adopted ISO 14001 more frequently report compliance with government regulations than those who have not signed up for the program.[88] Through a cross-national analysis of ISO 14001 adoption, Prakash and Potoski suggest that while firms in different policy and economic contexts attach varying value to the pro-

gram, joining ISO 14001 "reduces the amount of time members spend out of compliance with government regulations and reduces the amount of toxic pollutants they release into the atmosphere."[89] Other studies have also yielded evidence showing that participation in voluntary programs such as ISO 14001 or the 35/50 voluntary program sponsored by the Environmental Protection Agency (EPA) reduces firms' pollution emissions.[90] In short, the above discussion suggests that far from being a token gesture to improve corporate environmental behavior, firm self-regulation via voluntary programs such as ISO 14001 can have a tangible impact on firm environmental and regulatory performance.

In conclusion, this chapter presents our critique of the pollution-haven and race-to-the-bottom hypotheses and develops our key theoretical propositions. Before engaging in empirical tests of our main hypotheses, we first turn to a critical review of the Chinese government's regulation of foreign direct investment in the era of economic reform. This review provides no indication that foreign firms have rigorously lobbied the Chinese government to relax environmental regulation as China's regulation of the environmental impact of FDI has become more stringent since the early 1980s.

CHAPTER 3

Environmental Pollution and Regulation in China

This chapter introduces China's perilous environmental situation and the steps the Chinese government has taken to address what some have called "one of the greatest environmental threats the earth has ever faced."[1] We highlight the actors involved in the system of Chinese environmental protection, with particular attention to the limited role of the environmental protection agencies in enforcing local environmental regulations. We also discuss attempts by the Chinese government to regulate the environmental impact of foreign investment projects.

In recent years, the Chinese government has progressively improved the legal framework for regulating foreign investment in response to concerns about foreign pollution-intensive investment and adoption of outdated, environmentally damaging technology. China has developed a set of detailed and stringent criteria for governing the environmental impact of foreign investment. However, the real obstacle has not been policy development but local government policy implementation. As in many other areas of policy-making in China, the pursuit of local economic development often takes precedence over other socioeconomic priorities such as environmental protection or health and safety regulation. As a result, the central government has yet to strengthen its oversight of local governments to minimize local government intervention in the work of environmental protection agencies at various levels. This has led to a complete lack of cross-provincial conformity in screening foreign investment projects and enforcing central injunctions.

The first section of this chapter provides an overview of China's increas-

ingly perilous environmental conditions, justifying our analysis of how China's growing integration into the world economy shapes its environment. The following section lays out China's system of environmental governance by presenting an analysis of the actors and institutions involved in China's environmental policy-making process. The chapter then turns to focus on the Chinese government's legislative attempts to regulate the impact of foreign investment, tracing the development of China's legal framework for governing foreign investment since the early 1980s.

CHINA'S MOUNTING ENVIRONMENTAL PROBLEMS

China is currently experiencing environmental degradation on a monumental scale. While reforms have produced remarkable economic growth and resulted in substantially improved living standards for many Chinese citizens, rapid industrialization and minimal oversight have inflicted considerable environmental damage. Environmental pollution in China is manifested in many areas, but air and water pollution, industrial waste, and deforestation have had the greatest consequences—and not just for China. Spillovers and pollution disasters severely affect surrounding countries and the Earth at large through increased climate change risk. The following sections detail the threats posed by various pollutants, identifying key causes and consequences.

Air Pollution

Air pollution poses a significant threat to the Chinese environment. A recent World Bank analysis reports that only 1 percent of China's 560 million urbanites breathe air that is considered safe by EU standards. This research is based on urban measurements of PM 10, a descriptive term for fine-grained particulate matter such as soot, aerosol, and fine dust. Only Cairo has higher average measurements than Beijing.[2] According to a report released by the Worldwatch Institute in Washington, DC, sixteen of the twenty cities in the world with the most serious air pollution can be found in China.[3] While China has become the world's largest producer of steel, aluminum, coke, cement, chemicals, and other environmentally high-cost goods, it also has become its smokestack.

China has also emerged as a leading emitter of carbon, sulfur dioxide, particulate matter, and other greenhouse gases. China has recently surpassed the United States to become the world's leading emitter of carbon dioxide (CO_2).[4] According to the Netherlands Environmental Assessment Agency, Chinese CO_2

emissions grew by 8 percent in 2007 and accounted for two-thirds of the total increase in global CO_2 emissions that year. The same source suggests that China contributes to 24 percent of global CO_2 emissions.[5] Estimates of the annual growth rate of China's CO_2 emissions vary widely, ranging from conservative estimates of 2.5 to 5 percent between 2004 and 2010 to less sanguine forecasts of 11 percent for the same period.[6] While China's CO_2 emissions on a per capita basis remain far behind that of the United States, its population and economic scale make the country a primary cause for concern in global attempts to combat greenhouse gas emissions.

Coal and cement are two key factors contributing to such high (and increasing) CO_2 emissions. China is awash in cheap, accessible coal. China builds two or three new coal-fired power plants *per week,* and has for quite some time. The low-cost design of these plants means that they are less efficient and emit more CO_2. Moreover, to the extent that these plants are meant to last for somewhere between forty and seventy-five years, it seems highly unlikely that China will be able to eliminate or substantially reduce their numbers in the near future.[7] Cement production has also increased drastically in recent decades as the rush toward modernization has increased the demand for infrastructural development. Consequently, China now accounts for half of all global cement production, and a fifth of China's total CO_2 emissions can be traced to the cement industry.

China is also the ultimate global emitter of sulfur dioxide (SO_2), a potentially much more environmentally destructive gas. In 2006, China emitted a staggering 26 million tons of SO_2 into the atmosphere, producing untold amounts of damage from acid rain and contributing to the rapidly increasing numbers of citizens affected by cardiopulmonary lung disease, cancer, emphysema, and other respiratory illnesses. Sulfur dioxide and particulate matter emissions from coal-fired electric plants contribute to an estimated 400,000 premature deaths per year and result in annual economic losses of around 500 billion yuan.[8] Indeed, the utilization of coal as the primary Chinese energy source has contributed enormously to China's overall SO_2 emissions, to the health detriment of rural and urban residents alike. But it is not the only culprit. Millions of city dwellers choke on unregulated diesel emissions from the multitudinous trucks that supply China's economic boom, trucks so numerous that many cities permit only nocturnal operation.

Unfortunately, CO_2, SO_2, and other greenhouse gases are not the only airborne challenges faced by China. The rapid expansion of the Gobi desert, fueled by overcultivation and deforestation, is also a tremendous problem. The

yellow dust of the Gobi regularly coats Beijing in a thick blanket of filth, forcing citizens to suffer the summers with doors closed or face the consequences of noxious, dusty air. Indifferent to international borders, dense clouds of particulate matter from the Gobi combined with various other pollutants have been spotted by American satellites as they leave China, cross over Seoul and the Pacific Ocean, and finally hit the United States' western shores.[9] Such occurrences are not uncommon. Dust particles regularly bind with industrial pollutants such as arsenic, cadmium, and lead produced from China's industrial boom, forming huge clouds that blow into surrounding areas, shrouding cities like Seoul in a debilitating yellow cloud of toxic smog.[10]

Water Pollution

Putrid water threatens many Chinese cities and towns. With China's already inadequate water resources and rapidly deteriorating water quality, this is a challenge with no easy solution. The country supports a fifth of the world population with access to only 7 percent of the global water supply, a total that is being diminished by waterborne pollution. Some 90 percent of Chinese cities suffer from some degree of water contamination from industrial, municipal, and agricultural runoff. Damage reports are conflicting, but roughly 78 percent of the rivers and 75 percent of the lakes are polluted and incapable of being used as drinking water. More than one hundred major Chinese cities face severe water shortages, or will very soon. It is estimated that the country has an average annual shortfall of 30 billion cubic meters (m^3) in water requirements for irrigation, and a shortfall of 6 billion cubic meters for urban and industrial water requirements.[11]

The Huang River in northern China provides a stark example of pollution damage done to already overextended water supplies. It is estimated that toxic sludge from the discharge of industrial pollutants such as ammonia, phenols, and nitrates accounts for about 5 percent of the river's average daily runoff, and that number increases to more than half during the dry season. About 65 percent of the entire river basin falls into the worst two categories of state-prescribed standards, and only 8 percent meets either first- or second-class standards. Such extreme levels of pollution have severely affected the Huang's ability to serve as a main source of irrigation and industrial water supply for the millions of Chinese citizens that rely on it, with those residing on and around its lower reaches experiencing the most detrimental effects.[12]

Although larger rivers make larger pollution receptacles, it is the smaller rivers and tributaries with their lower-volume flows that are arguably suffering the worst effects of the pollution. Annual average densities of phenols were an alarming 69 times the national standard in the Liao River, and 7 times the standard in the Hai River. Biological oxygen demand (BOD), chemical oxygen demand (COD), nitrogen, mercury, and other heavy metals also far exceed state-prescribed standards.[13] According to a survey conducted in the 1990s, up to 75 percent of the river sections in the Huai River basin are no longer fit for use as drinking water. Serious pollution caused by chemical, paper, dyeing, leather, and liquor factory discharges led 80 percent of the Huai's tributaries to have black and green water, causing millions to lose access to their primary water source.[14] In response to floods and pollution accidents in 1992 and 1994, the central government adopted a major pollution control plan for the Huai River, ordering local authorities to shut down highly polluting factories and threatening to impose charges and fines on industries and government officials that failed to comply with stringent regulations. Unfortunately, the difficulties faced by local governments to accommodate compliance were compounded by factory closures and diminished tax revenue streams. Examples of this, in recent years, are not uncommon as provincial governments struggle to accommodate growth and sustain livelihood, while at the same time ensuring environmental sustainability.

Unfortunately, the problems affecting China's waterways do not end in the north; they reach every corner of China and affect rich and poor alike. In southern China, supplying the prosperous city of Guangzhou, the water in the Zhu River has deteriorated to such an extent that it now regularly falls into categories of 4 and 5, the most polluted by governmental standards. The release of industrial wastewater containing heavily polluting substances and residential sewage, pollution from ships and boats, and chemical fertilizers all contribute to the contamination of the Zhu River and affect the health of the entire Guangzhou metropolitan area.

While reducing these problems is not impossible, it does require considerable organizational mobilization and foresight to make the most effective use of investment funds, make wise choices about industrial relocation, impose higher levies on highly polluting factories and facilities, and establish quality control and discharge permit systems.[15] These solutions are not beyond the Chinese government's reach, but they will take time, creativity, and, most important, political will.

Solid Waste

Solid waste management presents yet another challenge to Chinese environmental protection. National statistics hint at the magnitude of the problem. National Environmental Protection Agency (NEPA) data suggests that state-owned enterprises (SOEs) have released 645 million tons of industrial waste just since 1995. Power generation and mining compose the lion's share, while chemical and metallurgical industries contribute another 70 and 30 million tons, respectively. Of this total number, 142 million tons have been treated, while 22 million tons have been released directly into the environment as untreated toxic waste. Sichuan, Yunnan, and Shaanxi have the worst practices.[16] Industrial waste reuse rates vary widely, from 20 percent in some provinces to 65 percent or more in some cities. Treatment rates vary as well, ranging from 0 to 30 percent.[17] Prevention and control of industrial dumping, toxic waste in particular, are difficult due to the inability of the Environmental Protection Bureaus (EPBs) to prevent factories from storing it on their own ground, limited expert knowledge about toxic substances, and the prohibitive cleanup costs of polluted soils.

Deforestation

Forest destruction is one of China's oldest problems, and one with the most diverse consequences. The past five thousand years have witnessed the cyclical deforestation of China for fuelwood consumption, timber, paper and chopstick production, cropland cultivation, and other agricultural and economic expansion.[18] Although such a long time-frame has allowed the Chinese to witness and harvest many forest life cycles, the last fifty years have perhaps been the most destructive in history.[19] The population boom, minimal forest management and oversight, and vastly increased domestic forest product demand have reduced China's forest cover to a mere 18.5 percent of total landmass, up from a low of 16 percent in 1999. Currently only Tibet and some parts of Yunnan province contain any remnants of what could be considered virgin forestland.

Within China deforestation has produced a dramatic array of environmental effects from wildlife habitat destruction to erosion-facilitated floods. NGOs such as the World Wildlife Federation (WWF) and the Rainforest Alliance have been working for years to stop logging to protect threatened and endangered species such as the giant panda and Indo-Chinese tiger. Erosion-induced flooding has become increasingly destructive, in some cases costing billions of yuan

in economic damages and thousands of lives. Some of the most dramatic examples have occurred in recent years. In 1998, massive flooding on the Yangtze prompted governmental officials to place a complete logging ban in thirteen provinces and autonomous regions on the upper Yangtze to promote forest regeneration.

Chinese deforestation has had some profound global effects. First, as a result of rampant logging, China has nowhere near the capacity to sustain contemporary domestic demand for forest products. In light of this, China relies heavily on forest imports from surrounding countries to maintain production and consumption levels. Currently China is the second largest importer of forest products in the world behind the United States. Although roughly 63.5 percent of China's pulp and timber imports are sourced from verified sustainably managed forests, the remainder likely originates in eastern Russia, Indonesia, Burma, and elsewhere in Southeast Asia, where forest governance capability is minimal and sustainable harvest practices unlikely.[20] The second major global impact of Chinese deforestation lies in the relationship between forest cover and global warming. Forests act as a major carbon sink, or repository for CO_2. When forests are removed, stored CO_2 escapes into the atmosphere, and future CO_2 emissions are left with reduced storage facilities.[21] Recognizing this, the Kyoto Protocol, the primary intergovernmental treaty on climate change, directly addresses the importance of forest sustenance by allowing participating countries to meet carbon targets with the use of "forest credits."[22] These forest credits can be applied to overall carbon emission targets, providing a counterbalance to carbon emissions.

The Role of the Chinese Government in Combating Pollution

China's mounting environmental problems make it imperative for the government to adopt effective pollution control programs. Indeed, in recent years the Chinese government seems to have increasingly recognized the need to balance the tensions between economic development and environmental protection. For example, Beijing made improving environmental quality and protecting natural habitats key priorities of social and economic development during its tenth five-year plan period, from 2001 to 2005. It has also adopted specific environmental protection strategies, especially in such areas as nature conservation and water resource management.[23] The eleventh National Five-Year Plan for Environmental Protection, from 2005 to 2010, spells out key environmental targets to be met by the end of the plan period, including reducing sulfur dioxide

by 10 percent, cutting back on greenhouse gas emissions, and making polluters pay for cleanup. The plan reflects a clear governmental recognition of the importance of strained environmental resources, and it represents a major effort to raise public awareness and funding for environmental protection.[24]

However, the Chinese government has not been entirely successful in addressing the environmental externalities of rapid economic growth. On the one hand, Chinese government agencies have passed regulations designed to raise environmental standards and have periodically cracked down on offenders. For example, in January 2007, SEPA investigations found that four major power firms and four highly polluted cities did not meet energy consumption and emission reduction goals in 2006. The agency subsequently issued an injunction banning these entities from undertaking new development projects until they brought their environmental performance up to governmental standards.[25] On the other hand, these crackdowns have been considered as primarily public relations moves that had little tangible impact. According to Elizabeth Economy, the promulgation of rules and regulations and periodic attacks against offenders are mostly significant for their symbolic value. While the government intends to convey its resolution to clean up pollution through these gestures, it has refrained from their use in the absence of incentives.[26]

CHINA'S SYSTEM OF ENVIRONMENTAL GOVERNANCE: THE ACTORS

The following section addresses the Chinese administrative system for environmental protection. Specifically, we discuss how well the environmental protection bureaucracy is suited to its task and how effective the government has been in minimizing the negative environmental externalities of inward foreign investment. While Chinese authorities have substantially improved the country's legislative framework for environmental protection, problems associated with legal implementation, including bureaucratic weakness, substantial local autonomy, and limited environmental NGO influence, have severely impaired the ability of the central government to implement environmental laws and to rein in recalcitrant local and business actors.

The Power of Local Environmental Protection Bureaus vis-à-vis Local Governments

The Chinese environmental bureaucracy is charged with environmental policy creation and implementation. The organization and capacity of this bureau-

cracy largely determine the extent to which the Chinese state is able to provide environmental policy enforcement. A key problem with this system, as many studies have emphasized, is the degree of autonomy possessed by local governments.[27] This autonomy has substantially curtailed the center's ability to effectively enforce environmental regulations and ensure local policy compliance. This bureaucratic structure bears considerable resemblance to the pattern of "fragmented authoritarianism" that characterizes the overall decision-making process in China.[28]

Environmental policy-making is the responsibility of the State Environmental Protection Agency and occurs at both the national and subnational levels. The program of environmental protection is based on the principle of a "polluter pays" levy collection system, where firms that pollute above a certain threshold pay a levy proportional to their pollution discharge. Firms are responsible to self-report emissions to local environmental agencies and pay under the threat of surprise inspections. Local and national regulators set pollution concentration standards jointly, while only national regulators establish levy rates and threshold parameters. This formula allows for substantial local variation in levy collection for otherwise identical pollutants and industries. In addition, pollution levies can be discounted or eliminated at the discretion of local environmental inspectors, postinspection, giving provincial authorities much latitude with regard to treatment of foreign and domestic polluters.[29]

In March 2008, SEPA gained considerable status and prestige when it was updated to the level of ministry. As this is such a recent development, whether or not the newly anointed Ministry of Environmental Protection (MEP) will improve upon SEPA's performance remains to be seen.[30] Although MEP leadership remains the same, with Zhou Shengxian as its head, it appears that the MEP mandate did receive a boost, though the extent is unclear. In any case, the elevation may allow for easier interministerial negotiation on environmental issues prior to the implementation of governmental projects.

At the national level, the MEP is charged with overseeing China's environmental policy implementation and reports directly to the State Council, which also serves as the MEP's main source of funding.[31] However, despite the authority of the MEP, its institutional effectiveness has historically been undermined by a lack of resources and enforcement capacity. For example, prior to elevation to MEP, SEPA was grossly understaffed, with only 300 full-time professionals in Beijing. In comparison, the staff of the U.S. Environmental Protection Agency, serving a country with less than one-quarter of China's population, employs an average of 9,000 just in Washington, DC.[32] Further, pollution control authority has been traditionally divided among various gov-

ernmental ministries and local governments, although, as of this writing, it appears that some of this authority has been transferred to the MEP itself under its internal Department of Pollution Control. Microlevel replicates of the MEP—the Environmental Protection Bureaus (EPBs)—bear much of the responsibility for implementing national environmental laws at the provincial, municipal, and county levels. These bureaus enforce and implement MEP policies and help draft regulations that cater to local conditions. As county-level governments constitute the locus of policy implementation in China, county-level EPBs have taken up most of the responsibility for policy enforcement, including conducting inspections, fine assessment, and environmental quality monitoring.

The principal responsibility of the local EPBs is to implement policy directives from the administrative rank directly above it. However, in reality the tasks of local EPBs are substantially complicated by the system of "fragmented authoritarianism." In this system, a governmental agency, such as an EPB, at any given level is responsible not only to the functional bureaucracy directly above it (a so-called *tiao* or vertical relationship) but also to other coordinating bodies within the same geographical jurisdiction with whom it enjoys equal authority (so-called *kuai* or horizontal relationships).[33] For example, a county-level EPB not only takes orders from the municipal-level EPB above it but also accommodates the interests of other county-level bureaucracies who may share an interest in environmental policy (such as the county-level construction bureau whose approval is needed for new investment projects with an environmental impact).

County-level EPBs are also subject to county government influence. County governments not only provide an important source of funding for local EPBs but also exercise considerable influence over the appointment and promotion of personnel within them.[34] This makes local EPB officials directly beholden to local governments in their regulatory work and subjects them to the political whims of local officials. This lack of clear accountability also diminishes any local EPB capacity to check other local governmental activity, as Huang Xihua, vice director of the environmental protection bureau of Huizhou, Guangdong Province, in reference to the performance of EPBs under the leadership of the SEPA, recently noted.

> Environmental protection bureaus at provincial level and below are under the direct leadership of local governments, who are in charge of our personnel changes and funding. . . . Eat one's hay, walk his way. It is hard for a local environmental protection bureau to work independently and monitor the government.[35]

The multiple authorities that bureaucratic entities must accommodate result in considerable interagency rivalry and competition. This system also produces gridlock and impasse in policy implementation.[36] The dependence of local EPBs on local governments means that horizontal (*kuai*) authorities often prevail over vertical (*tiao*) authorities. Overlapping bureaucratic authorities mean that interests in favor of stringent regulations are not always given first priority. Instead, competing bureaucratic interests are frequently able to insert themselves in the policy process, undermining the power and authority of local environmental protection agencies.

Environmental protection agencies at all administrative levels regularly work within a system of interministerial umbrella organizations called Environmental Protection Commissions that coordinate the work of environmental protection agencies with other functional units at the same governmental level, monitoring stations that provide the technical information needed for policy implementation, and a loose network of research institutions and university departments that assist in environmental impact assessment and equipment design.[37] Industrial ministries and companies are responsible for industry-level environmental management. In any case, although the complex task of environmental protection involves coordinated actions among a number of Chinese political actors, primary responsibility still resides in the environmental protection bureaucracy. The local EPBs evaluate the environmental impact of potential investment projects and supervise the environmental performance of factories.

While the tasks of the EPBs are by no means trivial, the fragmented nature of China's political system places considerable burdens on their functions. Local finance bureaus' budgetary control of EPBs means that local interests are frequently able to affect policy implementation and circumvent uniform compliance throughout the nation. In this context, the incentive structure of local governments has played an important role in shaping China's environmental policy outcomes.

Local authorities are often confronted with conflicting tasks of promoting local employment and production and preventing environmental degradation. Unfortunately, these officials often attach greater importance to economic development, as growth constitutes the key criterion for performance assessment. Pressure from businesses driven by revenue considerations, commercial ventures, and corruption, as well as pressure from local citizens to keep factories open all compound the problem. Despite recent moves to add environmental criteria to local officials' performance evaluations, there has been no consensus on what the criteria should be or how to implement them.[38]

Government officials' attitudes toward the environment are influenced by the "environmental Kuznets curve" (EKC) hypothesis, which posits a curvilinear relationship between economic growth and environmental protection.[39] Because economic growth is assumed to exert a positive effect on the environment after a certain income threshold is achieved, many have considered economic development to be a means of fostering better environmental protection at the expense of oversight.[40] In addition, the public good nature of environmental protection contributes to local authorities' tendency to free ride on others' contributions in environmental cleanup.

Given the numerous channels through which local officials can interfere with policy enforcement, there is little the MEP can do to rigorously enforce China's impressive set of environmental rules and regulations. Unless top party officials value environmental protection equally alongside economic growth, the MEP is likely to remain "an island of environmental awareness in a sea of disregard," and its attempts to utilize alternative measures to force better compliance are likely to remain largely ineffective.[41]

Weak Legal System

China's court system also undermines authorities' environmental regulatory enforcement capacity. While China's courts do provide legal recourse to pollution victims against companies that fail to comply with environmental standards, the system is highly dependent on local governments for funds, operating expenses, and judicial salaries.[42] This compromises its autonomy and independence. In addition, adjudication committees and party committees can bypass judges to influence court decisions, further undercutting the courts' ability to provide legal transparency and accountability.[43]

The Limited Role of Nongovernmental Organizations

China constrains the work of environmental NGOs. Although environmental NGOs have experienced steady growth since the 1990s, their ability to influence environmental policy-making is curtailed by governmental surveillance and activity suppression.[44] While the Chinese government appreciates the role of environmental NGOs in promoting environmental awareness and mitigating damage, it is wary that these groups may pose a threat to legitimacy by fomenting political unrest and impeding policy directives, or by evolving into political parties.[45] Consequently, the state restricts the number and nature of these or-

ganizations while simultaneously establishing state-sponsored groups to control resources and information flows between the government and society.[46] Nevertheless, despite these obstacles, environmental NGOs are providing an increasing counterbalance to environmental degradation through public education and awareness promotion. Guobing Yang underscores these points in a study on the rise of environmental NGOs in China. He argues that notwithstanding high levels of state intervention, these organizations have achieved some success in opening up channels of citizen participation in political processes. Environmental NGOs influence policy outcomes and contribute to the ongoing expansion of civil society by introducing new environmental rhetoric into the public discourse through civic debates and media campaigns.[47] However, this process is limited by political intervention.[48]

As an example of the heavy restrictions Chinese authorities impose on environmental NGOs, the registration and legalization process is fraught with difficulty and designed to exclude certain factions of dissent from the public sphere. Because of this, many environmental NGOs register as profit-seeking business organizations or simply do not register at all.[49] Given their ambiguous legal status, Chinese environmental NGOs often shy away from confrontational activities or "contentious politics," favoring indirect actions rather than direct altercation. Unlike their counterparts in other countries, Chinese environmental NGOs can not file court cases directly on behalf of citizens. While the number of citizen environmental protests has been on the rise, and while there are signs of growing public involvement and activism in environmental policy,[50] the activities of environmental NGOs have been primarily limited to innocuous issues that pose no direct threat to polluting industries or industrial expansion.[51]

Regardless of domestic political constraints, Chinese environmental NGOs are growing in number and scope, and will likely continue, albeit in a limited manner. In addition to domestic activity, NGOs also describe Chinese environmental problems for international observers. These budding organizations have actively participated in international environmental conferences, such as the World Summit on Sustainable Development sponsored by the United Nations in Johannesburg, South Africa. NGOs have also hosted a slew of domestic conferences with international participants. With the support of the Ford Foundation, Chinese environmentalists have established the Center for Legal Assistance to Pollution Victims in Beijing in 1999, which provides legal assistance to ordinary citizens seeking judicial redress for environmental injuries and assists in their efforts to seek remuneration from the government and private sector.[52] However, continued political interference, coupled with NGOs' embeddedness

in the broader political context, casts doubt on the ability of environmental NGOs to ever become as independent as their Western counterparts.

TEMPORAL PATTERNS OF TRADE, FDI, AND POLLUTION EMISSION

The above discussion highlights two important aspects of the development of Chinese environmental problems and policies during the reform period. First, despite an incremental strengthening of environmental NGOs, civil society, the Chinese middle class, and the legal regulatory framework for governing foreign investment and environmental pollution (discussed in the following section), local officials still have immense flexibility in enforcing central injunctions. This, combined with strong economic growth incentives for local officials, creates considerable regulatory disparities among provinces, forming ideal conditions for interprovincial competitive RTB behavior. Second, in response to a disjointed legal backdrop, foreign investors and domestic industrialists have had ample opportunity to seek out areas of lax regulatory enforcement to save on levy costs, use outlawed but cheaper production equipment, and shirk environmental production standards.

In light of the strong motivations for RTB competition and PH-seeking behavior and for collusion among local officials, foreign investors, and domestic producers, investment and trade flows should positively correlate with a relaxation of environmental regulatory stringency. However, the numbers provided in figures 3.1–3.3 indicate that as investment and trade flows have increased since the mid-1990s, so too have the ratios of treatment and removal of major environmental pollutants to overall emissions. Each of these figures details the annual level of foreign investment, exports, and imports (scaled on the right side of the graphs) alongside ratios of cleaned, treated, and removed volumes of air, wastewater, and solid waste pollution, respectively, to overall pollution discharges (scaled on the left side of the graph). Although the level of economic activity has increased aggregate levels of pollution discharge (i.e., the scale effect), the relative pollution amounts released into the environment as untreated waste have declined, in some cases precipitously. This has occurred even as foreign investment, exports, and imports have surged. This dynamic likely speaks to the income and technique effects, indicating a response by private and governmental actors to public calls for greater environmental protection *and* the use of more sophisticated and cost-effective pollution abatement equipment, respectively. While the income effect is thought to be a function of rising in-

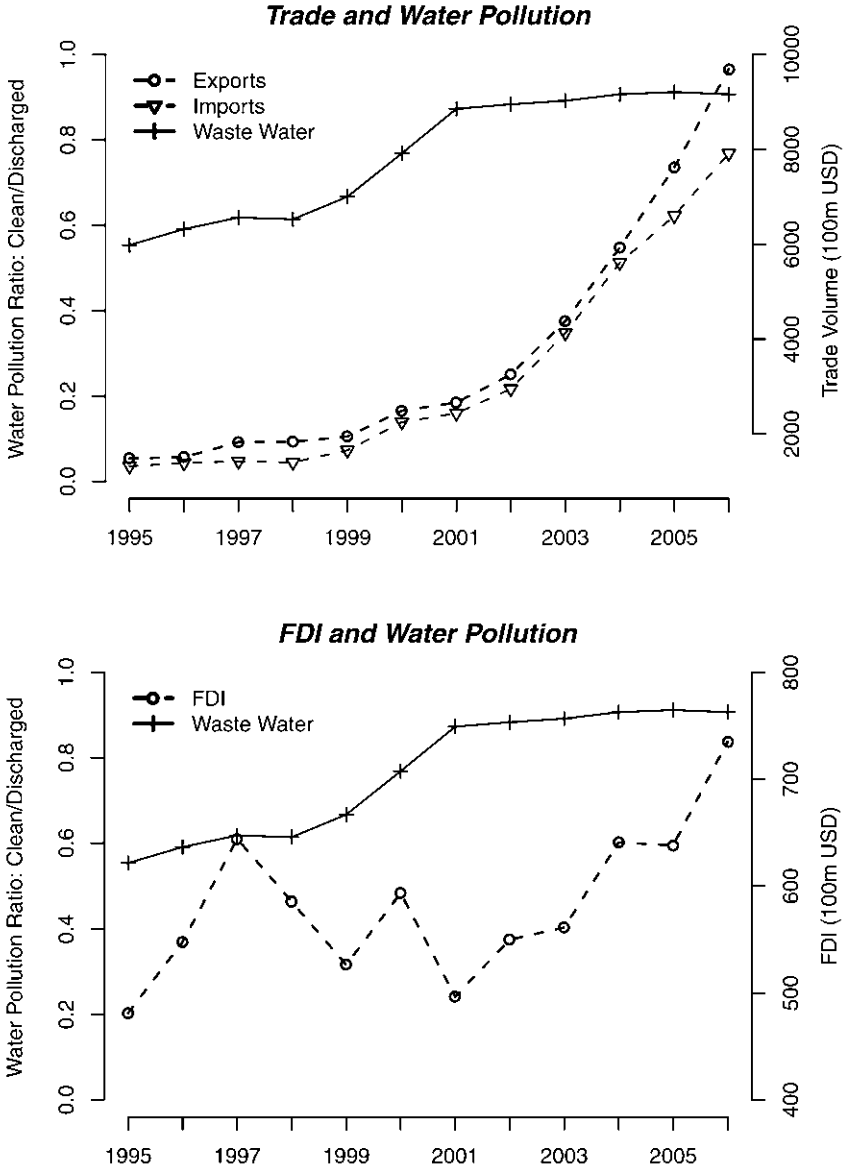

FIG. 3.1. Temporal distribution of trade, FDI, and wastewater pollution treatment. (Data from *China Statistical Yearbook*, various years.)

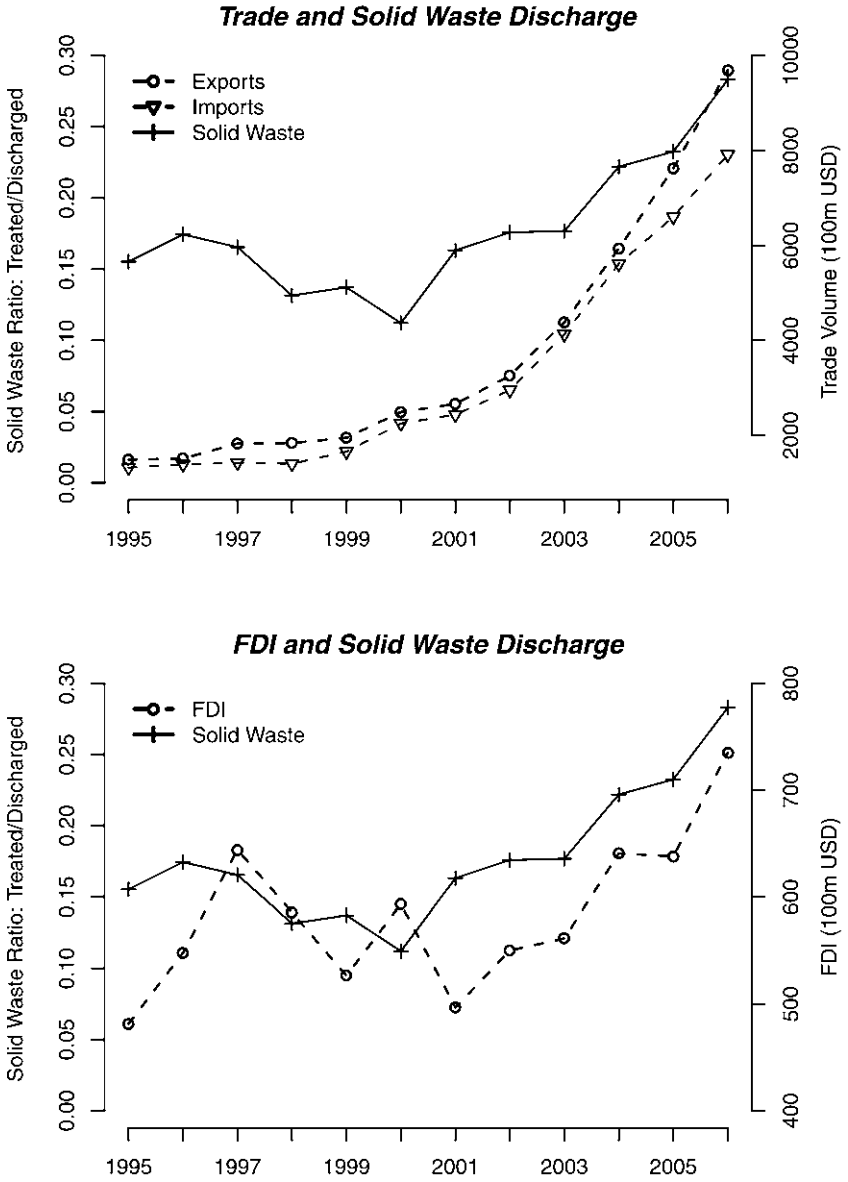

FIG. 3.2. Temporal distribution of trade, FDI, and solid waste treatment. (Data from *China Statistical Yearbook*, various years.)

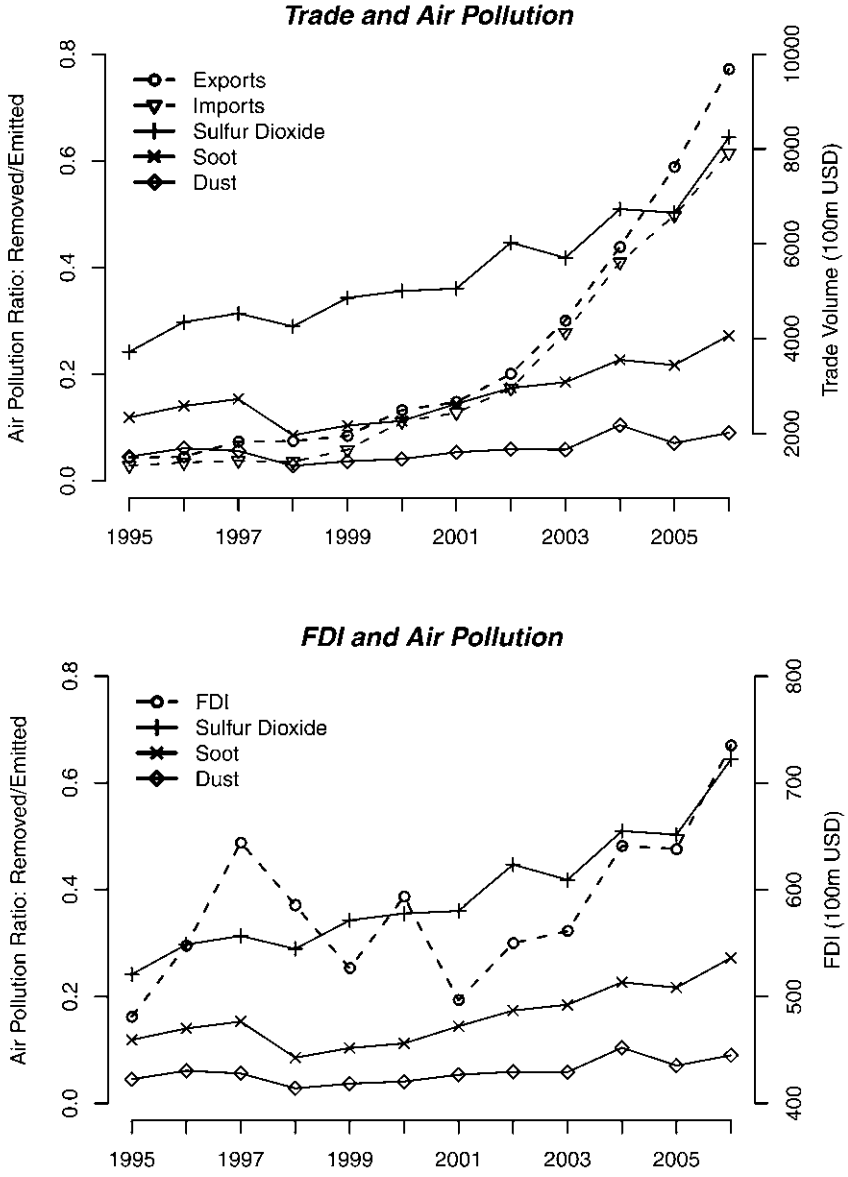

FIG. 3.3. Temporal distribution of trade, FDI, and air pollution treatment. (Data from *China Statistical Yearbook,* various years.)

comes, the technique effect is likely a result of technological and knowledge spillovers, competition-induced development, and a growing number of developed-world foreign firms included in emission reports. Though not conclusive, these figures lend support to our general propositions that pollution-haven and race-to-the-bottom behavior are anomalous, and that trade and investment may actually have a positive impact on the Chinese environment by contributing to the income and technique effects.

LEGISLATIVE ATTEMPTS TO REGULATE THE ENVIRONMENTAL IMPACT OF FOREIGN INVESTMENT

In China, the ability of local governments to circumvent injunctions from the center and to affect policy enforcement is not a new phenomenon.[53] As an old saying goes, "the mountains are high, and the emperor is far away." Indeed, as in other areas, this has been the case with respect to provincial environmental policy enforcement, especially when it contradicts economic growth generated by foreign investment. In light of this, the effectiveness of Beijing's environmental regulatory attempts has historically been mixed. There is some evidence that local governments engage in lax enforcement of the center's policies when evaluating, approving, and implementing foreign investment projects.[54]

While local government recalcitrance constitutes an important part of the problem in regulating foreign firms, an additional concern of central authorities is the tendency for foreign firms to invest in pollution-intensive industries or engage in dirty production processes. Because of this, the central government continuously attempts to strengthen China's legal framework for investment project supervision.

A number of factors influence the stringency of China's environmental regulations. First, as Lester Ross argues, domestic forces provide the primary impetus for the progressive expansion of China's environmental laws as citizen complaints of environmental pollution often prompt official responses.[55] Second, the wealth generated by China's rapid economic growth provides many resources for environmental regulatory expansion. Third, as environmental issues gain salience in China's bilateral and multilateral diplomacy, international forces are increasingly shaping China's regulatory environment by disseminating scientific knowledge and raising environmental awareness. These global forces place normative pressure on China and elevate the status of the MEP and other related bureaus.[56] While international pressure from environmental regimes, foreign governments, and NGOs plays an important role in this

process, the private sector also exerts a powerful influence.[57] The following discussion illustrates how China's regulatory framework for foreign investment attraction has become more stringent over time. This indicates that contrary to the pollution-haven hypothesis, in general foreign firms do not lobby for less stringent environmental laws at either the national or provincial levels, and they sometimes go beyond Chinese domestic law in their local operations.

Weak Legislative Framework in the Late 1970s and Early 1980s

China had relatively few restrictions on the behavior of foreign firms at the beginning of the reform era. It was not until the late 1970s that Chinese authorities first began to engage in extensive legislation concerning the environmental regulation of firm behavior. In 1979 the Chinese began to test the impact of environmental legislation designed to stem industrial pollution through economic incentives in article 18 of the *Trial Environmental Protection Law* (later ratified in 1989).[58] In the following three years, various local governments experimented with the effectiveness of this incentive system, and by 1981 the project had been implemented across China. In 1982 Beijing introduced an *Interim Procedure on Pollution Charges,* formally creating a levy system that mandated fee collection for pollution discharges.[59] Though the overall effectiveness of this system has been debated, it represented an important initial step on the path toward industrial environmental regulation and is still in effect today.

In 1981 the Chinese government issued the *Administrative Measures for Basic Construction Projects' Environmental Protection,* which contained provisions for environmental impact assessments (EIA) and delineated the EIA implementation procedure. As the *Administrative Measures* were issued at the beginning of the reform period when central planning still carried considerable weight, the provisions were of primary concern to local governments. Importantly, the *Administrative Measures* required feasibility assessments for any potential project to include an EIA. However, in effect the local industrial bureaus overseeing the various projects wielded by far the most influence over project approval. Moreover, it is not entirely clear whether or how the *Administrative Measures* applied to foreign-invested projects. Thus, while the *Administrative Measures* represented an early development of Chinese EIA regulation, early requirements were considerably vague in applicability and the locus of enforcement authority.

The weaknesses evident in the *Administrative Measures* were again on display in the *Implementing Regulations for Joint Venture Law* issued in 1983. Ulti-

mately, *Implementing Regulations* stated that pollution-intensive foreign investment projects should not be approved. However, while it provided broad specifications on the conditions under which foreign-invested projects should be permitted, it ultimately failed to give any guidelines on what constituted a pollution-intensive project. Nor did it require foreign investors to submit any type of EIA in their applications for project approval.[60] Instead, these directives were mostly concerned with the economic impact of foreign projects rather than their environmental effects.

The Progressive Strengthening of China's Environmental Laws in the Mid-1980s and Early 1990s

The steady increase in foreign investment in China in the mid-1980s and early 1990s led Chinese authorities to tighten regulations with a flurry of legislative activities over foreign investment to minimize environmental externalities. Officials introduced initial legislation directly concerning industrial pollution emission in 1984 with the *Water Pollution Prevention and Control Law* and later in 1987 with the *Air Pollution Prevention and Control Law.*[61] Laws concerning solid waste and soil contamination followed, as did the designation of various emission standards. Most of these have since been amended. The *Temporary Regulations on Enhancing the Environmental Management Practices of Economic Development Zones,* introduced in 1986, were directed primarily at local government officials overseeing the economic development zone construction. These regulations mandated that it was important for local government officials and businesses to abide by existing environmental laws during the construction process. They upheld the importance of environmental protection for local economic development and spelled out certain areas in which pollution-intensive investments were to be prohibited. These regulations also restated the requirements laid out in earlier environmental legislation (e.g., the *1979 Environmental Protection Law*) that potential investors must submit both an EIA and related information on projects' environmental impact, such as the type and amount of pollution discharges and intended abatement measures, prior to project approval.

Several other laws issued during this period also illustrate the government's growing awareness of the potential negative environmental impact of foreign investment. The Chinese government passed the *Law of the People's Republic of China on Foreign Capital Enterprises* in 1986 and the *Detailed Rules and Regulations for Implementing Foreign Capital Enterprise Law* in 1990. The latter dealt

more specifically with the environmental behavior of foreign firms. An important breakthrough of this legislation was that it specifically stated that foreign investment projects with the potential to "produce environmental pollution" should not be approved. While this law fell short of defining what exactly constituted an environmentally polluting project, it does illustrate the growing importance of environmental protection among state officials and the need to strengthen the regulatory framework governing foreign investment impact.[62]

In 1986, the *Management Procedures for Environmental Protection of Capital Construction Projects* (originally issued in 1981) was modified to include explicit guidelines for the environmental impact assessment system. The 1986 document eliminated a primary weakness of the original legislation by stating that the EIA requirements apply to domestic as well as foreign-invested enterprises. Some of the originally vague provisions in the original document were also clarified. These measures were strengthened yet again in *Procedures on the Administration of Environmental Protection of Construction Projects,* which, among other things, specifically outlined which projects were to be approved and exactly how the EIAs were to be implemented.[63]

Following the revised *Measures,* the government issued a number of other regulations that laid out even more clearly the guidelines for the EIA system. Among other things, these regulations spelled out the licensing requirements for organizations responsible for conducting construction project EIAs and the detailed procedures for EIA fee collection.[64] As a result of these regulations, foreign firms became subject to China's increasingly rigorous criteria for environmental impact assessment.

Several other regulations issued in the early 1990s dealt specifically with the environmental impact of foreign firms. The government issued regulations relating to the reprocessing of imported waste for export, admonishing local governments to more rigorously supervise, restrict, or exercise caution in approving pollution-intensive projects. Similarly, to deal with the tendency of foreign investors to use outdated and highly polluting technologies in their Chinese operations, a State Council document issued in 1993 reiterated the need to subject foreign investment projects to all necessary approval procedures.

In short, throughout the late 1980s and early 1990s, Chinese officials became increasingly aware of the potential environmental hazards of unregulated foreign investment. The government's growing concern with the environmental behavior of foreign firms was reflected in a stream of regulations released during this period that reaffirmed the importance for local government officials to follow established guidelines when approving foreign investment projects.

However, while the greater guideline specificity represented an improvement over previous legislation, the regulations unleashed during this period contained a number of weaknesses that hampered legal development of foreign investment policies. For example, laws passed during this period were considerably vague about the type of polluting projects that should be rejected. They also did not put forward a detailed penalty schedule for enterprises that failed to submit environmental data or secure EIA approval. In the absence of detailed implementation guidelines, local government officials gained considerable discretion over project approval and other areas of environmental policy implementation. Stalley suggests that while the central government was clearly aware that a lack of local enforcement contributed to the policy implementation difficulties, it was unwilling and unable to induce local government compliance.[65] It was not until the mid-1990s that more concrete criteria for policy implementation were established.

Toward More Rigorous Environmental Regulation since the Mid-1990s

Beginning in the mid-1990s, China's environmental regulatory framework went through another series of improvements. In 1995, Chinese authorities released *Provisions on Guiding the Orientation of Foreign Investment* and the *Catalogue for the Guidance of Foreign Investment Industries.* These documents were a significant improvement over the 1986 *Foreign Enterprise Law,* as they provided a detailed categorization of industries where foreign investment was "encouraged," "restricted," or "prohibited." While sectors in the "encouraged" category became eligible for preferential government policies such as tax breaks, the law mandated that those in the "restricted" category go through a rigorous and lengthy approval process with either the central or the local government.[66]

The *Catalogue* also provided a more fine-grained definition on what exactly constituted a pollution-intensive industry. Even though economic development promotion took precedence over environmental protection in the drafting of the *Catalogue,* and even though SEPA's influence on the legislation was likely minimal, it represented another step toward the strengthening of government control over the environmental aspects of foreign investment. Importantly, a number of economic activities with potentially damaging environmental impact were classified as "restricted" categories and subjected to more stringent screening during the approval process. For example, pesticides and fertilizers were removed from the "encouraged" category, while environmen-

tally friendly products and production processes such as Freon-substitution technologies and energy-saving technologies were added to the "encouraged" category. By enunciating more detailed criteria for screening foreign investment, the central government made environmental protection an important criterion in foreign investment attraction and provided greater specificity for screening polluting projects.

Amendments of the 1995 *Provisions* in 2002 and 2004 further illustrate the government's desire to limit foreign investment in pollution-intensive sectors and to contain the environmental fallout of foreign-invested projects. Both of these amendments singled out investment projects using outdated environmental technology as "restricted" categories. Similarly, in 1999 the State Economic and Trade Commission issued the *Catalogue of the Backward Production Capacities, Processes, and Products to Be Eliminated* listing products, production equipment, and processes to be prohibited. The items covered in this list range from mining and mineral extraction industries to certain products in the textile, chemical, pulp and paper, and leather industries.[67]

The *Catalogue* also prohibited the transfer, import, and distribution of these items. However, unlike its treatment of domestic firms, the *Catalogue* did not require foreign firms already producing with outlawed technology to cease operations. Instead, foreign firms were merely required to work with local governments to deal with the situation. This loophole in the document once again left local governments with substantial discretion in policy enforcement.

Legal development since the late 1990s continues to strengthen the development of China's EIA system. The Environmental Impact Assessment Law (EIA law), passed in 2002, represents a milestone in the expansion of China's EIA framework. Importantly, this law requires government development plans to include EIAs while also mandating public participation in the EIA process. The 2002 EIA law places certain government plans under external scrutiny and requires construction projects that mandate EIAs to go through a process of soliciting the government, expert, and public opinions via evidentiary meetings or testimony hearings. This is notable in that it is the first time that China's environmental regulations have emphasized public participation. To the extent that public scrutiny of investment projects has increased the pressure on foreign firms to comply with local environmental regulations, the EIA Law's explicit emphasis on public participation subjects foreign firms to greater environmental oversight.

Another important development in China's EIA system is the growing pro-

fessionalism of the EIA service agents. Historically, China's EIA service agents have been plagued with problems such as corruption and low quality. This problem became much more acute as economic growth progressed and more and more projects were being implemented without proper EIA protocol. Legislation throughout the 1990s sought to increase EIA agents' professionalism and responsibilities while enhancing agent oversight. In 1998, the government eliminated the requirement that all EIA agents must simultaneously be affiliated with a government agency to minimize government influence in the EIA process. Later initiatives focus on the EIA certification programs, strengthening the system of EIA agent management, and the creation of a national testing program for certifying EIA engineers. In 2005, the government passed a regulation that specifically prohibits environmental monitoring institutions, which often belong to the local EPB, from applying for EIA licenses, thus mitigating another potential source of conflict.

Finally, the *Criminal Law of the PRC,* passed in 1997, for the first time declared several environmental acts to be illegal, including the import of hazardous or regular waste for treatment. The *Criminal Law* also specified the penalty for both government and nongovernment entities that violate the law or fail to live up to their obligations.[68]

Ultimately, the series of legal initiatives undertaken since the mid-1990s have made China's environmental regulations more detailed, complex, and comprehensive. By specifying the type of investment that is encouraged, creating a set of legal instruments to address emerging problems in foreign operations, and steadily expanding the EIA system in China, the Chinese government has created an effective legal framework for governing foreign investments' environmental aspects. However, passing legislative measures is not the primary problem. Rather, the lack of uniformity in policy enforcement among provincial and local officials, the lack of clear structural accountability for EPBs, and the conflicting directives of environmental preservation and rapid economic growth have all led to an untenable situation for the Chinese environment. How this will change under the newly designated MEP is still in question.

CONCLUSION

This chapter has provided a brief overview of China's environmental crises, the bureaucratic system governing environmental protection in China, and a picture of the legislative development since the late 1970s designed to strengthen China's legal foundations. As a result of extensive legislation, authorities today

have a far wider range of legal instruments at their disposal to rein in noncompliant business actors. However, legislative enforcement still remains an obstacle to further implementation. In this respect, the behavior of foreign and domestic firms themselves will continue to be of paramount importance to environmental sustainability. Fortunately, at least since the mid-1990s, increases in foreign investment and trade openness have not correlated with increases in environmental deterioration.

PROVINCIAL-LEVEL ANALYSES

CHAPTER 4

Pollution Havens and Racing to the Bottom: A Provincial-Level Analysis

This chapter provides an empirical test of the pollution-haven and race-to-the-bottom hypotheses among Chinese provinces. According to the pollution-haven hypothesis, foreign investors have financial incentives to seek out areas of lax environmental regulation to establish production operations.[1] The concentration of pollution-intensive investment in these areas turns them into "pollution havens."[2] If the pollution-haven argument is valid, then Chinese provinces with lower levels of environmental regulatory stringency should attract higher levels of foreign direct investment, ceteris paribus. Conversely, the race-to-the-bottom argument posits that the need to attract FDI exerts intergovernmental competitive pressure to lower environmental standards.[3] Based on this hypothesis, Chinese provinces with greater foreign investment inflows should be less likely to stringently enforce environmental regulations, resulting in lower levels of environmental protection.

This chapter presents two empirical tests of these hypotheses by using Chinese provincial-level statistical data. These tests examine both the destination-seeking behavior of FDI in response to environmental regulatory stringency disparities among Chinese provinces *and* the impact of trade and FDI on environmental performance across Chinese provinces. As a preview of our results, our econometric analyses of the pollution-haven hypothesis find little evidence of pollution-haven-seeking behavior among foreign firms in China across specifications. Nor does our analysis of the race-to-the-bottom argument suggest that the growing amount of trade and foreign direct investment in China negatively impacts the environment, other things equal. The lack of empirical

support for both of these hypotheses lends credence to the central propositions of this book regarding the importance of firm self-regulation, the transfer of environmental management systems and technology, and the ratcheting-up effect of exporting to the world market. The first two sections of this chapter elaborate on our empirical tests and discussions of each hypothesis. This chapter concludes by highlighting its contributions and identifying future research opportunities.

EMPIRICAL TEST OF THE POLLUTION-HAVEN HYPOTHESIS

In line with previous pollution-haven analyses, our test of the pollution-haven hypothesis attempts to capture the effects of disparities in environmental regulatory stringency on investment flows. But, in a departure from previous studies that employ various proxy measures for regulatory stringency such as total pollution abatement costs, the degree of participation in various environmental treaties, the existence of environmental nongovernmental organizations operating in the host country, provincial sulfur dioxide emissions, or the provincial levy of a single pollutant (such as wastewater) as respective measures of environmental regulation,[4] we gauge provincial regulatory stringency by the annual environmental levies paid per firm in a variety of environmental pollutants, including wastewater, solid waste, industrial waste gas, radioactive waste, and an additional above-legal-limit emission levy. We argue that the use of pollution levy payouts represents a much closer approximation of the provincial regulatory environment than any of the previous dependent variables analyzed in other studies, as it actually captures the regulatory penalties faced by firms for excessive (i.e., above the legal limit) pollution emissions. Only total pollution abatement costs would, arguably, represent an equitable proxy; however, there is no consistent time-series data available for such a measure. Nevertheless, following previous studies, we also conduct empirical tests using alternative measures of the dependent variable, as detailed in the following sections.

Data

We test the pollution-haven hypothesis using provincial-level data available from the *China Statistical Yearbook*.[5] This data contains detailed information regarding annual FDI inflows, emissions levels, and primary pollutant levies at the provincial level. We focus on the 1996–2004 period as that is the only period for which we can locate consistent provincial time-series data.[6] Figure 4.1 pre-

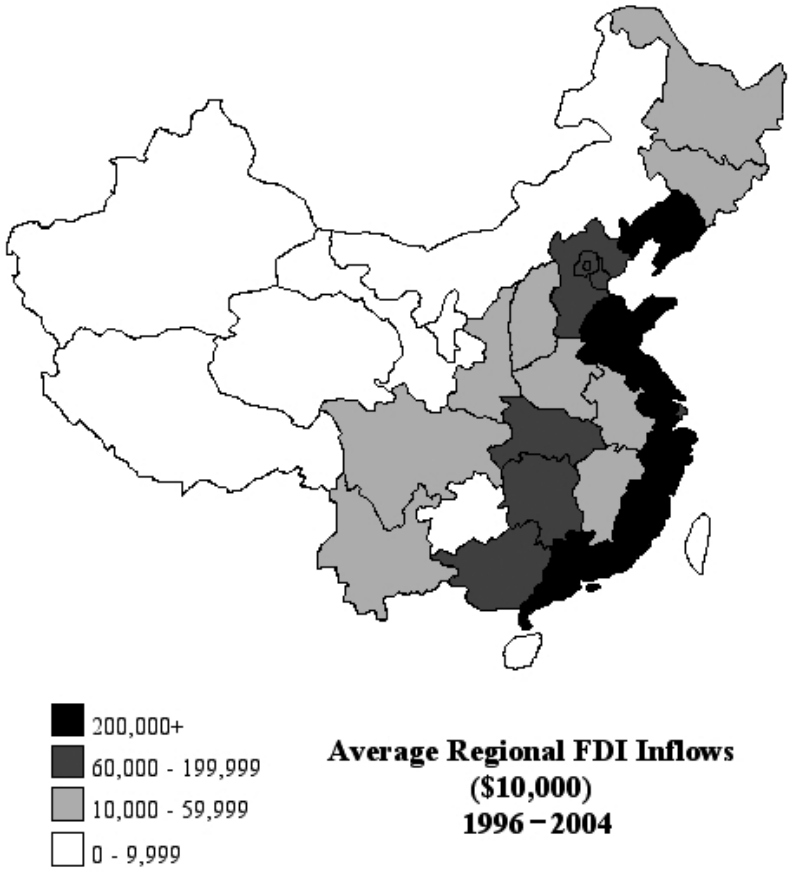

FIG. 4.1. Spatial distributions of FDI and primary pollutant levies. (Data from *China Statistical Yearbook*, various years.)

sents the spatial distributions of FDI and primary pollutant levies in China. A visual inspection of the data suggests that coastal provinces where FDI is most heavily concentrated do not necessarily have more stringent pollutant levies. In our test of the hypotheses about the potential pollution-haven-seeking behavior of FDI in China, we control for a number of alternative factors that may potentially affect the direction of foreign investment flows in order to increase the robustness of our results.

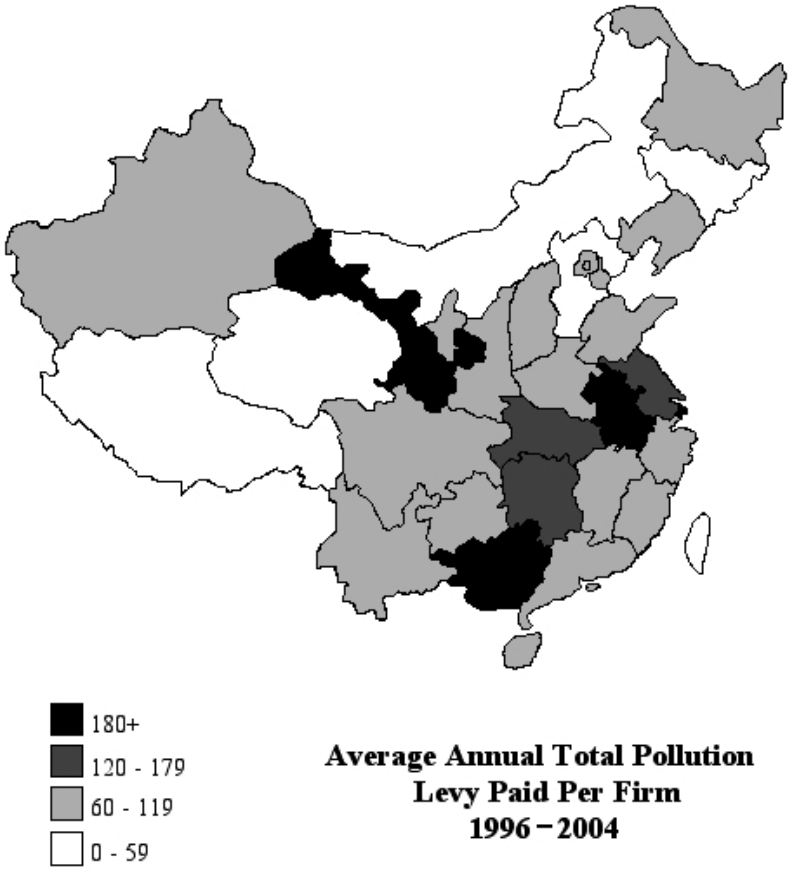

FIG. 4.1. (continued)

Dependent Variable

Our key dependent variable (*fdi/GDP*) is the actual FDI inflow into each of the Chinese provinces in each of the years examined. We normalize FDI inflows by provincial GDP to account for the possibility that larger provinces are likely to attract a greater amount of FDI. Although it may be argued that provincial FDI stock is a more adequate measure of FDI location decisions than FDI flow, we contend that this is not necessarily the case for this analysis. While a stock variable does indeed allow for the estimation of regulatory stringency on FDI accumulation and establishment, this chapter seeks only to gauge the effects of regulatory stringency at the point of investment location

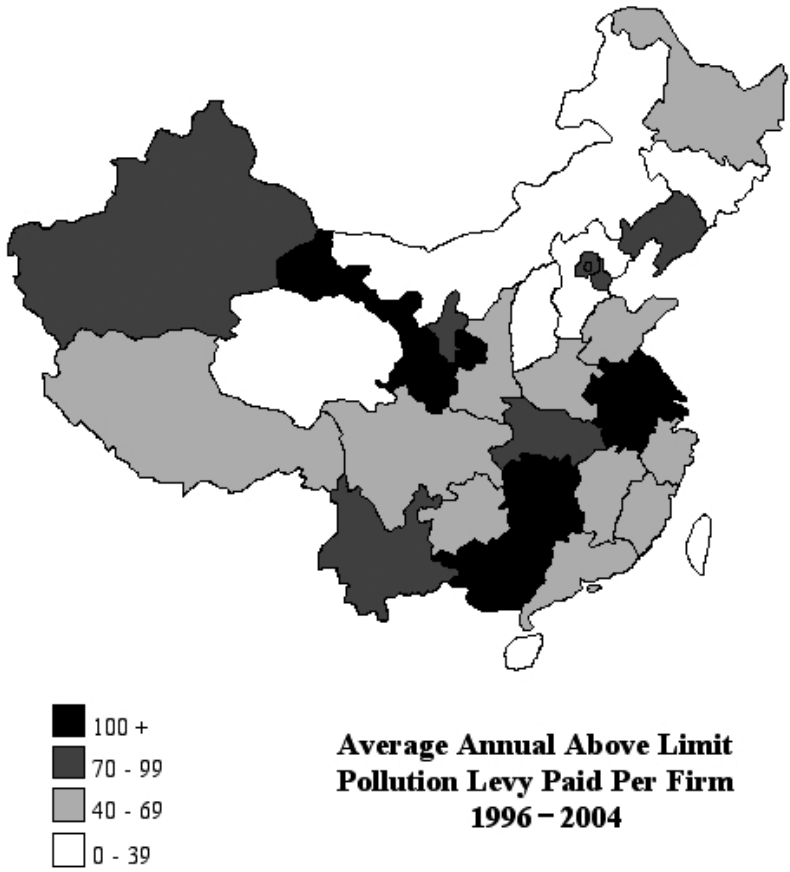

FIG. 4.1. (continued)

decision. Further, variations in capital mobility across industries limit investment *re*-location in some industries much more than others. Some industries are simply much better equipped to respond to a changing regulatory environment than others. For these reasons we argue that flow variables are better equipped to capture the effects of regulatory stringency on investment *decisions* than stock variables are.

Key Independent Variable

Our key independent variable in this analysis is provincial environmental regulatory stringency. We calculate regulatory stringency using data published by

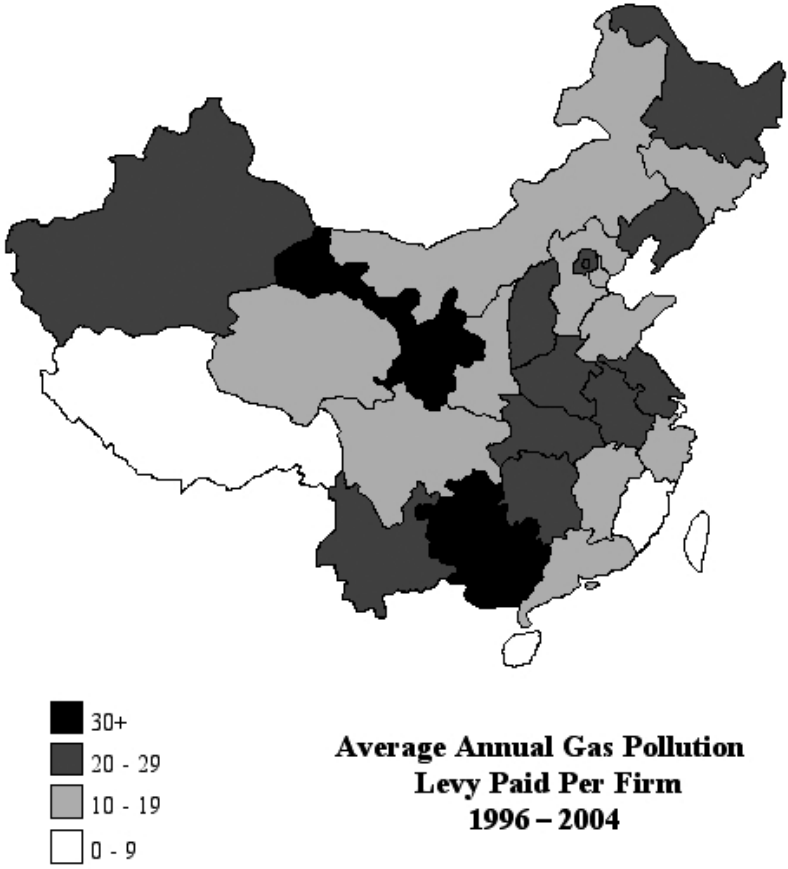

FIG. 4.1. (continued)

the All China Data Center on the volume of provincial environmental levies collected during the 1996–2004 period.[7] This data contains detailed information about total environmental levies, total levies for above-limit emission, and levies for wastewater, solid waste, and radioactive emissions by province-year. We divide these data by the number of firms paying levies. The average pollution levy paid by a firm in a given province should provide an indication of its environmental regulatory costs.

Control Variables

We control for other factors that may affect FDI inflows based on previous empirical studies of inflow determinants:

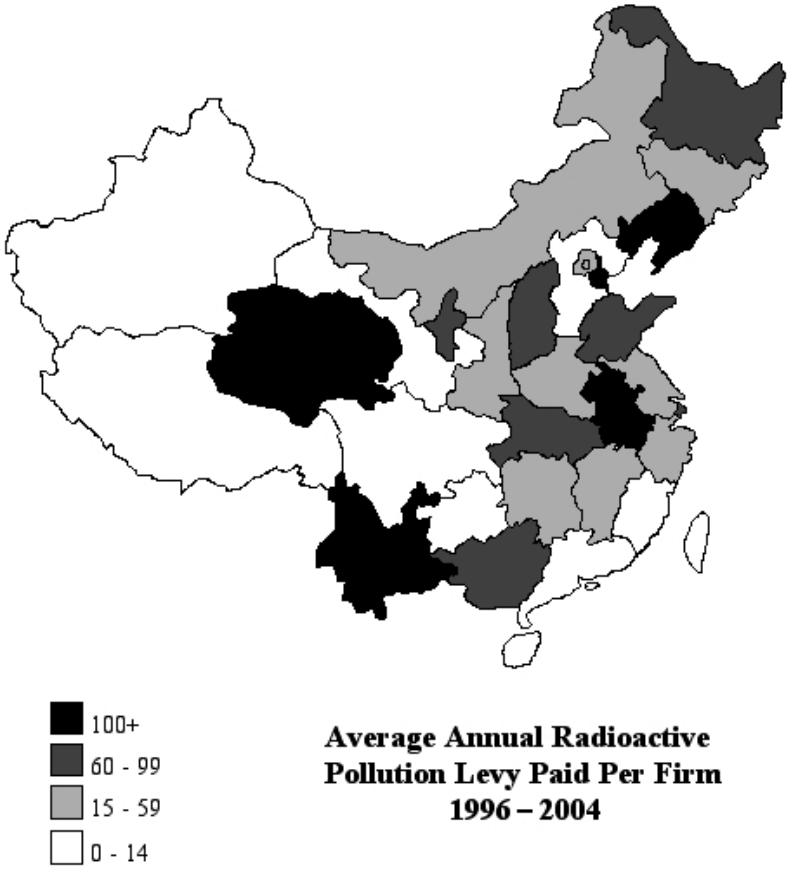

FIG. 4.1. (continued)

GDP per capita. Since one of the major motivations for FDI is to seek new sophisticated markets, scholars argue for a positive correlation between development and FDI attraction.[8] For example, Wang and Swain find that while interest rate and exchange rate are negatively associated with FDI flows in China's manufacturing sector, GDP and GDP growth rate positively affect inflows.[9] Other empirical studies yield similar supportive evidence.[10] To account for the effects of economic development on FDI location decisions, we include the natural logarithm of annual provincial *GDP per capita.*

GDP growth. Fast-growing regions may be more likely to attract foreign investors seeking to maximize potential returns and market opportunities.[11]

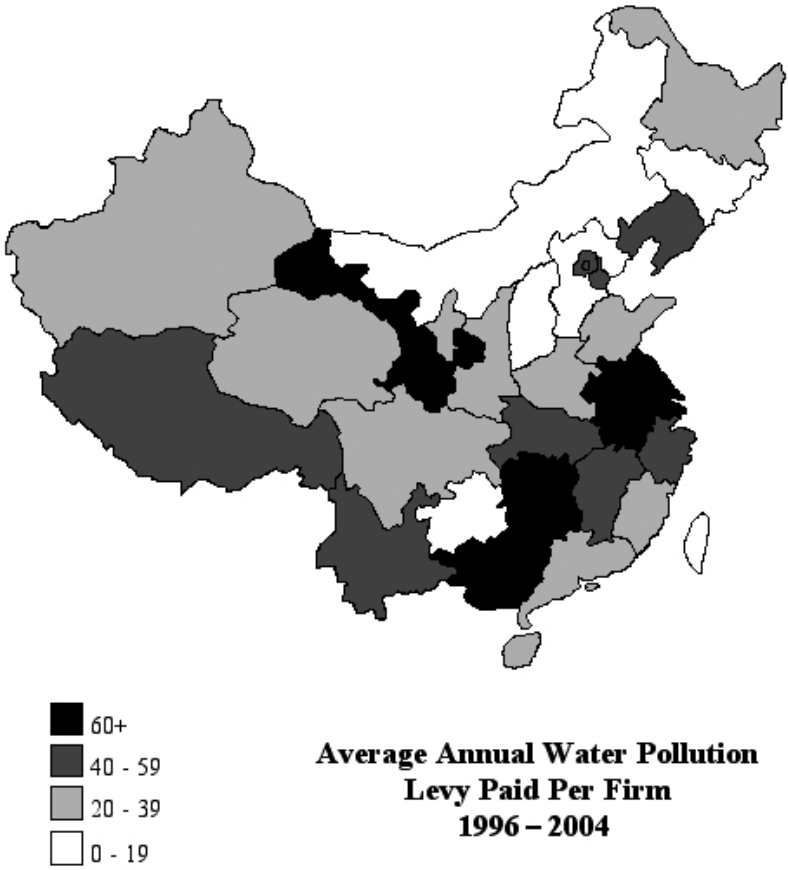

FIG. 4.1. (continued)

Thus, we include the percentage change in a province's GDP from the previous year to the current one to capture these effects.

Rail and *Highway.* Transportation linkages may affect regional and national market accessibility for foreign investors.[12] For example, Chen finds that transportation, technological filtering, and potential market share expansion are the most significant determinants of FDI location decisions in China.[13] Other studies yield similar evidence.[14] We use two alternative measures of transportation infrastructure in our analysis, the length of railway (*rail*) and the length of highway (*highway*), as percentages of provincial land area. China's highway network features several separate networks with few interconnections

and is underdeveloped across much of the country. The railway system arguably provides more efficient transportation, especially for moving raw materials and heavy industrial products over long distances. We test our hypothesis using these two alternative infrastructure measures to increase the robustness of our analysis.

Schools and *Graduates.* Numerous studies find labor quality to positively affect FDI inflows.[15] To account for labor's effects, we use both the natural logarithm of the total number of universities and secondary schools in a province (*schools*) and the total number of higher education institution and secondary school graduates normalized by provincial population (*graduates*). On the one hand, FDI may be attracted to areas with more educated workers. On the other hand, to the extent that educational attainment reflects labor costs,[16] FDI inflows may be attracted to areas of limited education where labor is cheap. Due to these contradictory arguments, we do not place any expectations on the sign of this variable.

SOE output share. We gauge provincial openness to foreign investment as the share of the output of state-owned enterprises (SOEs) in provincial GDP. Studies by Sun, Tong, and Yu as well as Fujita and Hu reveal a significant relationship between SOE concentration and FDI inflows.[17] However, the relationship between regional openness and FDI cannot be determined a priori. On the one hand, greater openness may attract more investment, as a more open economy implies greater host-market familiarity among investors. On the other hand, greater openness may curb investment flows because of greater foreign competition and reduced competitive advantage. We include *SOE output share* to capture the effects of economic openness and economic reform progress on FDI inflows.

Regional dummy variables. Finally, we include dummy variables for the inland, central, and coastal regions, respectively, to tap the effect of the unevenness of China's reform policy across regions on FDI location decisions. It is well known that China's regional development policy in the post-Mao era has an important geographic dimension. Because the coastal regions enjoy great advantages in infrastructure, technology, capital, and education, the central government provides these provincial governments with considerable latitude in FDI attraction. Consequently, coastal governments are able to provide a variety of incentives to encourage foreign investment, including tax breaks, the reduction and exemption of enterprise tax and profit remittance taxes, and the establishment of Special Economic Zones (SEZs). It is not surprising that the implicit geographical targeting of China's FDI policy has resulted in substantial FDI inflows into the developed eastern region, while the central and inland regions have lagged behind.[18] To account for the effects of the central govern-

ment's preferential policies on the spatial distribution of FDI, we use a dummy variable for each of the inland, central, and eastern regions. Our coding of this variable follows the research done by Chen.[19] The developed eastern region includes Liaoning, Hebei, Tianjin, Beijing, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, Hainan, and Guangxi. The central region includes Heilongjiang, Jilin, Inner Mongolia, Shanxi, Henan, Anhui, Hubei, Hunan, and Jiangxi. The western region includes Shaanxi, Ganxu, Ningxia, Sichuan, Yunnan, Guizhou, Qinghai, Xinjiang, and Tibet.

Limitations

Data limitations prevent us from controlling for other factors that may also affect FDI inflows such as R&D expenditures, tax structure, FDI attraction expenditures, and other special treatment offered to foreign investors. Importantly, labor cost has been considered to exert influence on MNCs' locational choice.[20] Consistent with the race-to-the-bottom argument, multinational companies may be attracted to provinces with lower wages to reduce production costs. However, multinational corporations may also have demand for higher-quality labor with higher wages. While we are unable to include a direct measure of labor cost, as wage data is only available for 2003, our two education variables, *Schools* and *Graduates,* provide a proxy because educational attainment is a well-known predictor of future wage earnings.

Table 4.1 describes the measurement of key variables and indicates expected signs between each independent variable and the dependent variable, FDI. Tables 4.2 and 4.3 provide summary statistics and the correlation matrix of key variables in the sample, respectively. As illustrated in table 4.3, the independent variables are not highly correlated with one another, which should ameliorate potential multicollinearity concerns.

Since our data is essentially time-series, cross-sectional data, we estimate ordinary least square (OLS) models with panel-corrected standard errors (PCSEs).[21] Beck and Katz argue that compared to the conventional feasible generalized least square (FGLS) estimator, models with PCSEs produce estimates of standard errors and variance-covariance estimates assuming that the disturbances are heteroskedastic and contemporaneously correlated across panels.[22] We also assume that there is first-order autocorrelation AR(1) within each province and that the coefficient of the AR(1) process is common to all the panels. Test results are presented in tables 4.4 and 4.5. In table 4.4 the models use *Graduates* and *Highway* as control variables; table 4.5 reports results with *Schools* and *Railway* as control variables.

Results

The most notable result is that our alternative pollution emission levy variables consistently demonstrate a positive relationship with the outcome variable across specifications (Models 1 and Models 2d–2e), and the relationships are statistically significant in Models 1e and 2e. While the emission variables demonstrate negative signs in Models 2a–2c, these relationships are statistically insignificant. These results do not provide support to the argument that FDI is attracted to areas with lower levels of pollution levies. The statistically significant results in Models 1e and 2e actually suggest the opposite, that FDI may be attracted to areas of elevated environmental regulatory stringency. In

TABLE 4.1. Variable Measurement and Expected Signs of the Pollution Haven Analysis

Variable	Measurement	Expected Sign
Dependent Variable		
FDI/GDP	FDI divided by the GDP of each province	
Independent Variables		
Schools	Natural logarithm of the total number of universities and secondary schools in each province	±
Highway	The length of highways divided by the land area of a province	+
Graduates	Natural logarithm of the total number of primary and secondary schools in each province	±
Railway	The length of highways divided by the land area of a province	+
GDP growth	Percentage change in GDP from the previous to the current year	+
GDP per capita	Natural logarithm of the GDP per capita of each province	+
SOE output share	The share of industrial output accounted for by SOEs in each province	±
Total levy	Total pollution levy divided by the number of reporting firms in a province	+
Total above-limit levy	Total levy on exceeding limit discharge divided by the number of reporting firms in a province	+
Wastewater levy	Total levy on wastewater discharge divided by the number of reporting firms in a province	+
Solid waste levy	Total levy on solid waste divided by the number of reporting firms in a province	+
Radioactive emission levy	Total levy on radioactive material discharge divided by the number of reporting firms in a province	+

any case, our results do not indicate that FDI is in any way attracted to provincial pollution havens.

Regarding the other independent variables, our alternative measures of infrastructure (*Railway* and *Highway*) consistently demonstrate positive relationships with the dependent variables, and the relationships are statistically significant across model specifications. This is in line with the theoretical expectation that FDI is attracted to provinces with better infrastructure. Variables representing labor quality (*Schools* and *Graduates*) are negatively associated with the independent variable, and the relationships are highly significant across model specifications. This lends support to the argument that FDI is more likely to be attracted to areas where the educational quality and educational attainment are lower in order to save on labor costs.

It is also notable that the share of the provincial income accounted for by state-owned enterprises (*SOE output share*) demonstrates a positive relationship with the emission variables, and the relationships are statistically significant in Models 1a and 1b. This indicates that economic openness may have a negative impact on FDI inflows and that the higher competition may deter foreign investment.

Finally, we did not find *GDP per capita* or *GDP growth rate* to affect provincial FDI inflows in any way. While these variables are negatively signed in all model specifications, they are also generally insignificant.

TABLE 4.2. Summary Statistics of Key Variables Included in the Pollution Haven Analysis

Variable	OBS	Mean	S.D.	Min	Max
FDI/GDP	308	0.355	0.466	0.000	2.916
Graduates	277	645,130.700	466,447.100	7,680.000	2,360,532.000
Schools	277	7.582	0.904	4.500	8.775
Highway	276	0.303	0.203	0.009	1.023
Railway	276	0.000	0.000	0.000	0.001
GDP growth	245	10.980	5.268	–21.231	29.065
GDP per capita	277	6.679	0.560	5.371	8.391
SOE output share	246	3.254	2.306	0.022	9.640
Total levy	263	107.924	111.274	9.073	1,467.189
Total above-limit levy	234	73.992	77.995	4.313	902.167
Wastewater levy	235	46.821	51.119	0.000	371.013
Solid waste levy	234	4.373	4.256	0.000	53.656
Radioactive emission levy	235	0.196	2.037	0.000	30.985

Note: OBS = observations; S.D. = standard deviation.

TABLE 4.3. Correlation Matrix of Key Variables Included in the Pollution Haven Analysis

Variable	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
FDI/GDP (a)	1.000												
Graduates (b)	–0.009	1.000											
Schools (c)	–0.145	0.812	1.000										
Highway (d)	0.597	0.160	–0.028	1.000									
Railway (e)	0.474	–0.272	–0.360	0.678	1.000								
GDP growth (f)	0.033	–0.041	–0.194	0.140	0.112	1.000							
GDP per capita (g)	0.589	0.097	–0.073	0.738	0.657	0.276	1.000						
SOE output share (h)	0.249	0.613	0.495	0.350	0.169	–0.016	0.455	1.000					
Total levy (i)	0.068	0.003	0.042	0.087	0.287	–0.035	0.096	0.078	1.000				
Total above-limit levy (j)	0.057	–0.048	0.037	0.044	0.273	–0.070	0.048	0.037	0.980	1.000			
Wastewater levy (k)	0.160	–0.047	0.001	0.158	0.448	–0.071	0.167	0.094	0.874	0.917	1.000		
Solid waste levy (l)	0.029	0.039	0.065	–0.025	0.013	–0.051	0.024	0.061	0.777	0.752	0.549	1.000	
Radioactive emission levy (m)	0.290	–0.106	–0.115	–0.004	0.151	0.036	0.064	–0.055	0.009	0.030	0.037	–0.054	1.000

Robustness Checks

In order to increase confidence in our findings, we divided the country into eastern, central, and western regions and ran the statistical analysis described in the previous section for each of these regions.[23] Results from this test corroborate the findings reported above. Our levy variables are positively associated with FDI inflows in most model specifications and are occasionally statistically significant. These results provide support to our hypotheses, indicating that foreign investors are not necessarily attracted to areas with lax environmental protection and enforcement.

As additional robustness checks, we employ several secondary measures of regulatory stringency—the actual annual emissions of SO_2, soot, and dust by

TABLE 4.4. Average Pollution Levy by Province and FDI Inflow (Models 1a–e)

Variable	1A	1B	1C	1D	1E
Graduates	–0.108***	–0.109***	–0.108***	–0.109***	–0.082***
	(0.016)	(0.016)	(0.016)	(0.015)	(0.017)
Highway	0.459**	0.448**	0.454**	0.455**	0.482**
	(0.218)	(0.217)	(0.216)	(0.220)	(0.199)
GDP growth	–0.002	–0.002	–0.002	–0.003	–0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
GDP per capita	–0.016	–0.020	–0.016	–0.015	–0.022
	(0.048)	(0.048)	(0.048)	(0.046)	(0.046)
SOE output share	0.011*	0.012*	0.011	0.011	0.009
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Total levy	0.00001				
	(.00004)				
Total above-limit levy		.00003			
		(.00007)			
Wastewater levy			9.17e-05		
			(.0002)		
Solid waste levy				0.001	
				(.001)	
Radioactive emission levy					0.023**
					(0.010)
Regional dummies	suppressed	suppressed	suppressed	suppressed	suppressed
Constant	(dropped)	(dropped)	(dropped)	2.064	(dropped)
				(.416)	
Number of observations	176	173	174	174	174
Number of groups	31	31	31	31	31
R^2	0.587	0.583	0.584	0.585	0.637

Note: Robust standard errors in parentheses; e stands for exponential notation.
*significant at 10% **significant at 5% ***significant at 1%

province,[24] the annual percentage emission reduction of each of these pollutants,[25] the annual percentage emission reduction adjusted for percentage change in GDP,[26] and the provincial investment completed in industrial pollution treatment as a percentage of provincial GDP (*Investment*)—as instruments for our key independent variable.[27] Although these measures are less direct than our primary ones, they do provide corroborative support for our initial results. These variables also enable us to account for multiple sectors of industrial investment, as the payout and emission data accommodate multiple industrial pollutants. The combination of multiple proxies creates a more complete picture of environmental regulatory stringency.

TABLE 4.5. Average Firm Pollution Levy by Province and FDI Inflow (Models 2a–e)

Variable	2A	2B	2C	2D	2E
Schools	–0.080***	–0.077**	–0.076***	–0.082***	–0.063***
	(0.015)	(0.014)	(0.014)	(0.015)	(0.019)
Railway	370.291**	377.991**	402.481**	348.599**	325.236***
	(160.393)	(163.645)	(174.674)	(159.361)	(98.684)
GDP growth	–0.002	–0.002	–0.002	–0.002	–0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
GDP per capita	–0.053	–0.044	–0.052	–0.040	–0.031
	(0.075)	(0.075)	(0.073)	(0.077)	(0.068)
SOE output share	0.010	0.008	0.008	0.009	0.008
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Total levy	–8.7e-05				
	(7.81e-05)				
Total above-limit levy		–6e-05			
		(4.74e-05)			
Wastewater levy			–0.0002		
			(.0002)		
Solid waste levy				0.001	
				(0.001)	
Radioactive emission levy					0.022***
					(0.008)
Regional dummies	suppressed	suppressed	suppressed	suppressed	suppressed
Constant	(dropped)	(dropped)	1.613	(dropped)	(dropped)
			(0.458)		
Number of observations	173	176	174	174	174
Number of groups	31	31	31	31	31
R^2	0.576	0.581	0.577	0.577	0.628

Note: Robust standard errors in parentheses; e stands for exponential notation.
*significant at 10% **significant at 5% ***significant at 1%

The results, shown in tables 4.6a–4.6c, are very similar to those reported above and do not diminish our central findings. Our alternative pollution emission measures consistently demonstrate a negative relationship with the FDI variable, and the relationships are occasionally highly significant. These results directly contradict the pollution-haven hypothesis. Models using measures of the annual percentage reduction in $SO_{2,}$ soot, and industrial dust as well as those using measures of the annual percentage reduction in those pollutants adjusted for percentage change in GDP yield similar conclusions. In these models, while the adjusted emission variables demonstrate a positive relationship with the FDI variable in some of the model specifications, they are also generally insignificant. Finally, the *Investment* variable exhibits different signs in Models A and B in table 4.6c, but the variable did not achieve statistical significance in either model. These test results therefore provide no empirical support to the pollution-haven hypothesis.

We also ran all models controlling for provincial fixed and random effects. In this set of tests, the levy variables are positively signed in some of models and are occasionally significant. They are insignificant in models where they demonstrate a negative sign, and do not alter our central findings.

Finally, we estimate models that include the total number of domestic enterprises as control variables, because provinces with larger numbers of intermediate goods suppliers may be more attractive to foreign investment. However, because the data for this variable are inconsistent across provinces, their addition leads to substantial case attrition. The results again do not affect our central findings.

EMPIRICAL TEST OF THE RACE-TO-THE-BOTTOM HYPOTHESIS

We once again draw on data contained in the *China Statistical Yearbook* (various years) to test our hypotheses about the effects of trade openness and foreign direct investment on provincial environmental protection. As with the pollution-haven hypothesis, we focus on the 1996–2004 period as it is the only period for which we can locate consistent time-series data.[28] We control for alternative hypotheses about the factors that influence environmental protection seen in the political economy literature in order to increase the robustness of our results.

TABLE 4.6a. Pollution Emission and FDI Inflow (A)

Variable	Emissions			% Reduction in Emissions			% Reduction in Emissions plus % Change in GDP		
GDP per capita	.51**	.48**	.46*	.74***	.73***	.74***	.74***	.73***	.74***
	(.20)	(.21)	(.23)	(.18)	(.18)	(.18)	(.18)	(.18)	(.18)
GDP growth	.005	.005	.004	–.02**	–.03**	–.02**	–.02**	–.03**	–.02**
	(.006)	(.007)	(.006)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
SOE output share	.06**	.07**	.05*	.04**	.04**	.04**	.04**	.04**	.04**
	(.03)	(.03)	(.03)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)
School	.82***	.76***	.83***	.85***	.85***	.85***	.85***	.85***	.85***
	(.15)	(.13)	(.18)	(.09)	(.09)	(.09)	(.09)	(.09)	(.09)
Highway	2.08***	1.98***	1.90***	2.10***	2.09***	2.11***	2.10***	2.09***	2.11***
	(.68)	(.63)	(.69)	(.50)	(.49)	(.50)	(.50)	(.50)	(.50)
SO_2	–.16**								
	(.08)								
Soot		–.13							
		(.09)							
Dust			–.15						
			(.12)						
$PRSO_2$				.0001					
				(.0003)					
PRSOOT					–2.25e-06				
					(.00001)				
PRDUST						.0002			
						(.0008)			
$PRSO_2GDP$							–.0001		
							(.0003)		
PRSOOTGDP								–2.25e-06	
								(.00001)	
PRDUSTGDP									.0002
									(.0008)
Central dummy	–1.28***	–1.23***	–1.32***	–1.24***	–1.25***	–1.24***	–1.24***	–1.25***	–1.24***
	(.13)	(.13)	(.13)	(.15)	(.14)	(.15)	(.15)	(.14)	(.15)
Inland dummy	–1.98***	–2.05***	–2.09***	–1.91***	–1.91***	–1.90***	–1.91***	–1.91***	–1.90***
	(.21)	(.21)	(.21)	(.23)	(.23)	(.23)	(.23)	(.23)	(.23)
Intercept	2.04	2.47	2.26***	–.27***	–.22***	–.27	–.27	–.22	–.27
	(1.63)	(1.72)	(1.67)	(1.69)	(1.68)	(1.69)	(1.69)	(1.68)	(1.69)
N	205	204	205	147	146	147	147	146	147
R^2	.95	.95	.96	.97	.97	.97	.97	.97	.97

Note: Robust standard errors in parentheses; e stands for exponential notation.
*significant at 10% **significant at 5% ***significant at 1%

TABLE 4.6b. Pollution Emission and FDI Inflow (B)

Variable	Emissions			% Reduction in Emissions			% Reduction in Emissions plus % Change in GDP		
GDP per capita	.32**	.35**	.31*	.80***	.78***	.74***	.80***	.78***	.78***
	(.23)	(.23)	(.25)	(.22)	(.21)	(.18)	(.22)	(.21)	(.22)
GDP growth	.004	.004	.004	–.03***	–.03***	–.03***	–.03***	–.03***	–.03**
	(.007)	(.007)	(.006)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
SOE output share	.06**	.06**	.05*	.03**	.04**	.04**	.03**	.04**	.04**
	(.02)	(.03)	(.02)	(.01)	(.02)	(.02)	(.02)	(.02)	(.02)
Graduates	.86***	.77***	.83***	.84***	.84***	.84***	.84***	.84***	.84***
	(.17)	(.15)	(.19)	(.09)	(.09)	(.09)	(.09)	(.09)	(.09)
Railway	1,324.88**	1,047.76**	863.38*	719.73***	731.80***	746.84***	719.73***	731.80***	746.84***
	(521.66)	(429.78)	(462.52)	(268.95)	(279.43)	(264.60)	(268.95)	(.09)	(264.60)
SO_2	–2.49***								
	(.09)								
Soot		–.15							
		(.09)							
Dust			–.22*						
			(.12)						
$PRSO_2$				.0001					
				(.0002)					
PRSOOT					3.37e-06				
					(.00001)				
PRDUST						.0004			
						(.0009)			
$PRSO_2GDP$							–.0001		
							(.0002)		
PRSOOTGDP								–3.37e-07	
								(.00001)	
PRDUSTGDP									–.0004
									(.0009)
Central dummy	–1.41***	–1.37***	–1.44***	–1.35***	–1.36***	–1.36***	–1.35***	–1.36***	–1.36***
	(.12)	(.13)	(.13)	(.12)	(.11)	(.12)	(.12)	(.11)	(.22)
Inland dummy	–2.14***	–2.27***	–2.27***	–2.05***	–2.06***	–2.05***	–1.91***	–2.06***	–2.05***
	(.20)	(.23)	(.22)	(.22)	(.21)	(.22)	(.23)	(.21)	(.22)
Intercept	–.66	–.23	–.30	–4.45**	–4.28*	–4.39*	–4.45**	–4.28*	–4.39*
	(1.99)	(1.98)	(1.85)	(2.21)	(2.20)	(2.25)	(2.21)	(2.20)	(2.25)
N	205	204	205	147	146	147	147	146	147
R^2	.95	.95	.95	.97	.97	.97	.97	.97	.97

Note: Robust standard errors in parentheses; e stands for exponential notation.
*significant at 10% **significant at 5% ***significant at 1%

TABLE 4.6c. Pollution Abatement Expenditure and FDI Inflow

Variable	Model A	Model B
GDP per capita	.81***	.94***
	(.21)	(.21)
GDP growth	–.02	–.03**
	(.01)	(.01)
SOE output share	.06***	.06***
	(.02)	(.02)
School	.88***	
	(.08)	
Highway	1.91***	
	(.48)	
Graduates		.79***
		(.09)
Railway		512.66
		(349.66)
Investment	.06	–.17
	(.30)	(.30)
Central dummy	–1.16***	–1.22***
	(.15)	(.13)
Inland dummy	–1.81***	–1.93***
	(.24)	(.241)
Intercept	–1.19	–5.02
	(1.57)	(1.87)
N	117	117
R^2	.97	.97

Note: Robust standard errors in parentheses.
*significant at 10% **significant at 5% *** significant at 1%

Dependent Variables

We use three annual provincial indicators of environmental pollution levels as our outcome variables: sulfur dioxide (SO_2) emission, soot emission, and solid waste emission.[29] To ensure that these measures are comparable across provinces, we divide the raw data by the number of reporting enterprises in each province and take their natural logarithm. Figures 4.2–4.4 present the average emission of sulfur dioxide, soot, and solid waste across Chinese provinces between 1995 and 2004. We use pollution levels as our dependent variables because they capture both environmental regulatory stringency and the extent of regulatory enforcement. Provincial-level measures are justified because provincial officials have the most leeway in the enforcement and implementation of

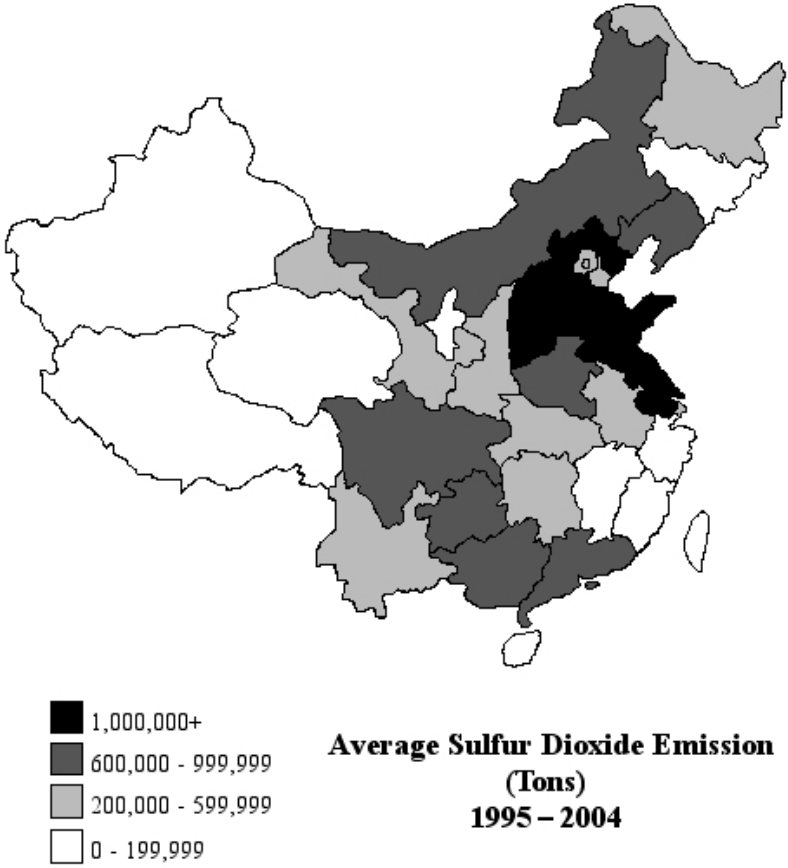

FIG. 4.2. Spatial distribution of sulfur dioxide emission across provinces (tons), 1995–2004. (Data from *China Statistical Yearbook,* various years.)

central government regulations. A visual examination of the data suggests that provinces that have received more FDI do not necessarily have higher emissions levels than those provinces that receive relatively less FDI.

To ensure the robustness of our analysis, we also include additional alternative pollution intensity measures: waste gas discharge, industrial dust emission, and industrial wastewater emission. Regression results for these alternative measures of environmental pollution are not as overwhelming as those reported in this chapter, though they do not affect our interpretation of the effects of our key independent variables.[30]

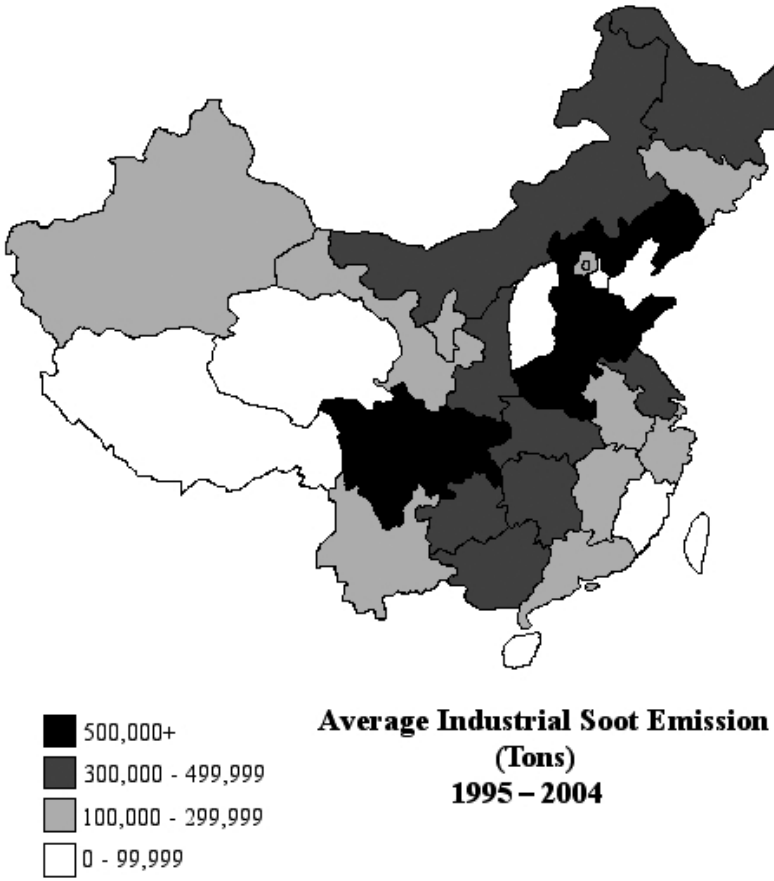

FIG. 4.3. Spatial distribution of industrial soot emission across provinces (tons), 1995–2004. (Data from *China Statistical Yearbook,* various years.)

Key Independent Variables

Consistent with previous works on the political economy of environmental protection, we directly address industrial pollution determinants. But in a departure from previous studies, we focus on the impact of *both* trade openness *and* foreign direct investment. We develop two variables to tap the effects of international economic integration on environmental protection in China: *openness* and *fdi. Openness* is the sum of a province's imports and exports divided by

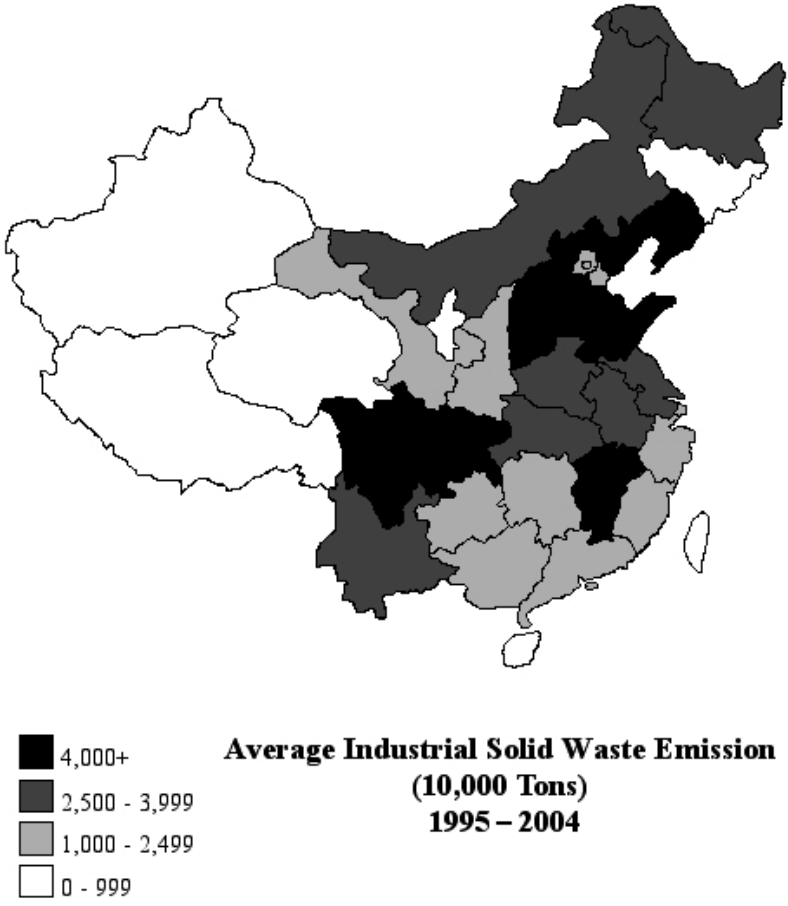

FIG. 4.4. Spatial distribution of industrial solid waste emission across provinces (10,000 tons), 1995–2004. (Data from *China Statistical Yearbook,* various years.)

its GDP in a particular year. Since data on provincial GDP are based on the Chinese currency *yuan,* and the trade data are recorded in U.S. dollars, we convert the GDP data into U.S. dollars using historical average annual exchange rates.[31]

To determine if there are any systematic differences between the effects of provincial export and import dependence on environmental protection, we employ measures of each separately: the share of provincial imports in its GDP (*impgdp*) and the share of provincial exports in its GDP (*expgdp*).

Data on FDI is based on actual FDI inflows into each of the Chinese provinces. Since it is possible that provinces that offer better environmental protection are also more likely to attract FDI inflows, we include a lagged FDI variable in our analysis. Lagged variables enable us to gauge the effects of FDI and trade from the previous year on environmental outcomes in the following year. The *fdi, openness, impgdp,* and *expgdp* variables are all lagged by one year.

Control Variables

We control for the following variables to address potential alternative explanations.

GDP per capita. *GDP per capita* taps the impact of economic development on environmental protection. The environmental Kuznets curve (EKC) argument posits that the rise in environmental pollution in developing countries should be accompanied by an initial increase in pollution levels, followed by a decline at some economic threshold.[32] From this perspective, the development of pollution abatement or environmentally friendly technologies, increases in demand for more stringent environmental policies, and a shrinking manufacturing sector facilitated by economic development combine to improve environmental protection. We include a lagged measure of annual provincial GDP per capita.

Growth rate. Similarly, recent research emphasizes that economic development should heighten the implementation of environmentally friendly policies.[33] We include the annual percentage change in provincial GDP to account for this possibility. A negative relationship is expected between *growth rate* and each of the three pollution indicators.

Coal. Coal production is a key source of pollution in China[34] and may potentially confound any relationship we find between trade, foreign direct investment, and environmental protection. To control for the effect of coal production on pollution levels, we create an annual dummy variable for the top ten coal-producing regions.

SOE output share. Most foreign direct investment in China has gone into light-manufacturing industries and is concentrated in southern and eastern coastal provinces. In contrast, most inward-looking heavy and energy-related industries (i.e., the heavy polluters) tend to be state-owned enterprises and historically have been located in the northern and central regions. As regions with a greater concentration of SOE production tend to generate more pollution,[35] we include a variable that measures the share of a province's industrial production accounted for by state-owned enterprises.

Personnel. The number of personnel charged with enforcement of environmental laws and regulations is another factor that may potentially affect environmental enforcement capacities. Previous research has shown that administrative capacity has an important bearing on policy outcomes.[36] It is conceivable that more environmental enforcement personnel may help strengthen environmental protection. Conversely, lower ratios of enforcement personnel in a province's population may prevent effective environmental oversight. To measure the effect of enforcement personnel on pollution levels, we include *personnel,* measured as the share of the environmental personnel in a province's total population. We take these data from the *China Statistical Yearbook.*

Finally, we include two additional control variables following conventions in the environmental pollution literature: *land size* and *population density.* Previous studies find that land size affects industrial usage.[37] Similarly, greater population density is often associated with higher pollution levels.[38] We take the natural logarithm of provincial land area (in square kilometers) and the natural logarithm of the annual provincial population density to gauge these effects.

All of the above variables are also lagged by one year to mitigate potential endogeneity problems. We employ the same method for analyzing the pollution-haven hypothesis to assess the race-to-the-bottom hypothesis.

Results

Our key measures of foreign direct investment and trade openness hold up well in all of the model specifications reported in tables 4.7–4.9. Further, in all of the model specifications, our key independent variables (e.g., *fdi, openness, impgdp,* and *expgdp*) consistently demonstrate a negative and statistically significant relationship with our alternative measures of environmental pollution, and the relationships are highly significant. The FDI variable increases the overall goodness of fit by .05, .08, and .10 in Models 1A, 2A, and 3A, respectively; whereas *openness* increases the adjusted R^2 by .01, .01, and .11 in Models 1B, 2B, and 3B, respectively.[39]

This suggests that far from leading to environmental degradation, integration into the world market via foreign direct investment and trade is associated with pollution emission reduction. Moreover, the statistically significant effect of trade openness is not an artifact of either import dependence or export dependence, as measures of both demonstrate a negative and statistically significant sign on alternative measures of pollution levels.

Turning to the effect of other control variables, faster economic growth seems to negatively impact emission levels, but *growth rate* is not statistically significant except in Model 3C. There is some evidence that the level of economic development, as measured by per capita GDP, tends to reduce pollution emissions. *GDP per capita* is negatively associated with our alternative measures of pollution emission levels, and the relationships achieve statistical significance in a few of the model specifications. This result is consistent with the view that economic development promotes environmental protection by increasing the funding available for pollution abatement technology or by fostering demand for environmentally friendly policies.

Land and *population density* are positively associated with pollution levels

TABLE 4.7. Effect of Foreign Direct Investment and Trade Openness on Sulfur Dioxide Emission

Variable	Model 1A	Model 1B	Model 1C	Model 1D
GDP per capita	–.0002***	–.00009	–.0001	–.0002
	(.00009)	(.0001)	(.0001)	(.0001)
Growth rate	.025	–.016	–.020	–.015
	(.022)	(.031)	(.030)	(.031)
Land	.155*	.239***	.287***	.221**
	(.094)	(.080)	(.082)	(.088)
Population density	.238*	.360***	.387***	.345***
	(.128)	(.069)	(.072)	(.072)
Coal	–.101	–.076	–.063	–.071
	(.080)	(.102)	(.102)	(.104)
SOE output share	.0002**	–.00004	–.0006	–.00003
	(.0001)	(.0001)	(.0008)	(.0001)
Personnel	17.022	15.871	20.133	14.955
	(21.627)	(22.424)	(22.246)	(23.236)
FDI	–.215***			
	(.060)			
Openness		–.006***		
		(.001)		
EXPGDP			–.008***	
			(.003)	
IMPGDP				–.008***
				(.003)
Intercept	4.220***	.880	.183	1.175
	(1.590)	(1.454)	(1.465)	(1.610)
N	178	184	184	184
R^2	.892	.849	.838	.849

Note: Robust standard errors in parentheses.
*significant at 10% **significant at 5% *** significant at 1%

in Models 1 and 3, and the relationships are statistically significant. These results suggest that larger land areas and higher levels of population density may increase the difficulties of environmental regulation.

The dummy variable representing the top ten coal-producing provinces in China is positively associated with levels of industrial soot and solid waste emission (Models 2 and 3), but the variable did not achieve statistical significance. There is some evidence that provinces with a heavy concentration of SOEs have higher emission levels as the *SOE output share* variable is positively associated with pollution levels in most model specifications and is occasionally statistically significant.

Contrary to our expectation, the percentage of environmental enforcement

TABLE 4.8. Effect of Foreign Direct Investment and Trade Openness on Industrial Soot Emission

Variable	Model 2A	Model 2B	Model 2C	Model 2D
GDP per capita	–.0006***	–.0005**	–.0005**	–.0005***
	(.0001)	(.0002)	(.0002)	(.0002)
Growth rate	–.006	–.027	–.026	–.027
	(.042)	(.035)	(.034)	(.035)
Land	–.018	–.045	.004	–.057
	(.222)	(.278)	(.284)	(.289)
Population density	–.074	–.094	–.065	–.104
	(.236)	(.306)	(.309)	(.316)
Coal	.051	.089	.091	.093
	(.168)	(.170)	(.169)	(.176)
SOE output share	.0003***	.0001	.0001	.0001
	(.0001)	(.0002)	(.0002)	(.0002)
Personnel	41.743***	29.977*	33.789**	29.528
	(15.397)	(17.470)	(16.665)	(18.955)
FDI	–.208**			
	(.099)			
Openness		–.007***		
		(.002)		
EXPGDP			–.011**	
			(.006)	
IMPGDP				–.010***
				(.004)
Intercept	7.496**	6.201	5.441	6.406
	(3.240)	(4.695)	(4.783)	(4.879)
N	177	183	183	183
R^2	.576	.497	.490	.506

Note: Robust standard errors in parentheses.
*significant at 10% **significant at 5% ***significant at 1%

personnel in provincial population is positively associated with emission levels and the relationship between these two variables is statistically significant (Models 2 and 3). It is possible that the size of the environmental protection enforcement agencies is not directly correlated with enforcement capacity. As Economy points out, the key agencies in charge of environmental protection in China—the Ministry of Environmental Protection (formerly SEPA, updated to ministerial level in 2008) and the local environmental protection bureaus (EPBs)—are confronted with a number of challenges in their regulatory efforts.[40] For example, as part of the governmental restructuring in 1998, SEPA experienced bureaucratic authority encroachment and received lower funding and many staff cuts. The local EPBs in turn had limited resources and over-

TABLE 4.9. Effect of Foreign Direct Investment and Trade Openness on Solid Waste Emission

Variable	Model 3A	Model 3B	Model 3C	Model 3D
GDP per capita	–.0002	–.00006	–.00004	–.0001
	(.0001)	(.0002)	(.0002)	(.0002)
Growth rate	–.012	–.040	–.044*	–.041
	(.017)	(.024)	(.024)	(.026)
Land	.211**	.266***	.326***	.279***
	(.093)	(.098)	(.094)	(.103)
Population density	.118	.243***	.281***	.242***
	(.105)	(.091)	(.092)	(.090)
Coal	.060	.056	.058	.059
	(.066)	(.072)	(.072)	(.076)
SOE output share	.0002**	.00003	2.25e-06	.00003
	(.0001)	(.0001)	(.0001)	(.0001)
Personnel	27.596***	35.540**	39.238***	35.665**
	(9.134)	(14.198)	(13.373)	(14.531)
FDI	–.185***			
	(.060)			
Openness		–.006***		
		(.002)		
EXPGDP			–.011***	
			(.004)	
IMPGDP				–.006**
				(.002)
Intercept	–1.336	–4.180***	–5.093***	–4.322***
	(1.484)	(1.584)	(1.545)	(1.668)
N	207	214	214	214
R^2	.263	.268	.220	.181

Note: Robust standard errors in parentheses; e stands for exponential notation.
*significant at 10% **significant at 5% ***significant at 1%

sight, inadequate inspection teams, and a problematic fee collection system. The local EPBs' effectiveness was further undermined by their greater accountability to local governments than to the SEPA, a typical problem in China's system of "fragmented authoritarianism."[41] These challenges indicate that the number of personnel charged with environmental protection may not provide a good indication of the enforcement capacity of the various administrative agencies. Unfortunately, data limitations preclude us from obtaining adequate alternative specifications.

Robustness Checks

As a robustness check on our regression results, we include alternative measures of our dependent variables: emission levels of waste gas, industrial wastewater, and industrial dust. All of these variables are also taken from the *China Statistical Yearbook*. Statistical analyses using these alternative measures of the dependent variable yield very similar results to those reported in this chapter. FDI and trade openness measures demonstrate a negative relationship with emission levels, and the relationships are significant in most model specifications.

In addition to estimating OLS models with PCSEs, we estimate Models 1–3 using the conventional feasible generalized least squares method. Estimation results using this procedure do not differ substantially from those based on the PCSEs. Most important, trade openness and foreign direct investment inflows retain their negative and statistically significant relationship with alternative measures of environmental pollution levels. These findings indicate that international economic integration via trade and foreign direct investment is actually associated with decreased emission levels in China and that the effects are independent of many potentially confounding variables.

Another potential concern about our statistical analysis is the existence of multicollinearity. Table 4.10 presents the correlation matrix of key variables used in our analysis of the RTB hypothesis. It indicates a relatively high level of correlation between population density, land area, and GDP per capita that may be of potential concern. We ran our models dropping these variables one at a time to address this concern. The removal of these variables from the model does not affect the significance of our key independent variables. It does result in reduced R^2s, which suggests that the full model better explains the variation in observed pollution levels. Moreover, in view of the relatively high level of correlation between GDP per capita and our alternative measures of trade, export, and import openness, we regressed each of these key indepen-

TABLE 4.10. Correlation Matrix of Key Variables Included in the RTB Analysis

	So_2	Soot	Solid Waste	FDI	Open-ness	EXP GDP	IMP GDP	GDP per capita	Growth Rate	Person-nel	SOE Output Share	Coal	Land	Density
SO_2	1.00													
Soot	.51	1.00												
Solid waste	.62	.57	1.00											
FDI	–.43	–.52	–.46	1.00										
Openness	–.42	–.52	–.49	.58	1.00									
EXPGDP	–.42	–.52	–.55	.63	.92	1.00								
IMPGDP	–.38	–.47	–.40	.49	.96	.78	1.00							
GDP per capita	–.37	–.50	–.38	.59	.75	.72	.71	1.00						
Growth rate	–.17	–.25	–.24	.35	.24	.28	.20	.29	1.00					
Personnel	.04	.07	.05	.15	.13	.14	.11	.28	–.009	1.00				
SOE output share	–.09	–.24	–.09	.67	.38	.39	.33	.56	.17	.21	1.00			
Coal	.21	.22	.30	–.11	–.26	–.26	–.24	–.23	–.03	.06	.11	1.00		
Land	.31	.44	.45	–.49	–.60	–.54	–.59	–.68	–.25	–.24	–.20	.27	1.00	
Density	–.25	–.47	–.38	.77	.48	.47	.44	.55	.28	.08	.53	–.07	–.79	1.00

dent variables on other independent variables. This procedure did not yield evidence of alarmingly high R^2s in each case.

Finally, to ensure that the results reported in this chapter are not distorted by provinces with disproportionately large shares of China's total trade and investment, we experimented running the models dropping Beijing, Shanghai, and Guangdong one at a time from the sample. Once again, this procedure did not alter our central finding as indicators of trade openness and FDI inflow consistently demonstrate a negative relationship with pollution levels, and the results are robust across model specifications.

Discussion

In contrast to previous studies that examine the impact of either trade openness or foreign direct investment on the environment, our analysis of the RTB argument investigates the influence of both aspects of international market integration on industrial pollution levels in China. This is noteworthy because the exclusion of one or the other reduces the likelihood of capturing the full effects of globalization on environmental protection.

Our results are consistent with the findings reported in Elizabeth Economy's study of China's environment. She suggests that, just as in other areas of economic development, the Chinese government utilizes an approach to environmental protection that emphasizes authority decentralization and increased participation of private and international actors.[42] She argues that this strategy results in increasing cross-regional environmental protection discrepancies. While a few regions with relatively high income levels, strong leadership, and extensive links with the world economy experience enhanced local environmental protection, other less-developed, less-integrated regions tend to incur much greater environmental degradation.

Limitations

Our analysis focuses primarily on the pollution emission determinants. While our results are supported by robustness tests, our analysis does not deal with other aspects of environmental governance such as governmental policy-making, environmental enforcement capacity, and the effects of corruption on local environmental protection bureaus. Nor are we able to provide a full answer to the question as to whether our results apply to different forms of environmental degradation such as deforestation. In addition, this study associates envi-

ronmental protection in a particular region with the amount of foreign direct investment received. Due to data limitations, we do not control for the potential for environmental degradation in one province to stem from foreign investment in another province. Future studies could extend this analysis to further analyze the link between globalization and environmental governance in China.

CONCLUSION

The above empirical results are largely at odds with the pollution-haven and race-to-the-bottom hypotheses. Our evidence suggests that the pollution-haven hypothesis does not apply to the case of China. Rather than (re)directing investment flows toward pollution havens, environmental regulatory stringency does not appear to have a noticeable effect on investment decisions. In some cases, MNCs actually seem to favor investing in provinces with higher standards. Whether or not a rigorous regulatory environment actually *attracts* investment is the subject of another study. However, our results lend substantial support to the hypothesis that the institutional and social pressures for self-regulation outweigh the financial benefits correlated with pollution-haven investment. These pressures are generated from an array of sources, including external pressure from consumers, potential investors, and corporate customers, and internal pressure from shareholders. In addition, environmental technology developed in response to higher standards in regulated markets can be exported to subsidiaries in host countries. This increases operational efficiency and heightens competitive pressure on host-country firms, and it diminishes the need for pollution-haven-seeking behavior.

Our findings challenge the conventional wisdom that globalization encourages "industrial flight" from developed to developing countries to reap residual cost benefits of lax regulations. It also supports prior arguments that pollution havens may be no more than a "popular myth."[43] Rather, globalization encourages corporate self-regulatory strategy adoption, which, in turn, promotes the development of global environmental norms. These effects may be sufficient to supplant the need for a transnational environmental regulatory body such as the WTO. As our results imply, communication technologies and external corporate monitoring can encourage better firm behavior through public awareness of corporate activity; and MNCs find environmental self-regulation to be more financially advantageous than the diminished sales and market values that follow from dirty production.

Our analysis of the effects of provincial trade openness and foreign direct investment on industrial pollution levels yield similar but more robust conclusions. Increased trade openness and foreign direct investment is actually positively associated with greater environmental protection. Our results suggest that far from creating a race to the bottom, trade openness encourages environmental protection via firm self-regulation, technology transfer, and an improvement in firm-level environmental regulatory and production standards in order to ensure global export market accessibility. FDI fosters similar dynamics. Technology transfer and knowledge spillovers significantly improve provincial environmental performance. Taken in concert, our findings suggest that as the world shifts toward a more globalized market, environmental standards should also rise.

Our results support prior contentions on the relationship between trade, the environment, and the environmental Kuznets curve.[44] The scale of economic activity in China has increased dramatically over the past two decades, contributing to massive pollution problems (i.e., the scale effect). However, as trade and foreign investment have increased, so too has the propensity to use cleaner production processes, foster higher product standards, and adopt environmental management systems and environmentally friendly technologies (i.e., the technique effect). The cross-provincial variation in levels of trade, FDI, and environmental pollution provides evidence of the technique effect at work in China.[45] With respect to the income effect, it is yet unclear as to precisely what extent the increases in national income brought about by trade and investment contribute to increased demand for environmental protection. This is a fruitful avenue for future research.

CHAPTER 5

Do Chinese Provinces "Trade Up" and "Invest Up"?

In this chapter, we analyze how regulatory pressure in primary export markets and FDI source countries affects Chinese provincial environments. Our empirical results demonstrate that *provinces that export to or receive the bulk of their investment from countries with superior environmental standards also tend to be more environmentally responsible.* In a refinement to our original argument, we posit that for provincial environmental protection, specific trade and investment partner identity matters, as investment firms often replicate practices developed in response to home-country laws in host countries; and developing-country exporters adapt product development and production strategies to meet customer and consumer demands in export markets.

This hypothesis illustrates a more nuanced depiction of the environmental effects of trade and FDI than those presented in previous chapters. Our empirical test of the race-to-the-bottom argument essentially examines the impact of the openness of a province to trade and FDI on that province's environmental performance, without considering the potential effects of trade partner and investor identity. In this chapter we move a step further by detailing how the environmental performance of a given province is shaped, at least in part, by the environmental standards of the entities with which it interacts. Our empirical analysis demonstrates that having trade and investment ties with environmentally regulated countries positively affects local environmental protection. The arguments presented in this chapter encompass two key components of economic integration: the environmental impact of export destinations and the

environmental effects of foreign investment source country. We elaborate the rationale for each component of our main hypothesis in subsequent sections.

EXPORT DESTINATIONS AND THE ENVIRONMENTAL PERFORMANCE OF CHINESE PROVINCES

David Vogel's "trading-up" argument posits that trade can serve as a vehicle for transmitting importing countries' environmental (product) standards to exporting countries.[1] In this view, trade partner identity matters as much as trade volume. We extend Vogel's argument to include *process* as well as *product* standards, and provide theoretical and empirical support that importer regulatory stringency positively affects both product *and* process standards in exporting countries.

Product Standards

An oft-touted argument claims that producers in environmentally regulated jurisdictions are disadvantaged with respect to competitors in less regulated economies. Free trade between regulated and unregulated countries, it is claimed, exacerbates this disadvantage by placing all firms on an equal footing within a single market regardless of regulatory outlays at the production origin. Preservation of environmental regulations is costly and can undermine the financial position of regulated producers. If this insight is correct, then regulated firms have a strong incentive to relocate production operations to unregulated jurisdictions or "pollution havens."[2] In fact, scholars have demonstrated that stringent regulation can have a significant effect on trade flows.[3]

To combat the potential for an "industrial flight" toward pollution havens, and to meet the demands of corporate lobbies and environmental groups, governments have the option of either imposing tariffs or nontariff barriers (NTBs) on imports that don't meet certain environmental or consumer safety regulations, *or* deregulating to reduce domestic production costs. However, as environmental concerns and product safety issues continue to take a prominent position in the public eye of developed countries, product deregulation is declining in political salience. In order to maintain reduced import prices, domestic importers have an incentive to counter with lobbies for deregulation; however, they often face uphill battles against "Baptist and Bootlegger" coalitions formed by domestic producers and environmental NGOs.[4] This position gives domestic producers the moral authority of environmental and consumer

protection, and it provides them with important environmental political support in their lobbying efforts. In this respect, trade with environmentally regulated countries can act as a boon for the elevation of product standards.

If governments impose regulation as more of a protectionist rather than safety measure,[5] injured producers, assuming WTO membership, can file a complaint of protectionism in disguise. However, litigation can be an extremely lengthy and costly process, diminishing it as an option to many small and medium-sized producers in developing countries.[6] Therefore, in lieu of adequate government regulation, export producers in poorly regulated jurisdictions have financial incentive to improve their environmental conduct in order to meet higher product standards in regulated markets. Competitive advantage is conferred upon exporting firms in less-regulated jurisdictions who are better able to meet the regulatory requirements of developed markets and produce environmentally sound products. Indeed, it has been demonstrated that regulation in the form of green tariffs or NTBs imposed by importing countries compels foreign producers to maintain product standards consistent with their most regulated markets of operation, a practice David Vogel termed the "California Effect."[7] Although Vogel initially applied the California Effect argument to trade and regulatory convergence among developed countries, we argue that this effect can also apply to trade between developed and developing countries. If this is true, then international trade can enable convergence of environmental product standards across political jurisdictions and offer competitive advantage to those better able to meet higher standards.

Production Processes

Firms have an incentive to regulate their export products to meet governmental regulatory requirements in developed markets in order to maintain unimpeded market access abroad. However, export-oriented firms in less regulated jurisdictions also have competitive incentive to regulate their process and production methods (PPM) to accommodate the public (and corporate) will of developed export markets. Specifically, we are referring to firms that supply directly to developed markets, supply to multinationals that sell in developed markets, and/or act as corporate subsidiaries in less-regulated economies. Because adverse environmental conditions in developing countries caused by excessive industrial pollution are coming under heightened scrutiny from consumer and environmental NGOs and corporate watchdog groups in the developed world, MNCs with extensive suppliers and subsidiary operations in

developing countries have a strong incentive to elevate PPM standards throughout the supply chain.

When major MNC suppliers in poorly regulated countries come under public fire for execrable environmental practices, MNCs are faced with the choice of a continuing loss of sales and public diminution of brand credibility, changing suppliers, or mandating higher PPM standards on existing suppliers. There is a range of factors that can influence the firm's decision on a specific course of action. However, the threat of loss of corporate supply contracts for many small and medium-sized developing-country producers can mean the difference, in a relative sense, between clean and dirty production. The regulatory requirements mandated by the MNC, and ultimately the consumers, can cascade down the supply chain and influence the actions of firms in less-regulated economies. In such a case the premise of significant competitive advantage conferred by participatory firms remains the same as with product standards. In fact the greening of the supply chain, as it is known, has the potential to marshal financial benefits for the MNC in terms of enhanced corporate image through public accountability and responsible environmental stewardship, an increase in existing market shares, and the exploitation of new green markets.[8]

The convergence of these forces places strong pressure on MNCs to seek out suppliers with superior environmental performance records, and on supplier operations to maintain PPM standards consistent with regulations in the most progressive markets of MNC operation. Considering the fact that a large portion of all trade among developed and developing nations occurs in the form of contract relationships, the environmental effects of green accountability and supply chain management could be quite significant.

While the empirical evidence on the overall competitive advantage proffered by green supply chain management (GSCM) is mixed, the strong theoretical foundations outlined here have led researchers to develop extensive economic models demonstrating potential benefits.[9] Importantly, recent empirical evidence of the advantages of green supply chain management among firms operating in Southeast Asia suggests that GSCM significantly increases the competitive advantage and subsequently the economic performance of the firm.[10]

To reiterate, trade can exert upward pressure on the environmental product *and* production standards in less regulated, export-based economies contingent upon importing-country environmental standards. On the basis of the above discussion, we derive the first component of our overall argument in this chapter (hypothesis 1): *Provinces that export to countries with stringent environmental standards tend to adopt more environmentally friendly policies.*

FDI SOURCE COUNTRY AND CHINESE PROVINCIAL ENVIRONMENTS

We further posit that FDI from countries with stringent environmental regulations can act as a vehicle for the diffusion of those practices to host countries. This challenges the conventional view of globalization critics who maintain that competition for FDI exerts pressure on national governments to weaken domestic regulation. When MNCs from heavily regulated countries transmit home regulatory standards to subsidiaries operating in China, it should improve environmental conditions in provincial FDI destinations.

Whether globalization induces a convergence or divergence in corporate practices is a useful way to approach the environmental impact of FDI. Advocates of the convergence theory posit that economic integration results in a common model of economic activities as international competition, globalization, and regional integration generate pressure for similar patterns of economic behavior across the globe, resulting in "common institutional configurations and ways of organizing the economy."[11] While cross-national variations may persist due to different historical legacies, they are likely to "fade over time, giving way to common economic structures whose efficiency and universality produce superior strength in the market."[12] In this view, FDI is likely to encourage the adoption of common corporate practices across the globe as MNC subsidiaries are expected to operate according to a uniform set of corporate practices instead of behaving in a country-specific manner. In sum, advocates of convergence posit that globalization can generate pressure for uniform corporate practices around the world, mediated by local institutional contexts.[13]

In contrast, advocates of the divergence perspective emphasize that country-level practices and institutions are often embedded in specific cultural and historical contexts and can represent an internal struggle among domestic interest groups. As globalization threatens the interests of groups negatively impacted by the convergence of economic norms and activities, these status-quo-oriented groups are likely to organize in opposition to such changes. Conflicts between those in favor of and those against globalization therefore make it possible for divergent models of corporate governance to emerge.[14]

FDI can lead to cross-country divergence in corporate practices in a number of ways. First, in part due to domestic resistance to convergence, MNC subsidiaries may seek to adapt their behavior to the expectations of the host governments and mold their practices in a way that is consistent with the prevailing practices in the host country.[15] For example, through an analysis of

the behavior of the largest U.S. affiliates of foreign firms in manufacturing, financial, and services sectors, Hansen and Mitchell found that far from converging to uniform patterns of behavior, firms often adapt their practices to the host political economy.[16]

Second, as MNC subsidiaries develop operating standards in response to home-country regulatory requirements, they are likely to reproduce these practices in host countries. Consequently, the substantial cross-national variation in the practices of the home country of FDI should be replicated in the recipient countries.[17] Pauly and Reich contend that "the domestic structures within which a firm initially develops leave a permanent imprint on its strategic behavior." Through a study of the behavior of firms based in the United States, Japan, and Germany, they conclude that as different national institutions and ideological traditions continue to exert strong influence on corporate decisions, MNCs continue to diverge "fairly systematically" in their internal governance and corporate structure and strategy.[18]

MNCs can also influence host-country practices by creating externalities for host-country firms. Previous studies have shown that MNCs can diffuse their home-country practices through a host country either by demonstrating the effectiveness of these standards or by requiring their local suppliers to abide by the same standards.[19] In addition, MNCs can transfer technology to local firms and boost the productivity of local firms by generating backward linkages and through worker training provision.

The "industrial organization" approach to FDI posits that the exploitation of firm-specific, intangible assets such as technological know-how, marketing and managing skills, and reputation is an important factor underlying multinational firms' investment decisions.[20] Given that intangible assets are gained through experience, they can be transferred at a reasonable cost to host-country subsidiaries instead of being licensed to unaffiliated host-country firms. In this view, host-country firms may improve their productive efficiency and reduce average costs of production by learning from foreign firms and their subsidiaries.

Worker mobility and technical support can also be significant channels for knowledge spillovers.[21] Workers employed by foreign-invested enterprises that acquire knowledge through foreign-firm production-process exposure or technical on-the-job training have the capacity, and occasionally the financial incentive, to leave. In doing so, they are able to bring their knowledge and expertise to future domestic employers. Through this channel, knowledge of more environmentally efficient production processes can be transferred to host-country firms. Technical support provided by either upstream or downstream

foreign firms to domestic firms could serve a similar function by contributing to the absorption of new production techniques.[22] Several empirical studies have found evidence that FDI may result in the spillover of superior knowledge to firms located in the host country.[23] The combination of these mechanisms should lead us to expect MNCs to transfer prevailing practices and standards in the home country to the host country.

In short, MNCs replicate the prevailing environmental policies and procedures in their home countries in order to streamline production costs. Through this process, they are able to generate positive externalities for the host economy via technology transfer, worker training, technical support, and productivity increases. These insights yield the second component of our overall argument (hypothesis 2): *Provinces that receive more FDI from home countries with stringent environmental standards tend to adopt more environmentally friendly policies.*

ISO 14001

In our empirical analysis, we use the ISO 14001 adoption rate of the export destination country and FDI source country, normalized by GDP, as a proxy for domestic environmental regulatory standards. The ISO 14001 is a series of environmental management standards created by the International Standards Organization. Because it is a voluntary program, firm adoption may signal the importance of corporate environmental responsibility to consumers, consequently making it an ideal proxy.

Established in 1946, the Geneva-based international organization issues both specifications that normalize product standards and metastandards that standardize procedures. The adoption of the ISO 9000 series in 1987 represents the first systematic international effort by business and government actors to create management standards on a global basis and has since then helped to improve global management practices. While adoption and compliance with such standards remain voluntary, failure to observe them threatens to impose both reputational costs and costs associated with denial of key international markets. The adoption of ISO 14000 in 1996 represents a similar process. By stipulating a set of criteria for certification, ISO 14000 commits a certified party to comply with verifiable regulatory standards, thus encouraging the pursuit and implementation of environmental corporate practices.[24]

We normalize the ISO adoption data by the GDP of a given country because higher ISO 14001 adoption numbers may reflect factors other than regu-

latory stringency such as country size.[25] Thus, with the normalized ISO data, it is expected that exporting to or having investment from countries with a higher rate of ISO adoption according to the size of their GDP is likely to positively impact the environmental performance of a province.

STATISTICAL ANALYSIS

To test the above hypotheses, we use a research design similar to the one used to test the race-to-the-bottom argument. Our key dependent variable is the provincial rate of ISO 14001 adoption for each of the years from 2004 to 2007. Data on provincial-level ISO 14001 adoption rate is taken from the China National Accreditation Service for Conformity Assessment (CNASCA).[26] Figure 5.1 presents the distribution of ISO 14001 adoption rate by province between 2004 and 2007.

We develop measures of a province's bilateral export context and its bilateral FDI context on the basis of the volume of provincial exports and FDI by source country.[27] The trading-up argument should lead us to expect a given province's environmental standards to be influenced by its net exports as well as by the ISO 14001 adoption levels in its main export markets. To measure a province's export context, we first take the square of the share of a province's exports to a given destination country in the province's total exports and multiply it by the ISO adoption rate in that export destination country. We then average the above figure for all the export destination countries of that province. This allows us to test our hypothesis regarding the bilateral export context of a given jurisdiction. A province's bilateral export context is calculated as follows:

$$\text{Bilateral exports weighted by ISO adoption}_{it} = \sum_{j} ISO_{jt} \times (Exports_{ij} / Exports_{i})^2$$

where ISO_{jt} is the number of ISO certifications in country j in year t, $Exports_{ij}$ is province i's exports to country j in year t, and $Exports_{i}$ is province i's total exports in year t.

From the country-of-origin school's perspective, the host's environmental performance is influenced not only by the overall amount of FDI but also by the ISO 14001 adoption levels in the FDI source countries (hypothesis 2). To measure a province's bilateral FDI context, we take the percentage of FDI that a province receives from a given country in the province's total incoming FDI in a given year and multiply it by the ISO adoption rate in the FDI home country. We then average the above figure for all the countries investing in that province.

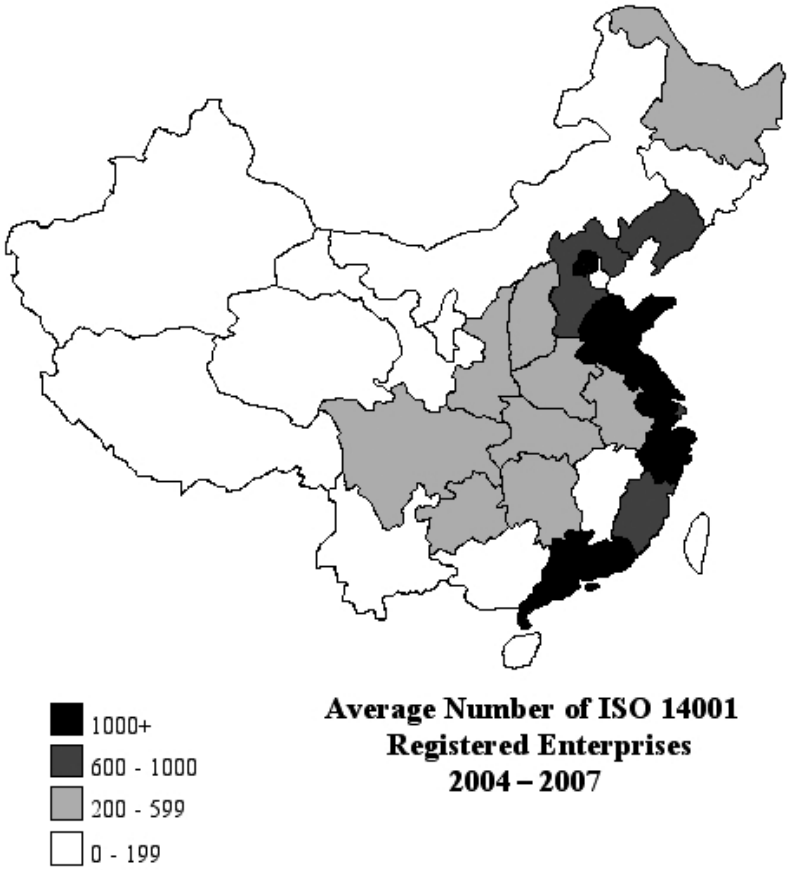

FIG. 5.1. ISO 14001 registered enterprises across Chinese provinces, 2004–7. (Data from China National Accreditation Service for Conformity Assessment.)

This allows us to test our hypothesis regarding the bilateral FDI context of a given province. We calculate each province's bilateral investment context as follows.

$$\text{Bilateral FDI weighted by ISO adoption}_{it} = \sum_{j} ISO_{jt} \times (FDI_{ij} / FDI_{i})^{2}$$

where ISO_{jt} is the number of ISO certifications in country j in year t, FDI_{ij} is the total FDI province i receives from country j in year t, and FDI_{i} is the total amount of FDI province i receives from all source countries in year t.

We also include a province's total exports and total FDI to tap the environmental effect of overall exports and FDI. These variables are *expdep* and *FDI,* and measure the share of a province's total exports and total FDI inflows divided by GDP.

In addition, we include the following control variables that may potentially influence the rate of ISO 14001 adoption at the provincial level into our analysis.

Emission variables. There may be more demand for environmental protection in provinces with higher pollution levels. If so, then firms should adopt more environmentally friendly policies in response to public pressure for more regulation. Consequently, we use alternative measures of pollution emissions, such as the emission levels of SO_2, soot, and solid waste, as proxies for the provincial pollution levels to account for this possibility.[28]

GDP. It is reasonable to expect provinces with more certifiable facilities to have higher ISO 14001 adoption rates. While one may best proxy the number of certifiable facilities by the number of industrial enterprises in a province, the data reported by the *China Statistical Yearbook* nevertheless contains considerable gaps. Consequently, we use the gross domestic product (GDP) of a province as a proxy of the number of its potentially certifiable facilities.

GDP per capita. The level of economic development of a province is expected to positively affect its ISO 14001 adoption rate, as wealth increases should generate demand for greater environmental protection.[29] As ISO 14001 adoption can signal firms' willingness to reduce the negative environmental externalities of production, wealthier provinces should be expected to have higher rates of ISO 14001 adoption.

Per capita GDP^2. Following Prakash and Potoski,[30] we square provincial GDP per capita and include it as a covariate to account for the possibility of a curvilinear relationship between economic development and environmental protection along the lines of the environmental Kuznets curve.[31]

Because provincial ISO adoption data are available only for the more recent years (i.e., 2004–7), while country-specific export and FDI data are only available for earlier years (i.e., 2001–5), we lag all of the above independent variables by three years in order to make maximum use of the data.

Statistical Method

Because our dependent variable is a count variable, we run negative binomial models of provincial ISO 14001 adoption rates. We assume that registering for ISO 14001 entails commitment by firms in terms of personnel and logistics.

Consequently the factors that influence the occurrence of the first "event" should similarly influence the occurrence of subsequent events. Moreover, our data dispersion suggests that the negative binomial model is more appropriate than the Poisson model for the purposes of our analysis.

To increase the robustness of our analysis, we run models both with and without provincial "fixed effects." We include provincial fixed effects in a variation of our model specifications to address the possibility that the independent variables do not fully account for provincial differences. Scholars have debated the pros and cons of employing fixed effects for panel analysis. Fixed effects control for the influence of unit-specific (province in this case) variables not addressed by the other covariates in the model. Opponents of using fixed effects in the models acknowledge the usefulness of fixed effects in certain situations but argue that if covariates that are expected to influence cross-sectional variations in the dependent variable do not vary sufficiently over time, which is the case in our analysis, then there are costs involved in using fixed effects.[32] Moreover, fixed effects chew up substantial degrees of freedom, making estimates of standard errors and other coefficients less precise. In light of these criticisms, we estimate the models with and without fixed effects. In models without fixed effects, we include a dummy variable for the central, inland, and coastal regions, respectively, to control for any fixed effects that may exist at the regional level. Our coding of the regional dummy variable follows the research done by Chen, as described in chapter 4.[33] Regression results from these two sets of models are similar and do not substantially affect the interpretation of our results.

Results

Models I–III in table 5.1 present results from negative binomial models without fixed effects at the regional level. Models IV–VI present negative binomial estimates with regional fixed effects. The most notable result is that the variable measuring the bilateral FDI context at the provincial level is statistically significant in Models I, II, III, and VI, and the variable measuring the bilateral export context at the provincial level is statistically significant in Models II, III, V, and VI. Both variables are positively signed as well. These results are in line with our theoretical expectations, indicating that provinces that export primarily to *or* receive the bulk of their FDI from countries with high levels of ISO 14001 adoption are also more likely to evince high levels of ISO 14001 adoption.

Other control variables performed well too. With the exception of *soot*

emission, our alternative measures of pollution emission (i.e., *SO_2 emission* and *solid waste emission*) are positively associated with ISO 14001 adoption rate, and the relationships are statistically significant. This result is in line with our theoretical expectation, indicating that a higher level of pollution is likely to generate greater demand for environmentally friendly policies.

Using provincial GDP as a proxy of the number of certifiable facilities in a province, we found that provincial GDP is positively associated with ISO 14001 adoption rate, and the relationship is statistically significant at the $p < 0.001$ level across model specifications. This suggests that ISO 14001 adoption rate corresponds positively to the number of potentially certifiable facilities in a jurisdiction.

TABLE 5.1. Negative Binomial Models of ISO 14001 Adoption

Variable	I	II	III	IV	V	VI
SO_2	.061***			.057**		
	(0.018)			(.022)		
Soot		–.00001			–.001	
		(.00002)			(.005)	
Solid waste			.070**			.059*
			(.032)			(.029)
GDP	.2000***	.194***	.186***	.197***	.202***	.194***
	(.013)	(.019)	(.012)	(.016)	(.016)	(.016)
GDP per capita	.0002**	.0002**	.0004**	.0003***	.0002**	.0004**
	(.0001)	(.0001)	(.0002)	(.0001)	(.0001)	(.0002)
Per capita GDP^2	–2.21e-08	–1.02e-08	–7.17e-08	–3.56e-08	–2.36e-08	–6.62e-08
	(2.58e-08)	(3.01e-08)	(4.31e-08)*	(2.79e-08)	(2.90e-08)	(4.42e-08)
Bilateral	9.99e-07*	1.21e-06**	1.27e-06**	7.54e-07	7.04e-07	9.72e-07*
FDI	(5.42e-07)	(6.05e-07)	(5.01e-07)	(4.95e-07)	(6.31e-07)	(5.82e-07)
context						
Bilateral export	2.95e-06	5.19e-06**	4.41e-06*	3.11e-06	4.99e-06**	4.21e-06*
context	(2.57e-06)	(2.65e-06)	(2.58e-06)	(2.36e-06)	(2.33e-06)	(2.39e-06)
Coastal dummy					–.098**	
					(.044)	
Central dummy				.060	–.046	.010
				(.045)	(.056)	(.040)
Inland dummy				.059		.058
				(.048)		(.046)
Constant	–.983***	–.552***	–.615***	–1.021***	–.632***	–.717
		(.163)	(.110)	(.148)	(.119)	(.121)
N	46	45	46	46	45	46
Wald chi^2	2,203.10	437.61	1,155.93	1,955.18	1,304.04	4,488.64

Note: Robust standard errors in parentheses; e stands for exponential notation.
*significant at 10% **significant at 5% *** significant at 1%

GDP per capita at the provincial level is likewise positively associated with the ISO 14001 adoption rate, and the relationship is statistically significant across model specifications. This finding lends support to arguments emphasizing the positive environmental spillovers of economic development. However, while we found the expected positive relationship between *GDP per capita* and *ISO 14001 adoption,* the effect of *per capita GPD*^{2} on *ISO 14001 adoption* appears more tenuous. *Per capita GDP*^{2} has a negative sign across model specifications, potentially supporting the inverted U-shaped relationship between economic development and environmental protection along the lines of the environmental Kuznets curve, whereby economic growth will help to clean up the environment only after a certain threshold of income level has been reached. However, this variable is only statistically significant in Model III.

Robustness Checks

As a robustness check of our key findings, we use alternative measures of actual pollution emissions at the provincial level as our key dependent variables. The choice of such an outcome variable may be defended on the ground that policy outcomes in large part provide an indication of the regulatory environment as industries located in provinces with more stringent regulations are likely to emit less than their counterparts in less heavily regulated provinces, other things being equal.[34]

In other words, we infer that economic interactions with countries with superior regulatory standards should encourage firms in a host province to adopt sound microlevel environmental standards, which would in turn help to curb pollution in this province. As provincial pollution emissions are simply aggregate reports of individual firm emissions and do not account for emissions elsewhere such as vehicle or consumer emissions, they provide an adequate proxy for firm-level behavior.

In this set of tests, we adopt alternative measures of the emission of sulfur dioxide (SO_2), solid waste, and waste gas among Chinese provinces as dependent variables. We include a set of control variables that were utilized in our analysis of the race-to-the-bottom hypothesis in chapter 4 in this set of analyses. To reiterate, these variables are *GDP per capita, GDP growth rate, SOE output share, land, population density,* the share of environmental *personnel* in a province's total population, and a dummy variable for the top ten *coal*-producing provinces. All of these variables are measured at the province-year level.

We estimate the conventional generalized least squares model for cross-sec-

tional time-series data. In addition, while we have assumed that observations across provinces are independent, it is possible that observations within provinces are not independent, resulting in heteroskedasticity across provinces and inefficient estimates. To account for this possibility, the models employ robust standard errors adjusted for clustering within provinces.

Tables 5.2 and 5.3 present our random- and fixed-effect estimation results, respectively. In all of the model specifications, the variables representing *aggregate* FDI and exports at the provincial level hold up well. With a couple of exceptions, *expgdp* and *FDI* have the expected negative sign with the emission

TABLE 5.2. Bilateral Export and FDI Contexts and Pollution Emissions at the Provincial Level (without fixed effects)

Variable	Solid Waste (1A)	Soot (1B)	Dust (1C)	SO_2 (1D)	Waste Gas (1E)	Waste-water (1F)
GDP per capita	.001***	–.0005**	–.001***	–.0005***	.000***	.000
	(.000)	(.0002)	(.000)	(.001)	(.000)	(.0001)
Growth rate	.000	–.163**	.055	.088*	.066**	–.135***
	(.043)	(.064)	(.064)	(.046)	(.029)	(.038)
Land	.574***	–.263	.107	.060	.048	.183**
	(.134)	(.170)	(.169)	(.122)	(.069)	(.086)
Population density	.508***	–.318**	.189	.311**	.024	0.199**
	(.110)	(.161)	(.142)	(.130)	(.070)	(.079)
SOE output share	.000	.0004***	.000	.0003***	.000***	.000
	(.000)	(.0001)	(.000)	(.0007)	(.000)	(8.01e-05)
Coal	.018	–.191	–.238**	–.082	–.051	–.348***
	(.064)	(.129)	(.107)	(.080)	(.070)	(0.070)
Personnel	6.458	37.870*	17.019	–.724	4.650	–10.264
	(10.342)	(20.451)	(15.951)	(14.215)	(11.179)	(11.115)
EXPGDP	–.016***	–.011*	.003	.003	–.004*	–.006
	(.004)	(.006)	(.002)	(.002)	(.002)	(.004)
FDI	–.467***	–.190**	–.297***	–.362***	–.296***	–.070
	(.073)	(.105)	(.091)	(.067)	(.037)	(.054)
Weighted export	–4.76e-07	–.933e-07**	1.00e-06**	–2.71e-07	–9.17e-07***	–6.32e-07*
	(4.95e-07)	(4.61e-07)	(5.11e-07)	(2.74e-07)	(1.37e-07)	(3.73e-07)
Weighted FDI	–7.59e-08	–6.42e-07***	–6.58e-08	3.78e-08	–9.25e-08	4.70e-08
	(6.25e-08)	(1.24e-07)	(5.32e-08)	(2.75e-08)	(9.85e-08)	(3.21e-08)
Constant	–4.923**	13.270***	5.810**	6.295***	2.326**	2.534*
	(1.963)	(2.554)	(2.639)	(1.920)	(1.155)	(1.531)
N	91	90	91	91	91	91
Log likelihood	–4.226	–22.431	–20.289	–4.226	14.969	3.651

Note: Robust standard errors in parentheses; e stands for exponential notation.
*significant at 10% **significant at 5% ***significant at 1%

TABLE 5.3. Regression Results with Fixed Effects

Variable	SO_2 (2A)	Soot (2B)	Dust (2C)	Solid Waste (2D)	Waste Gas (2E)
GDP per capita	.000	–.001***	.000	.001***	.0005
	(.000)	(.000)	(.000)	(.0002)	(.0001)
Growth rate	–.003	–.154***	.057	–.015	.060**
	(.040)	(.059)	(.089)	(.048)	(.029)
Land	.477***	–.278	.660***	.758	.295***
	(.116)	(.177)	(.229)	(.161)	(.082)
Population density	.573***	–.297*	.720***	.729***	.290***
	(.109)	(.161)	(.214)	(.140)	(.078)
SOE output share	4.60e–06	.000***	–.0005*	–.0004**	–.00002
	(.0001)	(.000)	(.000)	(.0002)	(.00007)
Coal	–.247***	–.163	–.180	.089***	–.029***
	(.053)	(.118)	(.171)	(.079)	(.057)
Personnel	7.699	34.447**	39.488	47.349**	8.872
	(9.112)	(16.767)	(24.060)	(15.662)	(42.003)
EXPGDP	–.001	–0.012**	.002	–.015**	–.004
	(.002)	(.006)	(.005)	(.005)	(.003)
FDI	–.348***	–.225**	–.217*	–.359***	–.334***
	(.067)	(.095)	(.132)	(.092)	(.045)
Weighted export	–1.05e-07	–9.84e-07**	.000	–9.22e-07**	–1.19e-06***
	(3.07e-07)	(4.82e-07)	(.000)	(4.71e-07)	(2.40e-07)
Weighted FDI	3.26e-09	–4.50e-07***	.000	–3.23e-08***	–2.61e-08
	(2.60e-08)	(1.43e-07)	(.000)	(4.55e-08)	(3.10e-08)
Coastal dummy	.031	1.095**	.215	.242*	.813
	(.098)	(.502)	(.283)	(.137)	(.079)
Inland dummy	.224*	.934*	.922**	.613**	.777***
	(.118)	(.516)	(.398)	(.201)	(.117)
Central dummy	–.557***	1.001**	.217	.238**	.475***
	(.086)	(.488)	(.268)	(.111)	(.079)
Constant	.712	12.736***	–4.947	–9.699***	–2.216***
	(1.850)	(2.760)	(4.144)	(2.692)	(1.357)
N	91	90	91	91	91
Log likelihood	15.639	–14.716	–38.325	–9.699	28.286

Note: Robust standard errors in parentheses; e stands for exponential notation.
*significant at 10% **significant at 5% ***significant at 1%

variables, and the relationships are statistically significant in most model specifications. Importantly, there is some evidence that export destinations matter as the *weighted export* variable is negatively associated with pollution emission variables, and the relationships are significant in most model specifications. The variable representing the bilateral FDI context is in the expected direction in most model specifications, and the relationships are statistically significant in Models 1B, 2B, and 2D. While the *weighted FDI* variable did not achieve statistical significance in the rest of the models, its sign is in the expected direction. This lends support to our hypotheses that it matters as to where each province is sending its exports and from whom it is receiving the foreign investment.

Turning to the effects of other variables in the model, it should be noted that the signs of most control variables are in the expected direction. The share of state-owned enterprises in a province's GDP is positively associated with the emission variables in most model specifications and is statistically significant in some. Provincial population density and land area are positively associated with the pollution variables in most model specifications, and the relationships are occasionally significant. The variable representing the share of environmental personnel in a province's population has demonstrated a positive sign with the emission variables and has reached statistical significance in Models 1B, 2B, and 2D. This counterintuitive result may be explained by the financial and human resource constraints faced by the local environmental protection agencies. As local environmental protection agencies face myriad challenges with regard to funding and monitoring capacity, the number of personnel charged with environmental protection may not provide a good indication of the enforcement capacity of the various administrative agencies. Finally, the per capita GDP and GDP growth rate of a province demonstrate contradictory signs in the models, making it difficult to draw definite conclusions about the influence of these variables on the environment in China.

DISCUSSIONS

This chapter finds that provinces that send most of their exports to or receive the bulk of their investment from countries with more rigorous environmental standards also tend to more actively pursue voluntary environmental standards certification. This result is independent of the net effect of aggregate provincial exports or that of total incoming FDI. It is also consistent with Vogel's California Effect argument, supporting the view that when developed countries with

stringent environmental standards absorb the bulk of developing-country exports, free trade can lead to the ratcheting-up of environmental standards in developing countries. Such findings lend further support to the argument that foreign direct investment can encourage the diffusion of organizational practices from the home country to the host country. To the extent that there is cross-national variation in home-country practices, this should result in the divergence of corporate behavior across national borders.

The above discussions have direct implications for the pollution-haven and race-to-the-bottom arguments. Advocates of the pollution-haven argument maintain that industries flock to areas of lax environmental regulation in the developing world to reduce business costs. They blame the so-called industrial flight on overly stringent regulation in the home country and view relaxations of domestic regulation as a way of ameliorating the problem.[35] In a similar vein, environmentalists argue that as free trade abets regulatory races, it is necessary to implement "fair trade" so as to relieve the burdens that stringent domestic regulations impose on domestic firms.[36]

Advocates of globalization take a different approach to this issue, arguing that MNCs often transfer technologies and management practices shaped by those adopted in the home country in order to streamline production costs in different locations and maximize firm efficiency. Furthermore, by adopting corporate practices in line with those of the home country and by adopting environmentally friendly technologies and practices, MNC subsidiaries should exhibit superior environmental practices relative to local firms. In addition, host-country governments, nongovernmental organizations, and other local stakeholders may exert pressure on MNCs to adopt environmentally friendly practices, instigating MNCs to maintain green standards in their operations.[37] Consequently, if hypothesis 2 is valid, then this should lend further support to the contentions of globalization optimists about how foreign investment generates positive environmental spillovers in the host country, especially if such investment originates from a home country with superior environmental standards and performance.

In addition to the theoretical contributions, the above findings have policy implications for environmental groups dedicated to promoting a greener world. Importantly, environmental groups argue that international trade creates structural conditions leading to regulatory races as developing countries' exporters exploit their allegedly less stringent environmental standards to capture markets in developed countries. They believe that governments in developed countries are likely to come under pressure from their constituents to level the playing

field by diluting domestic environmental laws. As a result, free trade encourages races to the bottom in governments' environmental regulations.

However, if our argument, based on a case study of China, is valid, then a case can be made that the importing countries are influencing the organizational practices in the exporting countries. As well, actors in developed countries are able to transfer prevailing corporate practices at home to developing countries. Consequently, for governments in the developing world, this means that more attention needs to be paid to the source country of FDI in order to bring in foreign investment that best serves the nation's specific needs.

Similarly, while many nongovernmental organizations striving to safeguard the environment are less than sanguine about FDI growth, this research emphasizes the potential environmental benefits that FDI can bring to a host country. Consequently NGOs may need to consider how to best maximize MNCs' potential positive externalities in the host economies by lobbying the MNCs in their home countries. It is possible that by exerting pressure on MNCs to require their suppliers in the host economy to adopt environmentally friendly criteria, NGOs and other actors interested in promoting the environmental cause can better enhance their chances of influencing the environmental standards in the host country and achieve their goal of bringing about a greener world.

FIRM-LEVEL ANALYSES

CHAPTER 6

How Do Firms Behave? Survey Evidence from Business Executives

This chapter supplements our provincial-level analyses with a survey of Chinese business executives' attitudes toward environmental protection and the motivations, costs, and benefits of implementing environmentally sound business strategies. The survey results lend substantial support to our key hypotheses about the ratcheting-up effect of trade and FDI on environmental standards in China. In line with our expectations, we find that foreign-invested enterprises (FIEs), including both wholly foreign-owned firms and joint ventures (JVs), are more likely to demonstrate a higher level of environmental responsibility in business decision making than wholly domestically owned firms (WDOFs). This result also holds for domestic firms that export a significant proportion of their products to *developed* countries and those that supply a significant proportion of their products to *developed-world* multinational customers based in China. These findings lend additional support to the importance of developed-world export and supply relationships on firm environmental behavior in industrializing countries.

This chapter outlines the specific hypotheses tested in the survey. We derive these hypotheses from the same body of theoretical literature that informed our work in previous chapters. We expect that the dynamics that led to the observed cross-provincial variation in environmental performance should also be reflected at the level of the firm as firms can be considered as the agents that drive the processes observed at the provincial level. In this sense, the survey provides a robustness check on our arguments about firm self-regulation and environmental technology transfer, showing how a firm's primary export mar-

kets and FDI source country affect its environmental awareness, decision making, and performance. After laying out our key hypotheses, we describe our research design, including the method of data collection and sampling and the measurement of key variables, and then present our survey results and a concluding discussion on the implications of our findings.

HYPOTHESES

In order to analyze the causal mechanisms linking international economic integration to firm environmental standards and performance, it is necessary not only to examine observed outcomes but also to go directly to the source, firms themselves. To do so, we conducted a survey of executives of WDOFs, FIEs, and JVs operating in China. We use the survey to tap firms' attitudes about how export market accessibility, partial or sole foreign ownership, and supplier-developed world MNC relationships affect firm environmental performance and decision making.

Based on the theoretical and empirical research discussed in earlier chapters, we hypothesize that international economic integration, particularly with developed-country markets, positively affects firm environmental attitudes and performance. We analyze international economic integration through two distinct variables: firm ownership type (i.e., the extent of foreign ownership) and level of integration into developed-world markets. We measure the latter as the level of a firm's exports to developed markets or the level of its supply to FIEs headquartered in the developed world. We focus on how multinational ownership and international economic integration affect both the environmental awareness and performance of the firms in our survey analysis.

Prior research suggests that MNCs increasingly engage in self-regulatory behavior in their worldwide operations by adopting environmental standards that exceed the mandates of the host government.[1] As explained previously, the pressure for such self-regulation originates from a number of sources, including international institutions, customers, and internal cost savings strategies. First, in addition to responding to the regulatory environment in the home country, MNCs need to abide by the regulatory requirements of international institutions.[2] Because the environmental standards in developed-world MNCs' home countries often exceed those in developing countries, and because international institutions such as the International Chamber of Commerce are devoted to promoting corporate adoption of global environmental standards, developed-country MNCs are often subject to higher expectations for corporate environmental responsibility than developing-world

firms.[3] Second, MNCs' environmental performance in developing countries directly affects corporate social responsibility (CSR) reputation. Companies with a bad CSR reputation are likely to face potential market share loss, as consumers tend to identify positively with products that are made in an environmentally friendly manner.[4] Third, there exists internal pressure for self-regulation, as the use of standardized production technologies across a company's facilities worldwide should increase efficiency by reducing production costs associated with multiple production processes and varying technological specifications.[5] The above conjectures lead us to expect MNCs to exhibit a higher level of responsibility toward environmental management and yield our first hypothesis.

Hypothesis 1 (H1): *In general, enterprises with significant foreign investment (including wholly foreign-owned enterprises and JVs) are more environmentally responsible than wholly domestically owned firms.*

While hypothesis 1 focuses on the generic differences in the environmental behavior of WDOFs and FIEs, hypotheses 2 and 3 tap the impact of developed-country exports and multinational supply contracts on firm environmental performance. In order to prevent customers in developed export markets from erecting protectionist trade barriers against substandard products, developing-country exporters have incentive to conform to the prevailing environmental standards in their most stringent export market(s).[6] Trade retaliation fears should lead developing-country exporters toward more environmentally responsible practices than nonexporters or those that export primarily to other developing-world markets.

This type of self-regulatory pressure also originates from corporate customers, as consumer demands and normative obligations compel firms to monitor supply chains. Based on this logic, we argue that subsidiaries of developed-country MNCs are more likely to subject Chinese WDOF suppliers to rigorous environmental behavioral scrutiny. Indeed, developed-country firms' desire to avoid negative publicity should lead them to mandate environmental criteria in supplier selection. In turn, these demands should generate pressure on both domestic and foreign-invested firms in China to conform to elevated demands or face significant sales losses.[7] Consequently, we not only expect FIEs to be more environmental than WDOFs, we also expect Chinese firms with significant developed-country foreign investment or supply relationships to be more environmentally responsible than *other Chinese firms* without such ties. These expectations lead us to hypotheses 2 and 3.

Hypothesis 2 (H2): *Firms that export a large proportion of their output to developed markets tend to make more environmentally responsible business decisions.*

Hypothesis 3 (H3): *Firms that sell a large proportion of their output to developed-world multinational customers tend to make more environmentally responsible business decisions.*

It should be noted that hypotheses 2 and 3 focus on the overall effects of developed-country economic interactions on firm environmental practices. They do not test the impact of specific export destinations or specific foreign investment source countries. As the evidence from chapter 5 suggests, Chinese provinces are likely to alter their level of environmental performance based on their level of integration with developed markets. If those results are valid, then we would expect this dynamic to be reflected in our survey of business executives as well. In this section we focus on the environmental impact of exporting to *or* supplying to corporate customers from specific developed countries and regions (such as Japan, Europe, the United States, Canada, Australia, or New Zealand) on firm environmental behavior. We focus on these countries and regions in part because they are the leaders in areas of environmental self-regulatory certification mechanisms such as ISO 14001. For example, according to worldwide statistical data on ISO 14001 adoption collected by corporate risk management, Japan, Australia, Canada, and the United States ranked fourth, seventh, ninth, and twelfth, respectively, in the per capita number of ISO 14001 adoptions as of the end of 2006.[8] Major European countries also show up as leaders of ISO 14001 certification: Sweden ranks first, Spain second, and Switzerland third, in the world for number of ISO certifications, while Italy, the United Kingdom, Germany, and France rank fifth, eighth, tenth and eleventh, respectively.[9] In addition, there is evidence that developed-world firms have strong concerns about bad publicity following negative environmental audit reports.[10] Consequently, we expect that firms that either export to or supply to firms from Japan, Europe, the United States, Canada, Australia, or New Zealand should engage in more rigorous environmental practices.

Hypothesis 4 (H4): *Chinese firms that export a large proportion of their output to Japan, Europe, the United States/Canada, and Australia/New Zealand tend to engage in superior environmental practices relative to other firms.*

Hypothesis 5 (H5): *Chinese firms that sell a large proportion of their output to multinational customers from Japan, Europe, the United States/Canada, and Australia/New Zealand tend to engage in superior environmental practices relative to other firms.*

We derive our conclusions about the effects of foreign ownership and variation in integration levels on firm environmental attitudes based on the "perceived impact" of these variables by Chinese business executives as noted by their survey responses. In the survey, we attempt to first gauge knowledge and awareness of general environmental issues, the legality of polluting in China, and various pollution-mitigating instruments (such as the ISO 14001) and then judge this knowledge against opinions of the behavioral effects of firm ownership and economic integration. Our primary goal is to assess executive opinion regarding the impact (positive, negative, or none) of these variables on firm attitudes and practices.

RESEARCH DESIGN

Data Collection and Sampling Method

We conducted the survey through a private third-party survey house based in China. This firm distributed questionnaires to executives of companies located in Chinese coastal areas in June 2008. The cities and provinces represented in the sample include Shanghai, Tianjin, Jiangsu, Zhejiang, Fujian, Shandong, and Guangdong. All respondents are either senior-level management personnel or chief executive officers. As such, their responses should be highly representative of the environmental opinions of business executives in a broader context. We collected responses from fifty firms. While the sample size is not large enough to lend itself to a reliable regression analysis, it is sufficient for descriptive statistics. We attempted to ensure truthful responses by avoiding personal or firm identity disclosure.

Our survey design enables us to control for many factors that might affect environmental attitudes and performance. Specifically, we apply sample selection criteria to ensure that our sample accommodates variation in ownership (i.e., multinational or not), the industry-level pollution intensity, and level of developed-country exports or multinational customer supply contracts.

(a) Foreign ownership. Because we posit a difference in the environmental awareness of executives of FIEs vs. WDOFs, we include both in our sample:

32 WDOFs (or 62 percent) with no foreign participation (state-owned, collective, or private enterprises) and 18 FIEs (or 38 percent) with foreign investment (wholly foreign-owned enterprises or joint ventures).

(b) Industry pollution intensity. To determine whether or not executives of different sectors evince distinct notions of corporate environmental responsibility, we surveyed companies from industries with varying levels of pollution intensity, including lightly polluting industries such as transportation equipment and consumer electronics; moderately polluting industries such as textiles and pharmaceuticals; and highly polluting industries such as iron and steel, mining, chemicals, and paper and pulp. Our sample is composed of 19, 20, and 11 companies (or 38, 40, and 22 percent of the total) in lightly, moderately, and highly polluting industries, respectively. The distribution across sectors should highlight any potential cross-sectoral differences in business executives' environmental attitudes.

(c) Multinational customers and exports/supply to developed countries. A key hypothesis in this project concerns the extent to which environmental regulatory stringency in major export destinations or MNC corporate customer home countries influences environmental practices and standards of domestic suppliers and exporting firms. To provide preliminary evidence for this hypothesis, we ensured that roughly half of the domestic companies either export to developed countries or supply to multinational customers.

Measures

We develop measures of both our dependent and independent variables. While most of these measures are original, particularly those of the dependent variables, those that capture the basic firm characteristics (such as multinational customers, exports to developed countries, and firm size) are adopted from previous surveys.[11]

Dependent Variables

To test H1, we developed questions to assess the environmental knowledge and awareness of business executives and the importance they place on environmental preservation. These questions include the following: "My company is willing to make a financial contribution to environmental protection"; "The government should invest more in environmental protection even if it impedes

economic growth"; "Compared to economic development, how important is environmental protection?"; "Supplying to corporate customers from North America, Europe, or Japan results in enhanced environmental awareness and greater attention to environmental management practices and corporate conduct." For the last question, respondents were asked to rank their answers on a scale of 1 to 5, with 1 indicating "strongly disagree" and 5 indicating "strongly agree."

To test H2 to H5, we developed questions to tap the environmental performance of the respondents and used these measures in the analysis.

ISO 14001 adoption. We developed the following question to measure a company's ISO 14001 adoption rate: "Has your company registered for ISO 14001?" Responses to this question are coded as a dichotomous variable, with "yes" coded as 1 and "no" or "not sure" as 0.

Environmental Management System (EMS) certification. We also asked whether a company has registered or applied for any type of environmental management system or certification as another measure of its environmental management performance: "Has your company registered/applied for any type of environmental management system or certification other than ISO 14001?" Positive responses to this question were coded as 1 and negative responses to this question were coded as 0.

Overall compliance success. A respondent's self-assessment of a company's overall compliance success with local and national environmental laws may provide another indication of firm environmental performance. Thus we asked respondents the following question: "In your opinion, how successful is your company in complying with local and national environmental laws?" We asked the respondents to rate their answer on a scale of 1 to 10, with 10 being the most successful.

Overall environmental performance composite index. We created a composite index of a firm's overall environmental performance by combining a given company's responses to the above three questions. The incorporation of these three variables into a composite index is justifiable as the three variables are highly correlated with one another.[12] We relied on respondent self-assessments of their environmental performance, as neither the Chinese government nor any third-party organizations collect or maintain such data. Although self-assessments may have an upward bias because respondents may overstate firm environmental performance, it should not pose a problem to our analysis because this bias should extend across the sample.

Independent Variables

We developed several measures of a company's world market ties as our key independent variables.

Multinational ownership. We asked the respondents to choose one of the following ownership types that best describes their company: (1) state-owned enterprise; (2) collective enterprise; (3) private ownership; (4) joint venture; and (5) wholly foreign-owned enterprise. We then recoded the respondent's answers: Answers (1) to (3) were recoded as 0, indicating that the respondent's company is wholly domestically owned, and answers (4) to (5) were recoded as 1, indicating that the respondent is employed by an FIE. The resulting variable is dichotomous.

Multinational customers. We asked the respondents the following two questions: "What percentage of your products is sold in the domestic Chinese market?" and "Of the products you sell in the domestic market, what percentage is sold to joint ventures or wholly foreign-owned firms?"[13] We then took the product of a respondent's answer to these two questions to create the *Multinational customers* variable.

Exports to developed countries. We asked the respondents to specify the share of the company's exports to the following countries and regions in the total sales volume of the company: Europe, the United States/Canada, Japan, and Australia/New Zealand.[14] The sum of the respondents' answers to each of these questions captures this variable.

Supply to developed countries. We also asked the respondents to specify the share of the company's supplies to China-based FIEs with home offices in *each* of the following countries or regions in the total sales volume of the company: Japan, Europe, the United States and/or Canada, and Australia and/or New Zealand. We then followed the same procedure described in the previous paragraph to create the *supply to developed countries* variable.

Exports to Europe, Exports to Japan, Exports to U.S./Canada, Exports to Australia/New Zealand, Supply to Europe, Supply to Japan, Supply to U.S./Canada, Supply to Australia/New Zealand are simply the respondents' answers to individual questions about the share of a company's exports or supply to *each* of the above countries or regions proportional to the company's total sales volume. These variables are different from *Exports to developed countries* or *Supply to developed countries* in that they measure a company's exports or supply to specific countries or regions, whereas the latter tap exports or supply to all developed

countries and regions named above as a whole. Table 6.1 provides a detailed description of the measurement of each of these variables.

RESULTS

Hypothesis 1

H1 addresses differences in awareness and appreciation for corporate environmental responsibility between executives of WDOFs and FIEs. To assess this hypothesis, we developed several questions to gauge the overall environmental attitudes of business executives. Specifically, we asked the respondents questions regarding the importance of environmental protection relative to economic development and their willingness to make a financial contribution to environmental protection.

The survey results lend support to the hypothesis that executives of WDOFs and FIEs demonstrate somewhat different attitudes toward the importance of environmental protection. For example, when asked to rate the extent to which they agree with the statement "My company is willing to make a financial contribution to environmental protection," on a scale ranging from "strongly disagree," "disagree," "neutral," "agree," to "strongly agree," 16 out of the 19 executives of FIEs (or 84 percent) answered either "agree" or "strongly agree," compared to 23 out of 31 executives of WDOFs (or 75 percent) (see table 6.2). The Pearson correlation between *Multinational ownership* and the respondent's answers to this question is .314, which is significant at the $p < 0.05$ level for a 2-tailed test.

Figure 6.1 provides a visual comparison of responses to the above questions from WDOFs executives versus those of FIEs. In particular, it shows the mean response score, one standard deviation below the mean, and one standard deviation above the mean for each group of respondents. As indicated, FIEs show up as having higher scores in each of these categories compared to WDOFs. The mean of FIEs' response to this question is 4.53, compared to a mean of 3.85 for WDOFs. The one standard deviation below the mean for FIEs is 3.63, compared to 1.93 for WDOFs; and the one standard deviation above the mean for FIEs is 5.44, compared to 4.93 for WDOFs.

Similarly, when asked to rate the extent to which they agree with the statement "The government should invest more in environmental protection even if it impedes economic growth," all of the FIE executives answered "agree" or

TABLE 6.1. Variable Measurement

Dependent Variables	Measurement
Environmental Awareness Variables	
	"My company is willing to make a financial contribution to environmental protection." (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree
	"The government should invest more in environmental protection even if it impedes economic growth." (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree
	"Compared to economic development, how important is environmental protection?" (1) not at all important; (2) somewhat less important; (3) equally important; (4) somewhat more important; (5) much more important
	"Supplying corporate customers from North America, Europe, or Japan results in enhanced environmental awareness and greater attention to environmental management practices and corporate conduct." (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree
Environmental Practices Variables	
ISO 14001 adoption	"Has your company registered for ISO 14001?" (1) yes; (2) no; (3) not sure what ISO 14001 is Answers (2) and (3) were recoded as "0"; answer (1) was coded as "1."
Environmental Management System (EMS) certification	"Has your company registered/applied for any type of environmental management system or certification?" (1) no; (2) yes
Overall compliance success	"In your opinion, how successful is your company in complying with local and national environmental laws? Please rate your answer on a scale of 1–10, with '10' being the most successful."
Overall environmental performance index	This variable is created combining a particular company's responses to the above three questions about ISO 14001 adoption, EMS certification, and overall compliance success.
Independent Variables	
Multinational ownership	"Which of the following best describes your business?" (1) state-owned enterprise; (2) collective enterprise; (3) private ownership; (4) joint venture; (5) wholly foreign-owned enterprise We recoded this variable into a dichotomous variable whereby answers (1)–(3) were recoded as "0" and answers (4) and (5) were recoded as "1."
Multinational customers	We asked the respondents two questions: "What percentage of your products is sold in the domestic Chinese market?"

(1) none; (2) 1–25%; (3) 26–50%; (4) 51–75%; (5) 76–100%
"Of the products you sell in the domestic market, what percentage is sold to joint ventures or wholly foreign-owned firms?"
(1) none; (2) 1–25%; (3) 26–50%; (4) 51–75%; (5) 76–100%
Multinational customers is the product of a respondent's answer to the above two questions.

Exports to developed countries

"Which countries and regions does your company export to? Check all that apply and specify the share to particular countries/regions in the total sales volume of your company."

Country/Region	None	1–25%	26–50%	51–75%	76–100%
(1) Europe	0	1	2	3	4
(2) U.S. and/or Canada	0	1	2	3	4
(3) Japan	0	1	2	3	4
(4) Australia and/or New Zealand	0	1	2	3	4

We took the sum of a respondent's answers to items (1)–(4) to create the *Exports to developed countries* variable.

Supply to developed countries

"If you supply to joint ventures or wholly foreign-owned enterprises in China, in which country (region) is this company (or are these companies) based? Please check all that apply and specify the share of your supply to these companies in the total sales volume of your company."

(1) Europe	0	1	2	3	4
(2) U.S. and/or Canada	0	1	2	3	4
(3) Japan	0	1	2	3	4
(4) Australia and/or New Zealand	0	1	2	3	4

We took the sum of a respondent's answers to items (1)–(4) to create the *Supply to developed countries* variable.

Exports to Japan

This variable is measured as the respondent's answer to the question about the share of the company's exports to Japan in the company's total sales volume. (For variable measurement, see the *Exports to developed countries* variable above.)

Exports to Europe

This variable is measured as the respondent's answer to the question about the share of the company's exports to Europe in the company's total sales volume. (For variable measurement, see the *Exports to developed countries* variable above.)

Supply to Japan

This variable is measured as the respondent's answer to the question about the share of the company's supply to Japan in the company's total sales volume. (For variable measurement, see the *Supply to developed countries* variable above.)

Supply to Europe

This variable is measured as the respondent's answer to the question about the share of the company's supply to Europe in the company's total sales volume. (For variable measurement, see the *Supply to developed countries* variable above.)

TABLE 6.2. Responses of Executives of WDOFs versus FIEs to the Following Question: "My company is willing to make a financial contribution to environmental protection"

Count (%)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
WDOFs	1	4	3	14	9	31
	(3.23%)	(12.90%)	(9.68%)	(45.16%)	(29.03%)	(100%)
FIEs	0	1	2	2	14	19
	(0.00%)	(5.26%)	(10.53%)	(10.53%)	(73.68%)	(100%)
Total	1	5	5	16	23	50
	(2.00%)	(10.00%)	(10.00%)	(32.00%)	(46.00%)	(100%)

TABLE 6.3. Responses of Executives of WDOFs versus FIEs to the Following Question: "The government should invest more in environmental protection even if it impedes economic growth"

Count (%)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
WDOFs	0	2	4	17	8	31
	(.00%)	(6.45%)	(12.9%)	(54.84%)	(25.81%)	(100%)
FIEs	0	0	0	9	10	19
	(.00%)	(0.00%)	(0.00%)	(47.37%)	(52.63%)	(100%)
Total	0	2	4	26	18	50
	(.00%)	(4.00%)	(8.00%)	(52.00%)	(36.00%)	(100%)

"strongly agree" to this question, compared to the 81 percent of executives of WDOFs who answered positively to this question (see table 6.3). The Pearson correlation between *Multinational ownership* and the respondents' answers to this statement is 0.341, which is again significant at the $p < 0.05$ level for a 2-tailed test.

Figure 6.2 plots the mean, one standard deviation above, and one standard deviation below the mean for each group of respondents. Similar to the pattern observed in figure 6.1, executives of FIEs consistently had higher mean scores on this question than WDOFs. The one standard deviation above the mean and one standard deviation below the mean are also higher for FIEs than for WDOFs.

Moreover, compared to executives of FIEs, a much smaller percentage of the executives of WDOFs consider environmental protection to be of the same importance as economic development. Specifically, the survey questionnaire asked the respondents the question "Compared to economic development, how

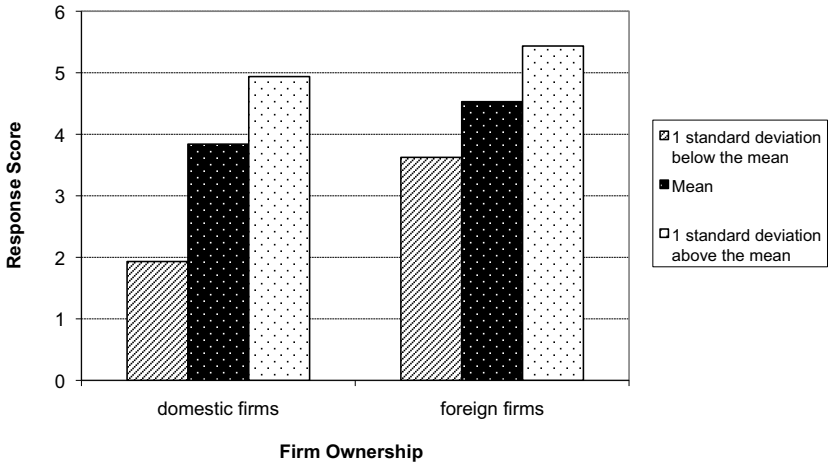

FIG. 6.1. Multinational ownership and firm responses to the following question: "My company is willing to make a financial contribution to environmental protection"

important is environmental protection?" Respondents were asked to rank their answers on a scale of 1 to 5, with 1 indicating "not important at all" and 5 indicating "much more important." As table 6.4 shows, 14 out of 19 of the executives of FIEs considered environmental protection to be "much more important" than economic development, compared to 6 of 31 executives of WDOFs (see table 6.4). The Pearson correlation between these variables is .366, which is significant at the $p < 0.01$ level for a 2-tailed test.

Figure 6.3 compares the mean score, one standard deviation above the mean, and one standard deviation below the mean for WDOFs and FIEs regarding this question. Once again, figure 6.3 illustrates that FIEs generally consider environmental protection to be equally, if not more important than economic development, as they have consistently achieved higher scores than executives of WDOFs.

Hypotheses 2–3

In this section we analyze how exporting to or selling to multinational customers from developed countries affects firm environmental behavior. As mentioned earlier, we created measures of the extent to which a firm exports to developed countries or supplies to developed-country multinationals. We also

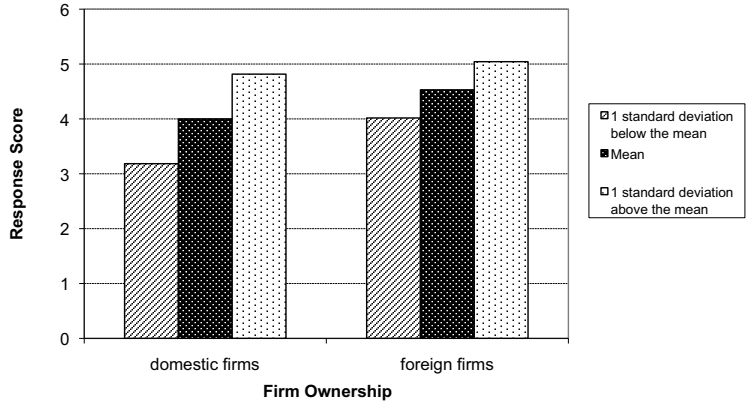

FIG. 6.2. Multinational ownership and mean firm responses to the following question: "The government should invest more in environmental protection even if it impedes economic growth"

TABLE 6.4. Responses of Executives of WDOFs vs. FIEs to the Following Question: "Compared to economic development, how important is environmental protection?"

Count (%)	Not Important at All	Not as Important	As Important	More Important	Much More Important	Number of Respondents
WDOFs	1	1	12	11	6	31
	(3.23%)	(3.23%)	(38.71%)	(35.48%)	(19.35%)	(100%)
FIEs	0	1	4	0	14	19
	(0.00%)	(5.26%)	(21.05%)	(0.00%)	(73.68%)	(100%)
Total	1	2	16	11	20	50
	(2.00%)	(4.00%)	(32.00%)	(22.00%)	(40.00%)	(100%)

created a composite index of firm environmental management performance on the basis of the firm's *ISO 14001 adoption, EMS certification,* and *Overall compliance success.* In this section, we draw on this composite index as our key measure of firm environmental management performance and present correlation statistics between this variable and each of our key measures of firm international economic integration.

Figure 6.4 presents the relationships between *Exports to developed countries* and the respondents' mean environmental performance composite index. The upward trend of the line in this figure indicates that there is generally a positive

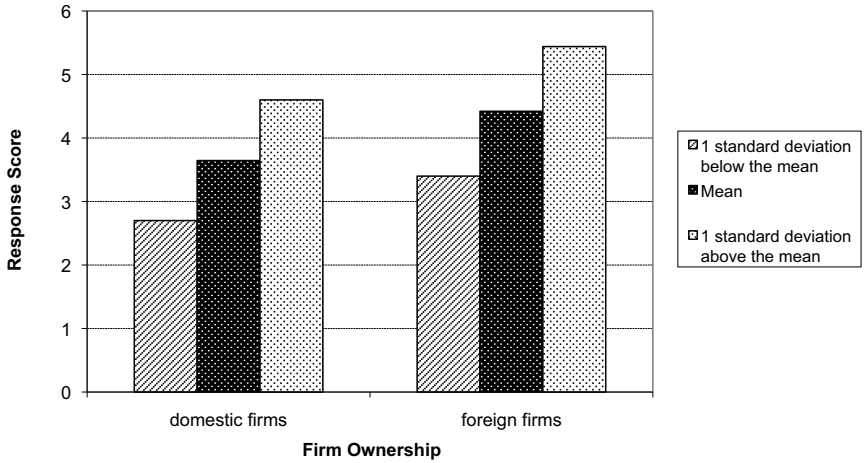

FIG. 6.3. Multinational ownership and mean firm responses to the question "Compared to economic development, how important is environmental protection?"

relationship between these two variables. An increase in a company's *Exports to developed countries* score from 4 to 7 on the *x* axis is associated with an increase in its mean environmental performance composite score from 7 to 11.5 on the *y* axis.

Figure 6.5 tells a similar story. Increasing a company's *Supply to developed countries* score from 7 to 14 on the *x* axis would result in an increase from 4 to 12.33 in its mean composite index score on the *y* axis. Overall, figures 6.4 and 6.5 suggest that the more a company exports to or sells to developed-country customers, the more likely it is to exhibit more sound environmental practices and performance.

Table 6.5 presents bivariate correlations among the key independent and dependent variables. Both *Exports to developed countries* and *Supply to developed countries* are positively associated with each of the three individual indicators of environmental performance, as well as the composite index. The Pearson correlations between each of these variables and each of the environmental performance variables are mostly significant at the $p < 0.01$ level for a 2-tailed test. These results provide strong support to our hypotheses that companies that either export mainly to developed countries or supply a large portion of their products to developed-country customers in China are likely to have stronger environmental performance than those companies with a lower level of export or supply relationships with developed-country customers.

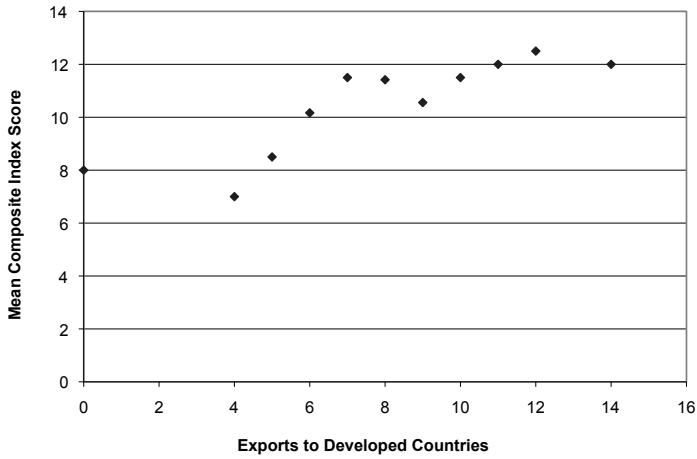

FIG. 6.4. Exports to developed countries and the mean environmental performance composite score

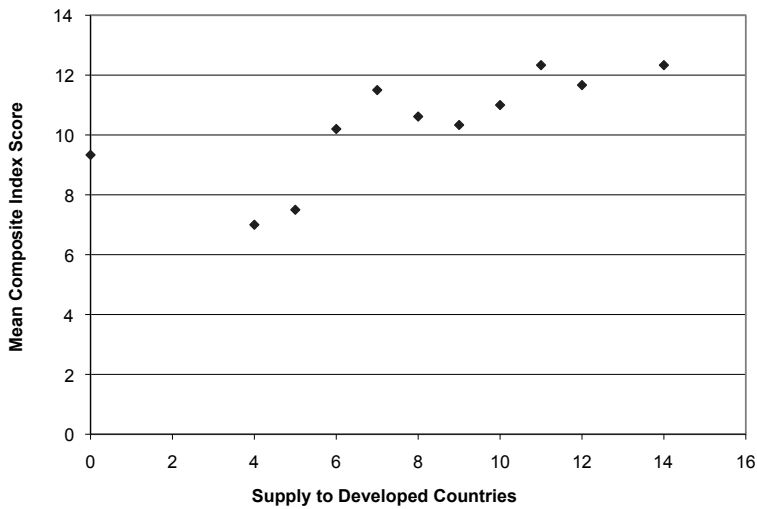

FIG. 6.5. Supply to developed countries and the mean environmental performance composite score

TABLE 6.5. Pearson Correlations between Key Independent Variables and Alternative Measures of Environmental Performance

	ISO14001 Adoption	EMS Certification	Overall Environmental Compliance	Composite Index	*N*
MNE ownership	.093 (.522)	.293* (.039)	.227 (.113)	.246 (.85)	50
Multinational customer	.001 (.996)	.114 (.434)	.215 (.138)	.184 (.207)	49
Exports to developed countries	.461** (.001)	.621** (.000)	.425** (.002)	.551** (.000)	50
Supply to developed countries	.351* (.012)	.436** (.002)	.333* (.018)	.421** (.002)	50

*correlation significant at the 0.05 level (2-tailed)
**correlation significant at the 0.01 level (2-tailed)

Hypotheses 4–5

We also found some support for the hypotheses that exporting to or supplying to multinational customers from Japan or Europe exerts a positive effect on a firm's environmental performance. Table 6.6 presents the correlation statistics between *Exports to Europe, Exports to Japan, Exports to U.S./Canada, Exports to Australia/New Zealand, Supply to Europe, Supply to Japan, Supply to U.S./Canada, Supply to Australia/New Zealand* and each of the measures of firm environmental management performance.

The *Supply to Europe* variable is positively associated with each of the environmental performance variables, and the Pearson correlation among each of these variables is significant at the $p < 0.01$ level for a 2-tailed test. The *Supply to Japan* variable is positively signed as well. The Pearson correlation between this variable and the composite environmental performance index, as well as the company's self-assessment of its overall environmental performance, is significant at the $p < 0.01$ level for a 2-tailed test. The *Exports to Europe* and *Exports to Japan* variables mostly have a positive sign and are occasionally significant too. While *Exports to U.S./Canada* and *Exports to Australia/New Zealand* do not appear to have strong statistical association with any of the measures of environmental performance, these variables are mostly positively signed. Moreover, *Supply to U.S./Canada* and *Supply to Australia/New Zealand* are positively associated with *EMS certification,* and the relationship is

significant at the $p < 0.05$ level for a 2-tailed test. Overall, these results are consistent with our argument about how exporting to or supplying to corporate customers in specific developed countries with rigorous environmental standards positively affects a company's environmental performance. The disparities among *Exports to Europe* and *Exports to Japan* on the one hand, and *Exports to U.S./Canada* and *Exports to Australia/New Zealand* on the other may be partially explained by the fact that individual European countries and Japan tend to have higher levels of regulatory stringency than their other developed world counterparts, as indicated by the per capita ISO 14001 adoption rate rankings. That executives found export and supply relationships with Europe and Japan particularly consequential also lends support to our decision to use ISO 14001 adoption rates as proxies for regulatory stringency.

In addition, not only did we find that exporting to developed countries or supplying to customers from Japan or Europe positively affects a company's environmental *performance,* executives of companies that either export to or supply to corporate customers from these entities also tend to have a more positive

TABLE 6.6. Pearson Correlations between Key Independent Variables (Country-specific) and Alternative Measures of Environmental Performance

	ISO14001 Adoption	EMS Certification	Overall Environmental Compliance	Composite Index	*N*
Exports to Europe	.202 (.199)	.349* (.024)	.184 (.243)	.248 (.113)	42
Exports to Japan	-.056 (.725)	.061 (.699)	.499** (.001)	.444** (.003)	47
Exports to U.S./Canada	.058 (.713)	.282 (.071)	.131 (.408)	.192 (.224)	47
Exports to Australia/ New Zealand	.073 (.644)	.227 (.147)	-.124 (.435)	.087 (.582)	47
Supply to Europe	.435** (.002)	.497** (.000)	.357* (.014)	.474** (.001)	47
Supply to Japan	.161 (.281)	.239 (.106)	.503** (.000)	.478** (.001)	47
Supply to U.S./Canada	.181 (.224)	.316* (.031)	.168 (.259)	.236 (.111)	47
Supply to Australia/ New Zealand	.228 (.123)	.342* (.018)	-.026 (.862)	-.138 (.354)	47

*correlation significant at the 0.05 level (2-tailed)
**correlation significant at the 0.01 level (2-tailed)

perception of the environmental impact of such practices. Since test results for the environmental effect of economic interactions with Japanese and European firms are identical, the following discussion draws on the case of Japan to support our argument.

As mentioned above, we asked the respondents to rate the share of the company's exports to Japan in its total sales volume on a scale of 0 to 4, with 0 indicating none, 1 indicating 1–25 percent, and 4 indicating 76–100 percent. We then asked the respondents their views about whether more stringent product and process standards of countries and regions such as the United States, Japan, and Europe may have any impact on the environmental performance of their own companies. Respondents were asked to rate their responses on a scale of 1 to 5, with 1 indicating "has no effect," 2 indicating "makes it significantly worse," and up to 5 indicating "makes it significantly better." We then followed up with another question about whether this is true for other exporting firms in their industry, in order to reduce potential bias in our results due to the respondents' unwillingness to answer truthfully about their own operations. Finally, we used the sum of the respondents' answers to these two questions as a summary index of their attitudes toward the impact of exporting to developed countries on the company's own environmental performance.

What is most noticeable about the results is that companies that export a large proportion of their products to Japan turned out to have the most positive views on this issue. Table 6.7 presents the frequency distribution of the responses to the above question. As we can see, the greater the extent of a company's exports to Japan, the more likely it is to have a higher mean response score on this question. In other words, companies that export a larger portion

TABLE 6.7. Frequency Distribution of the Responses to the Following Question: "If you export goods directly to North America, Europe, or Japan, how do the more stringent product and/or process standards of the importing country affect the environmental practices of your company?"

Exports to Japan	Mean	*N*	S.D.
1 (1–25%)	3.900	10	1.197
2 (26–50%)	4.438	16	.629
3 (51–75%)	4.546	11	.522
4 (76–100%)	5.000	5	.000
Total	4.405	42	.798

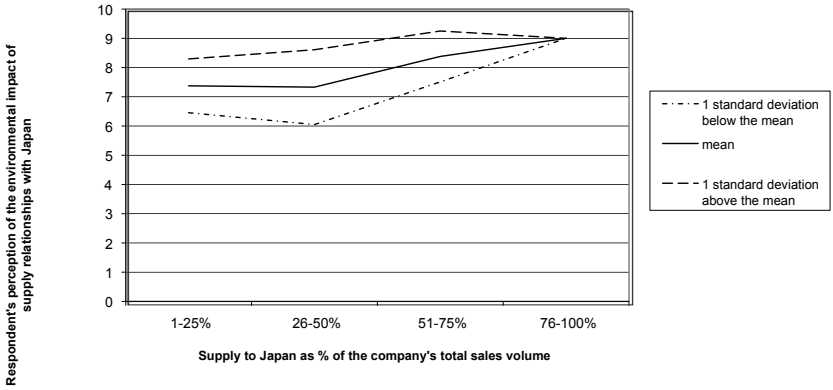

FIG. 6.6. Exports to Japan and the respondent's perception of the environmental impact of such practices

of their products to Japan are more likely to view such practices as having a positive effect on their own environmental performance.

Figure 6.6 further provides a visual presentation of the relationship between a company's exports to Japan and its perception of the environmental impact of these practices. In figure 6.6, as the share of a company's exports to Japan goes up, the mean and the standard deviations of its executive's perception of the environmental impact of such practices increase as well. This dynamic indicates a positive view of the environmental spillovers of exporting to the Japanese market. Furthermore, the Pearson correlation between *Exports to Japan* and the summary index of executive attitudes toward the environmental impact of such practices is 0.344, and the relationship is statistically significant at the $p < 0.05$ level for a 2-tailed test. These results suggest that companies that export a large proportion of their products to Japan tend to have positive views of the environmental impact of such practices.

We followed a similar procedure in analyzing business executives' attitudes toward the impact of supplying to corporate customers from Japan on the company's environmental performance. Respondents were first asked to specify the share of the products the company supplies to Japanese firms operating in China in the company's total sales volume. Then in two separate questions, we asked the respondents to share their views regarding whether the more stringent product and process standards of the home country(s) of the MNC customer(s) have any impact on the environmental performance of their com-

pany *and* of other companies in their industry. We again combined the respondents' answers to these two questions to create a summary index. Table 6.8 shows the respondents' mean response scores to these two questions. Once again, the greater the share of a company's supply to Japanese firms in the respondent's total sales volume, the higher its mean response score on the summary index. This indicates that the greater the extent of a company's supply to Japanese firms, the more likely it is to view the more stringent product and process standards of Japan as exerting a positive effect on the company's overall environmental practices.

Figure 6.7 plots the relationship between *Supply to Japan* and the executives' perception of its environmental impact on the firm. The result again reveals that companies that supply a large percentage of their products to corporate customers from Japan tend to have a more positive view of the influence of product and process standards in their clients' home country on their own environmental performance. As the share of the company's supply to Japan in the company's total sales volume goes up, the mean and standard deviations generally also follow an upward trend. The Pearson correlation between the extent of a company's supply to Japan and its executive's attitudes toward the influence of the supply relationship on the company's environmental performance is .430, which is significant at the $p < 0.01$ level for a 2-tailed test. Overall, these results suggest that business executives consider the environmental standards of their corporate customers to positively influence their company's own environ-

TABLE 6.8. Responses to the Summary Index of the Following Two Questions

(a) "If you supply goods directly to North America, Europe, or Japan, how do the more stringent product and/or process standards of the importing country affect the environmental practices of your company?" and
(b) "If you supply goods to a foreign company based in North America, Europe, or Japan, how do the more stringent product and process standards of the country you supply affect the environmental practices of your company?"

Supply to Japan	Mean	*N*	S.D.
1 (1–25%)	7.375	8	.916
2 (26–50%)	7.333	21	1.278
3 (51–75%)	8.385	13	.870
4 (76–100%)	9.000	3	.000
Total	7.756	45	1.190

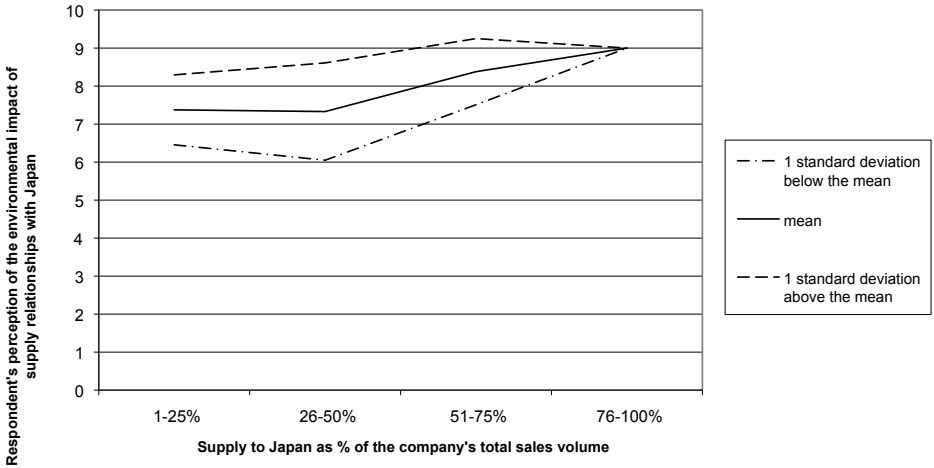

FIG. 6.7. Supply to Japan and the respondent's perception of the environmental impact of such practices

mental performance. The results also indicate that the environmental standards in a company's main importing country(s) or its main corporate customer(s) do exert a ratcheting-up effect on its own environmental standards and procedures as reflected in executives' belief systems. These results lend additional support to the findings presented in chapter 5.

In addition to the strong positive environmental effects of economic interactions with Japanese firms, we found a similar effect for exporting to or supplying to corporate customers from Europe. However, we did not find the same strong positive environmental effect for exporting to or supplying to multinational customers from other developed countries such as the United States, Canada, New Zealand, or Australia. While a priori we do not have a theoretical expectation for why this may be the case, it is possible that both Europe and Japan (and their firms) are considered global environmental regulatory leaders, more likely surpassing the other developed countries (and their firms) cited above in environmental standards. Again, this claim is substantiated in the normalized ISO 14001 rankings mentioned above. The assumption that Japanese and European regulators are particularly strong supporters of ISO 14001 adoptions is also supported in a study by Prakash.[15] Moreover, the United States, especially under the Bush administration, has not exercised a role in global environmental affairs that is commensurate with its status as the world's dominant

economy, failing to ratify agreements such as the Kyoto Protocol, a treaty designed to curb global greenhouse gas emissions; the Stockholm Convention on Persistent Organic Pollutants; and the Rotterdam Convention, which governs international trade in banned and restricted pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons.[16] While the examples cited above are largely anecdotal, they do point to the subtle variations that may exist in developed countries' environmental regulatory records, which in turn help to explain the variation in the environmental impact of developed-country MNCs in the developing world.

Preliminary Regression Analyses

In addition to the descriptive statistical analysis detailed above, we carried out a number of regression analyses. Specifically, we regressed each of the three environmental performance indicators mentioned above (*ISO 14001 adoption, EMS adoption,* and *Overall compliance success*) on both the key measures of independent variables and a number of control variables derived from the survey, including firm age, size (as measured by the number of employees), profitability, and total assets. In each of these models, our key independent variables (such as the extent to which a firm exports to developed-country markets and supplies to multinational customers) show up as having a positive and statistically significant relationship with the environmental performance variables. Of course, these regression results are rather preliminary given the small sample size. Future studies could include a larger number of respondents in the sample to more rigorously investigate the posited causal dynamics.

Sectoral Comparison

To address potential concerns that more heavily polluting industries are less likely to exhibit sound environmental performance, we ran bivariate correlations between the pollution intensity of the industry and both the individual and the composite index of environmental performance. We also ran bivariate correlations between the pollution intensity of the industry and the respondents' answers to each of the following questions: "When you established your business operations, were local environmental laws an important factor in making the decision about where to build your business?" and "To the best of your knowledge, how important were local environmental laws in others' decisions about where to build their businesses?" The correlations suggest that the

pollution intensity of the industry is uncorrelated with the environmental performance and locational decisions of the industry in any way, as none of the correlation statistics achieved statistical significance. Of course, given the constraints of the sample size and the absence of robust controls, these results are highly preliminary. More rigorous empirical testing in the future can help us better address the question as to whether industries with varying levels of pollution intensity behave differently with regard to the race-to-the-bottom and pollution-haven hypotheses.

Limitations

An obvious criticism of this survey is that Chinese business executives may be unwilling or reluctant to share unbiased opinions regarding the environmental performance of their own firms. The fear of negative publicity, government crackdown, or other such negative reactions may provide a significant deterrent to truthful responses. This, in turn, could lead to an overall bias with two possible effects. On the one hand, respondents may be inclined to underrepresent the severity of the negative environmental behavior of their own firms. This might diminish the reported influence of the two independent variables on firm behavior. From their perspective, if their firms are doing nothing wrong, then there should be no effect one way or the other. On the other hand, executives might be inclined to overrepresent the effects of the two variables in order to demonstrate either a conscious effort to reduce environmental pollution or strong knowledge of mechanisms by which to do this.

Unfortunately, there is no way to completely avoid the potential for bias either way. In addition, it is possible that the bias mentioned above could be larger for WDOFs than for FIEs as the former are under more direct scrutiny of the Chinese government. However, in an effort to extract truthful answers, the survey asks questions regarding not only the performance of their own firms but also the perceived performance of other similar firms within the same industry. We expect respondents to be more forthcoming with their opinions when they themselves are not directly implicated. Assurances were made that no names were attached to the survey. These procedures should help alleviate concerns about potential sample bias.

DISCUSSIONS

While the previous chapters undertake empirical examinations of the pollution-haven and race-to-the-bottom arguments through provincial-level data

available from the *China Statistical Yearbook,* this chapter supplements these analyses with firm-level evidence. By tapping the perceptions and opinions of business executives that directly participate in the process, this chapter presents strong evidence in support of our arguments about how globalization exerts a ratcheting-up effect on corporate environmental behavior and pollution outcomes.

Our results reveal a positive association between multinational ownership and business executives' environmental knowledge and awareness (H1). The sources of firm self-regulation described in earlier chapters can help to explain the greater sense of environmental responsibility of the executives of foreign-invested firms. In addition, our results indicate that firms that either export to developed countries or sell a large portion of their output to multinational customers within China operate with a higher level of environmental standards and operating procedures, as demonstrated by ISO 14001 adoption, environmental management systems certification, and firm self-assessment of overall environmental compliance (H2–H5). Specifically, in addition to uncovering the environmental impact of exporting or selling to multinational customers from developed countries, our survey analysis yields strong evidence that firms that either export to or supply to MNCs from Japan or Europe are especially likely to have strong environmental standards and performance due to fear of environmental importing-country tariff retaliation or developed-country corporate customers' expectations for environmental product and process standards that conform to home-country criteria (H4–H5).

These findings help to explain why our analyses of provincial-level data failed to uncover pollution-haven and race-to-the-bottom type behavior. They provide strong support for the argument that while on the one hand the globalization of trade and production provides firms with ample opportunity to exploit cross-national differences in environmental regulation, on the other hand it generates competitive and institutional pressures that minimize the gains from pollution-haven-seeking behavior, and prompts firms to engage in rigorous environmental self-regulation. These findings suggest that the increases in China's total trade volume and inward FDI brought about by the market liberalization mandates of the WTO will not necessarily inflict additional harm on the country's environment and may result in positive environmental externalities.

Our findings relate directly to the literature on the diffusion of environmental policies and practices from MNC-owned and export-oriented firms to firms that are largely domestic in terms of ownership and operating market. These results are also consistent with those uncovered by Ronie Garcia-John-

son in her study of the flow of environmental values and strategies from U.S. multinational chemical corporations to companies in Mexico and Brazil. She finds strong support for the notion that environmental policies and procedures diffuse through corporate supply chains and spill over to investment host countries.[17] While our findings are preliminary, they do suggest that corporate norms of environmentalism may not have been internalized by domestically owned Chinese firms, as executives of WDOFs have not demonstrated the same level of environmental awareness as FIE executives. Instead, the importation of corporate voluntary environmentalism seems to be a tactic adopted by firms with an interest in meeting the demands of overseas markets. As such, it may be an instrumental goal that may be susceptible to changes in trade and FDI patterns. Future studies could engage in more detailed analysis of the behavior of domestically owned Chinese firms to see if corporate norms of environmentalism have been diffused to China as a whole or remain confined to firms with substantial exposure to the international market.

CHAPTER 7

Asia Pulp & Paper: Local Standards, World Markets, and Environmental Protection

Through analyses of Chinese provincial-level data and survey data, the previous chapters suggest that economic integration with developed-world markets encourages companies to adopt more sustainable business practices. By ensuring further development and innovation of environmental abatement technology and by facilitating the transfer of corporate norms of environmental governance, integration with the world market has helped to mitigate some of the worst environmental effects of rapid industrialization.

This chapter further highlights these effects through a case study of Asia Pulp & Paper (APP), a major manufacturer of pulp and paper formerly based in Indonesia, now in Singapore. Not only does the company have a reputation for illegal domestic environmental destruction, it has also attracted considerable criticism from both environmental nongovernmental organizations and the media for illegal logging in southern China. Thus this case helps to illustrate how the environmental practices of the parent firm influence those in its overseas subsidiaries. However, our interviews with APP executives and independent researchers of the Chinese pulp and paper industry indicate that when access to important developed-country markets became threatened by negative media exposure and criticism by nongovernmental organizations, APP-China gradually modified its behavior and introduced more environmentally friendly policies, procedures, and technologies in its China operations. By illustrating how the transmission belt effect of its trade relationships produced these unexpected outcomes, this case study helps to strengthen our central theoretical ar-

gument about how trade and, more specifically, developed-country exports can ratchet up the environmental standards and operating procedures in developing countries.

Before proceeding, a few words about our case selection are in order. Instead of illustrating our argument with a company with a sound reputation for environmental protection, we choose to focus on APP, which has long been alleged to employ destructive forestry practices in Indonesia and elsewhere in the world. The country-of-origin argument presented in earlier chapters should lead us to expect that the Indonesia-based APP should be even less environmentally responsible than a Chinese firm. However, the evidence presented below suggests that APP has demonstrated subtle changes in its environmental behavior in China. We conjecture, in line with our previous arguments, that the behavioral change results from an attempt to maintain continued developed-world export market access. APP represents a hard case where one should find the least support for our argument, and yet we found confirming evidence for our contentions. Compared to a case study based on analyses of a "good" corporate citizen, our strategy allows us to provide stronger evidence about how linkages with the international market can compel changes in a company's environmental practices.

The causal mechanisms illustrated in this chapter highlight the importance of several key dimensions of economic integration on the Chinese environment at the firm level, demonstrating in particular the importance of country of origin and export destinations to those interactions. Drawing on firm-level evidence from the paper and pulp industry, an industry considered to be highly polluting and energy and waste intensive, this chapter sheds light on both the process through which the environmental practices of the parent firm affect those of its subsidiaries *and* the process through which pressure emanating from export markets can ratchet up a firm's environmental policies, standards, and procedures, even when it is considered a heavy polluter.

In the next section, we address the rationale for our case selection in greater detail and issues related to data and methodology. The chapter then turns to an overview of the Chinese pulp and paper industry, followed by detailed analysis of our industry case. We also discuss alternative explanations for the subtle alterations in APP's behavior, noting that each of these explanations alone does not account for the observed behavior. The chapter concludes by relating our findings to the key contentions of this project and discussing their theoretical and policy implications.

CASE SELECTION, DATA SOURCES, AND METHODOLOGY

Case studies are useful in the context of this book because they allow us to reinforce our prior findings with evidence derived from the firm level. Our case study draws on the process-tracing procedure, which places the process leading to the observed policy outcomes at the center of the investigation, to support our key theoretical contentions. By focusing on the motivations, behavior, and responses of the key actors involved in the process, our research strategy allows us to test our central theoretical propositions to see if the FDI country of origin and the export destination(s) of the firm do indeed affect its environmental policies and procedures through the posited causal mechanisms.

Our case study focuses on the Chinese pulp and paper industry. Our primary corporate case is APP, a subsidiary of the Sinar Mas conglomerate formerly of Indonesia and now based in Singapore. APP is currently one of the world's largest paper manufacturers with extensive operations in China and across the globe. In choosing our individual corporate case study, we sought a foreign invested firm that not only provides an empirical backdrop to our process illustration but was also representative of the industry at large. Rather than stacking the deck with an MNC that is an exemplar of corporate environmental responsibility and had never been identified with a scandalous or negative exploit, we sought a firm that is truly representative of the paper industry. While it had at one point been faulted with its destructive forestry practices, APP has demonstrated signs of improved conduct due to concerns about loss of overseas market shares brought about by negative NGO campaign and media exposure. Such subtle yet perceptible changes in APP's behavior toward greater environmental responsibility lend support to both legs of our argument.

We draw upon a number of different sources in this analysis in order to provide the most comprehensive evidence of the processes driving the patterns demonstrated by the data in previous chapters. First, interviews were conducted with representatives from both the corporate headquarters and an APP subsidiary. These interviews were designed to generate insight into the behavior of specific firms operating within the industry. Although our arguments about the outcomes of firm behavior are all external to the firm itself, these interviews provide us with insight into the internal processes that lead to these outcomes. We supplemented these interviews with a thorough review of available corporate literature, financial statements, shareholder reports, capital expenditures on environmental policy directives, and environmental budget allo-

cations to determine the extent of corporate monetary emphasis on environmental sustainability.

Second, in order to account for the possibility that firms may be less than forthcoming with disclosures of unscrupulous environmental behavior or that firm emphasis on environmental sustainability was mere window dressing, we conducted interviews with the Forest Stewardship Council, an industry-specific international environmental nongovernmental organization operating in China. The organization provides supervision of the corporate actions of APP and similar firms, and lends additional validation to the data collected from APP. We also conducted interviews with researchers in the Research Institute of Forestry Policy & Information at the Chinese Academy of Forestry and a professional private pulp and paper industry market research firm, Brian Stafford and Associates, both of which analyze the Chinese pulp and paper industry and specific pulp and paper firms. By pursuing a variety of sources we attempt to check both the statements provided by the mills themselves and the environmental NGOs monitoring them, as the two have been known to be quite antagonistic toward one another.

Finally, we relied heavily on both English and Chinese language news sources to provide evidence of environmentally destructive corporate activity not mentioned by the firms or environmental NGOs and to substantiate or contradict the information they did provide.

THE PULP AND PAPER INDUSTRY

In many ways the pulp and paper industry proves to be an ideal candidate for an analysis of corporate environmental behavior. The pulp and paper industry, both in China and globally, has been the focus of worldwide attention for environmental pollution. In the past few decades regulatory authorities and the global public have applied pressure on the industry to reduce sulfur dioxide emission, eliminate chlorine in pulp and paper manufacturing, and cut back on the production of dioxin, a highly toxic chemical, in wastewater streams. In Southeast Asia, the pulp and paper industry underwent significant technological and material modernization in the 1980s and 1990s as a result of pressure from government, environmental groups, and global and regional institutions, as well as technological innovation in both public and private sectors. However, while the industry has made considerable strides toward ecological modernization, it remains highly dependent on raw materials from the developing world. Moreover, many older and less technologically developed small and medium-

sized enterprises in Southeast Asia's pulp and paper industry remain heavily polluting.[1]

Dating back to antiquity, the craft of paper manufacturing has a long history in China.[2] Unfortunately after a couple of millennia or so papermaking has not yet reached an environmentally sustainable equilibrium as the paper and pulp industry's environmental impact encompasses not only water and air pollution but also forest extraction, habitat destruction, and desertification.[3] In China, paper and paperboard manufacturing has been cited as the source of 16 percent of China's wastewater emissions (second only to chemical manufacturing), 33 percent of its chemical oxygen demand (COD), and the largest source of rural pollution.[4] In real terms, that amounts to somewhere in the neighborhood of 3.18 billion tons of wastewater and 1.48 million tons of COD per year and growing. Despite industrial technological advances such as elemental chlorine-free bleach (ECFB), many of the smaller and less advanced mills still in operation use pollutants such as chlorine dioxide, sulfur, and various alkalis in the pulp preparation and bleaching process, much of which is discharged directly into adjacent bodies of water.[5] The relatively recent development of environmentally ameliorative technology and its relatively widespread use in paper mills in industrialized countries belie the destruction that outdated technology and poor managerial skill have brought to developing-country environments.

At the beginning of the Chinese reform period, government-owned mills were largely wood- or reed-based and equipped with secondhand reconditioned machines that had become uncompetitive in the West. This "old industry" was composed of literally thousands of small mills that had no chemical recovery, and all solid effluent was vented to river systems, resulting in high levels of pollution. Though technological developments are increasing the sustainability of this industry, papermaking in China still has a long way to go to reach a sustainable equilibrium.

The Chinese government closed many of the old mills in the past decade to mitigate the environmental impact of paper production and to increase industry productivity and efficiency.[6] The pulp and paper industry in China today has been diversified to include mills owned by the Chinese government, some of which have been privatized, and mills established by private entrepreneurs, notably foreign-invested mills such as APP, April Fine Paper China, International Paper, Stora Enso, UPM Kymenne, and Norske Skog. During the restructuring process the Chinese government offered incentives to both domestic and foreign investors to provide capital to accommodate restructuring, ensure adequate fiber supply growth, and sustain booming domestic demand.

In 2002, the National Development and Planning Commission (NDPC) gave a rating of "encouraged" to several paper industry subsectors in which it sought foreign investment, including wood base development for pulp and paper processing, large-scale chemical and mechanical pulping, and high-grade paper and paperboard (excluding newsprint).[7] The NDPC also conferred significant authority to provincial officials over the foreign investment approval process in an effort to diminish bureaucratic impediments and enable fast-track approval for integrated pulp-paper projects, or those that couple fast-growing plantations with pulp and paper production. To enhance the attractiveness of the industry to foreign investors, provincial officials were given the ability to offer tax rate subsidies, tax holidays, and fee waivers.[8] These policies have created a favorable investment environment for foreign investors. And investors have taken note. Between 2001 and 2005 the number of foreign invested firms in paper and paperboard manufacturing jumped from 740 to 1,296, while the overall industry grew from 5,027 to 8,376 firms.[9]

Unfortunately, along with creating a fertile climate for investment, devolution of authority from the central to the provincial level, combined with a central mandate to increase investment in this industrial sector, has increased the opportunity for provincial officials to relax environmental regulations to attract investors. In this sector, perhaps more so than in many others, a provincial relaxation of environmental enforcement mechanisms may be a significant attraction for unscrupulous manufacturers. Though a loosening of effluent discharge standards would likely have an appeal to many pulp and paper manufacturers, as these mills produce tremendous amounts of wastewater, a very significant (and visible) attraction exists for integrated pulp and paper manufacturers who must rely on wood-based pulp for their industrial output rather than recycled wastepaper or straw-based fiber supply. Mills of this sort produce pulp for paper that requires the longer and stronger fibers found in virgin timber, for example, high-grade printing paper, art paper, and writing paper. Because virgin timber has such high water content, long distance timber transportation is less cost effective than local sourcing and in general not a feasible long-term supply strategy. As such, pulp mill sites are heavily dependent on proximity to existing local timber supplies or the opportunity to develop tree plantations for future use. For these manufacturers, the ability to harvest existing sites and/or develop new ones is not only significant; it is an industrial necessity. This opens the door for the possibility of race-to-the-bottom and pollution-haven-seeking behavior to occur between local and provincial officials and pulp and paper manufacturers. Environmental protection in this sector de-

pends heavily on the desire of local administrators to enforce the law and the enthusiasm of pulp and paper manufacturers to follow it. Indeed, the evidence suggests that there are large behavioral disparities among firms with respect to their willingness to abide by host-country environmental laws. Our findings imply that these disparities are rooted in the core firm values and operating standards cultivated from home-country environmental laws and norms *and* the different characteristics of global export destinations. This chapter demonstrates that the effects of economic integration on host-country environments and the likelihood of firm pollution-haven-seeking behavior depend heavily on the national origin of multinational firms, and the markets in which they do business.

ASIA PULP & PAPER

A subsidiary of the Indonesian Sinar Mas Group, APP is a major international company specializing in pulp and paper production. APP first established its presence in China in 1994. Since then, APP's illegal logging practices in both China and Indonesia have caught the attention of the international media and environmental NGOs. The negative media exposure of APP's forestry practices, coupled with poor financial performance that resulted in a major default on its loans, sent APP's shares tumbling and caused it to be delisted from the New York Stock Exchange in early 2001. However, at a time when APP's global businesses seemed to be in trouble, its China operations underwent a surprising expansion to include almost 20 pulp and paper enterprises and more than 20 plantation sites. By 2008, APP-China's annual production capacity reached over 5 million tons and its total assets were valued at about RMB 56 billion.[10]

Forest Practices under Fire: The Influence of Parent Firm's Environmental Policies

This section reviews APP's dubious green credentials in Indonesia and elsewhere. In particular, by discussing APPs' problematic natural forest practices in Hainan and Yunnan provinces in China and linking such practices to the company's alleged history of illegal logging in its home country, Indonesia, this section sets the context for the following discussion about the impact of country of origin and export destinations on APP's behavior. We argue that APPs' environmental misconduct in China, specifically with regard to illegal logging in Hainan and Yunnan provinces, can be explained by the fact that APP originated

in a country that has minimal environmental regulatory enforcement and therefore failed to develop and follow an adequate corporate code of conduct.

APP and its parent firm, Sinar Mas, have long been charged with extensive Indonesian deforestation.[11] Sinar Mas's sustainable fiber supply practices first ascended to the media spotlight in 2000. In November 2000, a study of the Indonesian pulp and paper industry released by the Center for International Forestry Research (CIFOR) pointed to APP's problematic fiber sourcing practices, charging that it would likely clear large new areas of natural forest to meet its raw material demands because of the low probability of securing sustainable fiber supplies from existing plantations.[12] In addition, throughout the summer of 2001, the British daily *The Guardian* published a series of articles detailing the destructive impact of pulp and paper manufacturing on Indonesia's forests,[13] leading one of Britain's major paper suppliers, Robert Horne Group, to temporarily suspend purchases from APP in August 2001. Interestingly, such media and NGO attacks against APP took place at a time when the company was also confronted with major financial troubles. The combination of these problems caused share prices to tumble, leading APP to default on its debt in March and to be delisted from the New York Stock Exchange in July. APP and Sinar Mas Group's financial weaknesses alerted financial analysts, paper buyers, and other concerned parties to its unsustainable wood supply strategy and enabled environmental activists to drive home the point that tremendous pressure on forest resources exerted by Indonesia's pulp and paper industries entailed considerable environmental as well as financial risks.

Evidence of APP and Sinar Mas Group's destructive forestry practices continued to surface in the following years. For example, a 2003 report released by Human Rights Watch highlighted the group's destructive behavior in Riau and Jambi provinces in Indonesia. The report pointed out that while APP and Sinar Mas group held concessions for 500,000 hectares in those two provinces, the rapid increase in fiber demand necessary to meet expanding production capacity meant that even such a large area would be insufficient. Moreover, as APP claimed that only 50 percent of the above concession could be converted to plantation due to land claims and "other problems," it had plans to double the area of plantation in the next few years by forming joint ventures with community cooperatives and companies with existing permits.[14]

The Sinar Mas Group's problematic forestry practices in Indonesia help to explain why APP has received such wide public criticism about its logging practices in Yunnan and Hainan provinces. As its parent company was headquartered in a country with lax environmental regulations and plagued by its own

environmental woes, it is not surprising that APP-China's environmental practices are influenced by Sinar Mas's groupwide policies and reflect certain continuities with the latter's long-standing practices. Indeed, in both Hainan and Yunnan provinces, APP's forestry policies have drawn considerable public scrutiny. The following sections briefly survey evidence of such problematic practices.

Case 1: APP's Hainan Operations

APP's forestry practices in Hainan province in southern China have been the focus of much media and NGO criticism. APP started to develop its Hainan operations in 1995. In 1997, APP established the Jinhai Forestry Co., Ltd. This subsidiary introduced a fast-growing high-yielding eucalyptus program. In March 2005, the Jinhai Pulp and Paper Plant went into production. According to Greenpeace, poor management and the commencement of Jinhai's operations exerted tremendous pressure on Hainan's deteriorating forests and biodiversity. For example, Greenpeace charged that APP failed to plant enough trees in Hainan to meet its commitment to regenerate forest cover, as the actual area of forest cultivation, 64,666 hectares, was 70 percent below the original plan. Furthermore, experts from Hainan estimated that the pulp-yielding eucalyptus timber area only accounted for a quarter of the total eucalyptus area mentioned above, falling far short of Jinhai Pulp Mill's desired pulp production capacity of 1 million tons per year. According to Greenpeace, the huge supply gap in raw materials subsequently led APP to exploit the natural forest resources in Hainan under the guise of "reforestation." In the spring of 2004 Greenpeace published its investigative report of APP's Hainan practices, presenting substantial evidence that APP was destroying Hainan's natural forests.[15] An investigative report released by *Caijing* magazine went even further, claiming that APP's first illegal logging in Hainan took place much earlier than this case.

Case 2: APP's Yunnan Operations

APP's logging practices in the southwestern Yunnan province have attracted an even greater amount of media coverage and public outcry than did its actions in Hainan. In August 2002, APP signed an agreement with the Yunnan provincial government to develop a eucalyptus forest-pulp-paper integration program, covering almost two million hectares in the province. According to media reports, while the project was pending approval by the central government,

APP started to fell trees without any permits in order to clear land for its 1.83 million hectares forest-pulp plantation. Several environmental groups countered APP's argument that the project would be undertaken on barren wasteland, pointing out that most of the project actually took place on primary forestland. Following six months of field investigations, Greenpeace released *The Investigative Report on APP's Forest Destruction in Yunnan* in November 2004, disclosing APP's practice of clearing forests for plantations in Yunnan, similar to its conduct in Indonesia. A case study by Greenpeace reported that APP had planned to set up a eucalyptus pulp base covering over 800,000 hectares of "barren land" in Simao prefecture, in Yunnan province. However, as the region only had 186,666 hectares of nonforest land in total, this meant that APP had planned to clear out 613,333 hectares of Simao's forest to plant fast-growing high-yielding eucalyptus trees for its expanding pulp production.[16] In the same year, the State Forestry Administration (SFA) released two investigative reports, in April and December, respectively, presenting evidence of APP's improper conduct in implementing the integration program. The SFA further demanded APP to address the problem.

APP's forestry practices in southern China have also attracted the attention of other environmental groups and activists. For example, the Institute of Public and Environmental Affairs, established by high-profile Chinese environmental activist Jun Ma, has blacklisted APP-China on its Green Responsibility List of Chinese Enterprises.[17] The World Wildlife Federation (WWF) has similarly accused APP of illegal logging in the Simao region of Yunnan.

Perhaps the most damning indication of APP's negative practices is the decision by the Forest Stewardship Council (FSC), an international nonprofit organization dedicated to promoting responsible global forest management through standard setting, independent certification, and labeling of forest products, to take away APP's right to use the FSC logo in November 2007.

In August 2008, due to concerns about APP's poor environmental record, Greenpeace China and other environmental groups launched yet another major initiative to prevent Gold East Paper from listing its shares on the Shanghai stock market. Greenpeace and other environmental NGOs accused another APP subsidiary, Hainan Jinhai Pulp & Paper Co., of long discharging polluting gases and wastewater in excess of legal limits.[18] Moreover, on June 10, 2008, Suzhou City Environmental Protection Bureau found that Gold Hua Sheng Paper had also exceeded legal pollution limits.[19] The media and NGO reports cited above provide strong indications of APP's problematic environmental conduct in China and its (once) home country of Indonesia.

The Impact of Exports on Firm Environmental Practices

Much of APP's poor forestry practices can be explained by the country-of-origin argument, which states that the environmental behavior of the parent firm of a company bears directly on that of its subsidiaries. However, after APP's investment and establishment in China, the real judgment that needs to be made is whether pressure emanating from customers and other sources (such as NGOs) has led to any perceptible change in environmental behavior. Our analysis suggests that developed-world trade relationships have mitigated some of the negative effects of the parent firm's poor environmental practices. Our detailed study of APP's environmental management system indicates that the company gradually changed its behavior when it became clear that developed-world export relationships and corporate contracts were threatened by the exposure of its negative environmental activities in China. Thus APP is a case where one would not expect to see our argument work, but where we actually do because of the influence of developed-world trade relationships. While NGO activism and negative media coverage certainly acted as an intervening variable by bringing APP's forestry practices under close public scrutiny, it was concern about how such negative publicity may affect corporate sales and exports that ultimately precipitated a reorientation of corporate environmental strategy. The reoriented strategy eventually compelled APP subsidiaries to introduce incremental modifications to their environmental management systems, engage in regular environmental audits and assessments, and introduce more environmentally friendly technology, in the process reducing pollution emissions and mitigating the negative environmental impact of production.

APP-China exports to about sixty-five countries around the world. Its main export destinations include Europe, the United States, and Japan. Gold East Paper, a major APP operation in Jiangsu province, sells about 30 percent of its art paper in the world market and the remaining 70 percent in the domestic market, with developed-world markets such as the United States, Canada, Europe, and Japan making up the bulk of Gold East Paper's total exports. Negative exposure by nongovernmental environmental organizations and poor environmental practices threatened APP's access to its major export markets. For example, due to negative media coverage of APP's logging practices in southern China, the Japanese company Ricoh, the German company Metro, and some retail stores in the United States such as Office Depot and Wal-Mart have stopped purchasing APP products. In early 2008, Staples Inc., the largest U.S. office supply retailer, which historically purchased about 5 percent of its paper

products from APP, announced that it would sever its business ties due to environmental concerns.[20] In August 2007, an Australian-owned New Zealand supermarket chain, Woolworths, pulled more than 10,000 rolls and packets of paper products off the market in response to claims by environmentalists that the Select brand of paper products it carried was made from illegally logged rain forests in Indonesia by APP.[21] In August 2008, under relentless pressure from the Wake Up Woolworths campaign spearheaded by Woolworth's shareholders, and unable to provide independent verification that the products were sourced in a sustainable manner, Woolworths terminated its contract with APP for the supply of the company's Select paper products.[22]

There is evidence that with its access to the export market in jeopardy, APP has been gradually mending its course by implementing more environmentally friendly management systems and technology in its China operations. As a matter of fact, both the APP headquarters in Shanghai and Gold East Paper have been remarkably forthcoming with our interview requests and have supplied detailed information about the company's environmental operations.

> As one of the world's largest, vertically integrated pulp and paper companies, APP-China recognizes that sustainable development is the foundation for long-term business success. In addition to this commitment, the concerns of stakeholders and customers from around the world are also an important factor in implementing [the company's] environmental management strategies.[23]

Interviews with independent researchers of the Chinese forestry industry confirm this impression. For example, an independent researcher at the Research Institute of Forestry Policy and Information under the Chinese Academy of Forestry suggests that the problems of APP are often not as severe as reported. Nor is the APP the only company with such problems in China. According to this source, as APP plans to expand in China on a long-term basis and establish itself as one of the largest paper manufacturers in the world, it still needs to demonstrate the sustainability of its operations to retain consumer confidence and to maintain positive brand image.[24] With its access to export markets threatened by negative publicity, APP-China has gradually introduced measures to strengthen its environmental management system and introduce more advanced technology to reduce effluent discharge and ameliorate the negative environmental impact of its China operations. APP-China's strategic reorientation lends further support to our argument about how developed-

world customer relations can compel subtle changes in a company's behavior toward more sustainable environmental practices.

Changes in APP's Environmental Behavior: Evidence from Fieldwork

We conducted interviews with the sustainability departments at both APP-China's headquarters in Shanghai and in one of APP's subsidiaries—Gold East Paper, located in the city of Zhenjiang in Jiangsu province. Gold East Paper, which bills itself as the "single largest art paper mill in the world,"[25] was originally formed as a joint venture with a branch company of the Zhenjiang Light Industry Bureau—Jin Da Industrials Trade Co. We asked questions regarding the company's overall environmental management strategy, environmental management system, motivations for the development of advanced technology, the impact of local Chinese environmental regulations on the company's environmental practices, the implementation of either internal or external environmental audits, and the company's overall record in emission reduction. This section provides a summary of APP's and Gold East's responses to each of the above sets of questions. In doing so, it also tries to provide external validation of our corporate interview data by supplementing it with interview data from independent researchers of the forestry industry and other secondary sources.

Environmental Management Strategy

APP-China develops its environmental management strategy in consultation with key stakeholders, outside environmental experts, and assessment organizations. According to our interviews with the APP headquarters in China, APP has come to the realization that the long-term development and even the survival of the enterprise go hand in hand with environmental care. Consequently the company's environmental strategy, from forest to mill, draws on international best practices and advanced technology to minimize the negative environmental spillovers of its production. To achieve this goal, the company seeks to promote sustainable plantation development and biodiversity conservation and employ advanced technology in managing forests and production facilities.[26]

With regard to its forestry strategy, APP first began implementing the forest-pulp-paper project in 1994. It has made it a company policy to adhere to its environmental commitment of "using one tree after planting six."[27] According to secondary sources, the company's forest plantation practices follow a set of

standard guidelines. First, it strives to select seeds of diversified species well suited to local geographical conditions in order to avoid genetic narrowing. Second, on the basis of remote sensing data and investigation, APP sources wasteland, barren mountains, abandoned farmland, and ecologically degraded scrub forests in areas permitted by the government. Such practices presumably allow APP to stay away from natural forests with a canopy density of above 0.2, thus ensuring wood supply volume and carbon sequestration provision. Third, APP-China's plantations use fast-growing acacia and eucalyptus varieties that grow to maturity and are harvested in six years. In doing so, the firm has adopted a recycling operation model in which planting and logging are undertaken in batches according to logging rotation cycles. For example, APP fells about only one-sixth of the trees that grow to their full size in six years and leaves the remaining trees intact.[28] According to company reports, since its initial operations in China, APP has planted trees on 3 million *mu* (200,000 hectares) of land, which has helped to absorb carbon dioxide and prevent soil erosion in areas once known for severe soil erosion and desertification such as the Mahuang Mountain Range and West Forest Farm in Dongfangdao, both located in Hainan province.[29]

With regard to pulp and paper production, APP considers it important to have each step of the production strictly conform to the standards of its environmental management system. Overall, it has sought to follow the resource recycling usage policy and to achieve the long-term development of natural resources by integrating forest planting, pulp production, and papermaking into the so-called plantation-pulp-paper green cycle. APP claimed that, as of December 2006, it has invested over US$400 million (or RMB 3 billion) in more than 300,000 hectares of fast-growing, high-yield eucalyptus plantations in ten provinces and autonomous regions in China and has carried out forestation efforts with the help of its village partners.[30] Since 2006, the company has also reportedly invested RMB 4.38 million in plantation and biodiversity protection research.[31]

As part of its environmental strategy and commitment, APP-China hosted the "Sustainable Future of China's Paper Industry—Paper Contract with China" forum in partnership with the National Plantation Products Industry of China and the Forest and Paper Association in Hainan in 2008. The "Paper Contract with China" that resulted from this conference spelled out 22 commitments with detailed sustainability action plans the company planned to undertake in five key areas: sustainable forestry; clean production; energy conservation and emissions reduction; corporate social responsibility initiatives; and

assistance to local community development. Under these guidelines, APP-China has obligated itself to engage in sustainable forestry practices in places where the company does business, strongly promote energy-saving and waste-reduction policies, strengthen education of environmental protection, reduce carbon footprint throughout the business, and actively contribute to economic and community development by creating employment opportunities, investing in infrastructure construction in rural areas, building more schools, and offering training courses to local residents.[32] Since the signing of this contract, APP-China has issued quarterly updates on progress made with regard to the above commitments. In order to meet these commitments, it has also set clear targets for water consumption for paper/pulp per ton, wastewater emissions for paper/pulp per ton, and COD emissions. Overall, the "Paper Contract with China" signals the company's commitment to expand its operations on a sustainable basis in an attempt to counter NGO accusations of environmental standard violation.

Environmental Management System

According to our interviews with APP-China and Gold East, APP-China has a groupwide team in charge of environmental issues that supervises the work of environmental departments in each APP subsidiary. Specifically, the Business Enhancement Team, housed in the APP headquarters, assumes overall responsibility for managing and monitoring the implementation of the company's sustainability initiatives and for coordinating company-wide sustainability initiatives. This team, headed by one of APP-China's vice presidents and consisting of representative members from each mill's environmental protection department, holds the APP group environmental protection meetings every three months. In addition, each mill has its own environmental protection and sustainability research department in charge of implementing sustainability initiatives, promoting the development of new technology and production methods, and monitoring the company's environmental performance to ensure that the mill's effluents meet stated environmental targets. Furthermore, APP-Indonesia has a department of sustainability and stakeholder engagement, whose director reports directly to the company's CEO and participates in the development and implementation of APP-China's environmental sustainability initiatives.

With regard to environmental financial planning, each mill makes yearly environmental protection budgets and forecasts for the following year's budget on the basis of its own fresh water input, wastewater output, power and chemical consumption, and so forth.

Environmental Technology

APP-China has sought to use modern equipment and production technologies in its production lines. While the equipment used by APP subsidiaries in their papermaking and pulping processes varies in quality, it is differentiated primarily by the age of the specific mill under consideration, as the newer ones are generally better equipped and use more modern technology. At the same time, the company increasingly emphasizes environmentally friendly production procedures to lower cost, conserve energy, and reduce the amount of effluent and exhaust discharge. Each mill purchases its technology on the world market and undertakes some minor modifications to adapt the equipment and technology to the special requirements of local production. In addition, APP takes into account environmental protection in its new research and development projects as well as in the future expansion of the mills.[33] According to our interviews and company reports, key motivations for the development and implementation of advanced technology relate to considerations about industry competitiveness. An executive at APP-China's headquarters put it this way.

> Technology provides the only way to achieve sustainable development of the forestry industry in China. . . . In terms of our processing facilities, we are committed to using state-of-the-art technology to improve efficiency and to decrease environmental impact. We are strongly committed to the philosophy of continuous improvement and the use of best available technologies with the long-term goal of producing carbon neutral paper. One of our main motivations in developing and using new technology is to increase production and improve energy efficiency and fuel mix.[34]

Guided by this philosophy, company executives interviewed suggested that APP-China's plantation forest areas in Guangxi, Hainan, and Guangdong provinces have been applying technologically advanced machinery and methods for breeding, trimming, cutting, and peeling since the late 1990s in an attempt to enhance forest and plantation efficiency. In addition, as a result of its commitment to continuous technological development in its processing facilities, the technology employed by APP-China compares favorably with other foreign-funded enterprises in many areas.[35]

Environmental considerations are a significant factor in APP's technological development. To counter accusations by environmental NGOs, APP-China

argued that Gold East Paper and its six subsidiaries have invested as much as RMB 4.4 billion in the development of environmentally friendly production facilities to ensure that their emission levels meet and exceed national and industry standards.[36] It has also made a combined investment of RMB 1.7 billion to develop advanced alkali recycling systems in its Jinhai Pulp Factory.[37]

According to a *China Daily* article, APP has put in a good amount of investment in the development of an alkali recycling system that both cuts down on the cost of production and is friendly to the environment. The system not only recycles all the "black fluid" produced during pulping but also makes use of the heat produced from burning such fluids to generate electricity. This recycling system also uses waste such as bark and chips as fuel for boilers. The white clay created by the alkali recycling system is in turn sent to a lime kiln to be recycled.[38]

According to APP-China, the emphasis on the utilization of advanced technology has allowed it to increase the efficiency of its production, improve the quality of its pulp and paper products, and reduce water and energy consumption and effluent discharge. For example, in 2006, to generate one ton of paper, APP-China used 16.7 percent less coal and 4.3 percent less electricity compared to the amount used in 2005. The surplus energy was supplied to the local grid.[39] Moreover, the executives of Gold East Paper interviewed suggest that the company uses environmentally friendly equipment for its power plant. In addition to reducing temperature inside the boiler to restrain the generation of nitrous oxide, Gold East feeds a large quantity of production waste into boiler coal to attain desulfurization by calcium carbonate.[40]

With regard to technological cooperation, Gold East Paper Mill has an independent R&D center, which also cooperates with Beijing University on paper quality and calcium carbonate filler research projects. APP-China has plans to construct an APP R&D center on its Gold Hua Sheng mill site within the next three years.[41]

As a result of its commitment to environmentally friendly operations, Gold East Paper received the "National Environmentally Friendly Enterprises" award in June 2004 from the Ministry of Environmental Protection, which, according to the company, was the country's highest environmental honor. In 2005, Ningbo Zhonghua received the same award. In 2006, Jinhai Pulp and Paper received the "Environment-Friendly Project" award, also issued by the Ministry of Environmental Protection. In 2007, Gold East Paper became the first demonstration base of industrial tourism in China's papermaking industry.[42]

The Impact of Chinese Environmental Regulations on APP-China's Environmental Practices

According to APP-China, APP subsidiaries not only abide by local environmental regulations but also frequently exceed those regulations. At a minimum, APP mills strive to follow the Chinese government environmental protection regulations in production design, mill installation, and customer service. Even in areas where government regulations are the most stringent, such as in the Yangtze river and Tai lake areas, where considerations about the protection of the natural ecology and local fauna have resulted in government regulations restricting or limiting the scope of paper manufacturing, APP subsidiaries have made a good-faith effort to strictly abide by those regulations. An APP-China executive described their practices in an interview.

> APP abides by all local Chinese environmental regulations, and all other laws and regulations. In many cases this does not impact our environmental practices because our policies already require a degree of environmental consideration at or above the regulations. However, in some cases regulations have created the need to adjust our practices.[43]

According to the same source, in some cases, APP mills' performance even exceeded local mandates. For example, in Hainan province, where APP's Jinhai pulp mill subsidiary is located, there is no specific local COD standard for pulp manufacturing. Instead, the Hainan government has a common COD standard of 100 parts per million (ppm) for pulp production, which is more stringent than the central government's COD standard for pulp production of 400 ppm. Jinhai mill not only met the local standards, it also exceeded those standards to be "one of the first pulp mills in China to achieve a COD standard of less than 100 ppm."[44]

When assessing the environmental performance of its subsidiaries, APP-China uses standards set by APP headquarters, local environmental and legal regulations, international standards, and independent third-party verification and assessment. Examples of third-party assessment include Program for the Endorsement of Forest Certification (PEFC) and ISO certifications. More recently, APP-China is undergoing a carbon footprint assessment of eight of its mills in China in partnership with ESD Sinosphere, a major company providing environmental, social, and carbon management consulting services in China. According to our interviews with APP, as a result of such a conscious at-

tempt to adhere to strict environmental standards, each of the APP mill's effluents exceeds the local environmental regulatory standards. In part due to its commitment to sustainable environmental operations, APP-China has been recognized by the China Paper Association and the China Technical Association of Paper Industry for its contributions to the development of the paper industry in China.[45]

Environmental Audits and Assessments

Whether a company conducts regular environmental audits and assessments is another indication of environmental policy rigor. APP-China seems to hold up well to this criterion. APP has an Environmental Protection and Industrial Safety Division to ensure that each mill achieves the environmental protection targets. This division holds a competition for mills in China and checks the Key Performance Index (KPI) of each mill to identify the best- and worst-performing mill to encourage environmental protection. Every three months, this division holds a meeting to exchange ideas about environmental protection and solicit suggestions about how to improve environmental technology. In addition to internal audits, all APP-China's factories are regularly monitored by local environmental protection departments, which not only record all emissions data on a regular basis but also carry out random inspections from time to time. Such inspections are often formal and conducted without prior notice. Mills whose effluent discharge exceeds the local standards receive serious penalties.[46]

Another indication of APP-China's commitment to sustainable environmental practices is ISO 14001 certification. While ISO 14001 certification does not set requirements for environmental performance or provide verification of the achievement of these internal objectives, it does serve to certify the establishment of an internal environmental management system to identify, measure, and monitor the environmental impacts of the organization to ensure continual improvement of those impacts. Judging by this criterion, APP-China seems to have performed well. As of this writing, 14 of APP's subsidiaries engaged in pulp and paper manufacturing have received ISO certification. Each of the remaining APP mills sets its own targeted time frame to achieve ISO 14001 certification. Ningbo Zhonghua was the first Chinese papermaking company to receive ISO 14001 certification. Gold East Paper received ISO 14001 certification in 2000, and an audit team has been conducting annual checks of the firm since that time. According to APP-China, the motivation for obtaining ISO 14001 and other certifications stems from APP's "desire to operate according to international standards and to have outside and independent verification of its envi-

ronmental operating standards."[47] Table 7.1 presents detailed information about APP subsidiaries that have achieved ISO 14001 certification.

APP-China subsidiaries have also undergone other external environmental audits. As mentioned above, the company is undergoing a carbon footprint assessment of eight mills in China in partnership with ESD Sinosphere, part of the Camco Group, a global leader in engineering and environmental services based in the United Kingdom. Also, the Jinhua Forestry Company of APP-China's Forestry Department has a professional academic organization monitoring the effectiveness of the company's environmental operations. According to company executives, APP-China receives reports from the organization periodically and uses these reports as a reference in corporate decision making.

Several APP pulp and paper companies, including Gold East (Jiangsu), Gold Huasheng Paper, Ningbo Zhonghua Paper, and Ningbo Asia Pulp & Paper, have received certification from the PEFC, an independent, nongovernmental and nonprofit organization that promotes sustainable forest manage-

TABLE 7.1. ISO 14001 Certification of APP-China Subsidiaries

APP-China Subsidiary	Date of Certification	Certifying Agency
Ningbo Zhonghua Paper Industry Co., Ltd.	March 1999	SGS
Asia Paper (Shanghai) Co., Ltd.	December 1999	DNV Shanghai Center for EMS
Jin Yu (Qing Yuan) Tissue Paper Industry Co., Ltd.	July 2000	DNV
Jinxin (Qing Yuan) Paper Industry Co., Ltd.	July 2000	DNV
Gold Hai Paper Products (Kunshan) Co., Ltd.	October 2000	SGS
Yalong Paper Products (Kunshan) Co., Ltd.	December 2000	DNV
Gold East Paper (Jiangsu) Co., Ltd.	December 2000	SGS
Ningbo Paper Converting Co., Ltd.	March 2001	CQC
Ningbo Asia Paper Tube & Carton Box Co., Ltd.	March 2001	CQC
Ningbo Asia Unpolluted Paper Products Co., Ltd.	March 2001	CQC
Gold Huasheng Paper (Suzhou Industrial Park) Co., Ltd.	January 2002	CQC
Gold Hong Ye Paper (Suzhou Industrial Park) Co., Ltd.	February 2002	CQC
Jinhai Pulp & Paper Co., Ltd.	May 2006	EIC
Ningbo Asia Paper Co., Ltd.	August 2006	CQC

Source: APP-China corporate headquarters.

ment through independent third-party certification.[48] From the point of view of APP, having each pulp and paper mill receive this certification signals the company's commitment to environmentally friendly practices.

Effluent Treatment and Emission Reduction

An important criterion for judging the effectiveness of a company's environmental management is the actual level of emissions. This section draws primarily on the example of Gold East to illustrate how growing attention to environmental protection has led the company to deliver emissions outcomes that compare favorably with China's industry benchmark. As a result of more rigorous enforcement of environmental guidelines, the active promotion of clean production, and increased paper recycling, Gold East has achieved considerable progress in its effluent treatment and emission reduction targets. For example, in 2005, Gold East added an effluent treatment line with a daily treatment capacity of 25,000 tons, in addition to its (then) capacity of 50,000 tons. Further, as of 2008, each of its pollutant discharge indices was performing above global benchmarks.[49]

Gas Emission Reduction. In 2007, Gold East Paper's production capacity increased by 8 percent and boiler load rate increased by 5 percent. One particular challenge to clean production was the difficulty of procuring low sulfur coal, which led the average sulfur content of boiler-inflaming coal to increase from 0.5 to 1 percent. In order to ensure that gas emission reached the national standards, Gold East invested RMB 2.8 million to reconstruct the boiler limestone conveying system and to increase the uploading capacity from 5 tons per hour to 45 tons per hour. As a result of this initiative, in 2007 the total production of SO_2 was 4,350 tons and reclaimed gas for producing calcium carbonate reached 0.5 billion normal meter cubed (Nm^3). Accordingly the company was able to reduce the amount of SO_2 emission by 302 tons after neutralization treatment.

Gold East has also engaged in various energy-saving activities to reduce coal consumption and thereby reduce CO_2 generation. In 2007, reconstruction projects allowed the company to reduce total coal consumption by 5,965 tons, which resulted in a 9,126-ton reduction in CO_2 emission. At the same time the company increased the comprehensive utilization and consumption of gas. In 2007, the PCC plant used limestone with CO_2 from power plant gas to synthesize coating color and paper filler, thus reducing CO_2 emissions by 89,525 tons from the previous year. Gold East used discharged carbon dioxide directly to produce calcium carbonate filler for the papermaking process.

Wastewater Treatment. Gold East Paper has also sought to promote cleaner production and recyclable material usage. By optimizing the production process through technological improvements, the mill has been able to reduce its whitewater concentration and increase the amount of effluents recycled through the system. Gold East's papermaking whitewater recovery rate is 90 percent. In 2007, the water consumption of the mill was reduced to below 7.5 m^3 of water for producing one ton of paper, a level well below the international benchmark. The company uses recycled water for removing dust, cleaning roads, and irrigation. Due to its effective wastewater treatment, the wastewater discharge of Gold East was only 13.7 percent of the national standard, and its COD discharge amounted to only 7.31 percent of the national standard in 2004 (see table 7.2; see also table 7.3 for Gold East's latest water emissions and consumption data).

Wastepaper Recycling. Another APP subsidiary, Ningbo Zhonghua Paper Co., Ltd., one of the largest manufacturers of white paperboard in China, has developed significant paper recycling experience. Ningbo Zhonghua collects discarded newsprint, office paper, and magazines from residential and business communities, and reuses them as raw materials for paper production. Eighty-five percent of the raw material it uses for pulp production originates from

TABLE 7.2. Comparison of Gold East Drainage and COD Discharge Standards

	Gold East Standard	National Standard	German Standard
Drainage (m^3/t)	8.19	60	11.2
COD (kg/t)	0.439	6	3

Source: "Environmental Revolution of the Paper Industry—APP's Development in China," *China Daily,* May 17, 2005.

TABLE 7.3. Latest Emissions and Consumption Data for APP-China

Item	Unit	Proposed Target	Data in August 2008	Domestic Standard	International Standard
Water consumption per ton of paper	ton	10	9.46	—	12–18
Wastewater emitted per ton of paper	ton	9	8.65	60	—
COD emitted per ton of paper	kg	0.61	0.61	6	—
Water consumption per ton of pulp	ton	28	29.3	—	35–41
Wastewater emitted per ton of pulp	ton	17	21.3	220	27

Source: APP-China headquarters in Shanghai.
Note: — = no standard presently exists.

wastepaper. Based on these recycling techniques, Ningbo Zhonghua was able to recently implement a paperboard production line with world-leading technologies, and it consistently meets China's national paper whiteness standards.[50] Through the above practices, Ningbo Zhonghua has also been able to implement a new process of producing art board from recycled pulp.

Solid Waste Reduction. Gold East has sought to control the production process in order to reduce the level of solid waste. To avoid pollution, the solid waste is transformed into recyclable materials through internal and external channels. In 2007 the overall recycling rate of generated solid waste was 99.8 percent. In order to reduce the amount of residue discharge, the mill reengineered the power station's fuel transition system in 2002 so that residue from the production lines could be used as fuel for power generation. Sewage blocks and marble residue were used as fuel along with coal. This helped to reduce the solid waste discharge, facilitate the desulfurization of the emission, and reduce the cost of limestone procurement.

ALTERNATIVE EXPLANATIONS

In this section, we address several alternative explanations that could affect the validity of our argument. Above all, it is important to note that our APP case study introduces an important agent pushing for corporate environmental responsibility that so far has not received extensive treatment in this project: environmental NGOs. The following discussion about APP's alleged illegal forestry practices in Indonesia and China reveals that environmental NGOs were indeed instrumental in exposing the company's problematic environmental policies. However, while recognizing their important role in raising public awareness of APP's environmental record and in inflicting reputation harm on the company, NGO activism did *not* constitute the only source of pressure on APP to adopt more sustainable business practices. Indeed, our detailed case study suggests that considerations about how such negative media and NGO exposure might jeopardize the company's key overseas markets and threaten the long-term viability of its China operations figured importantly in APP's calculations to improve its environmental conduct. Pressure from environmental NGOs, while important, did not by itself lead to changes in APP's behavior. Rather, we contend that it was the combined pressure from environmental NGOs and customers in key export markets that helped to shape the observed outcome.

Another potential explanation for the alterations in APP's behavior is that

the Chinese government has gradually tightened its oversight of the paper industry and sought to crack down on illegal logging and other polluting behavior by the pulp and paper manufacturers. Indeed, in the past decade, the Chinese government, acknowledging the need both to decrease the environmental impact of its former state-owned enterprises and to restructure the industry to support economic modernization and export growth, has gone to great lengths to support industrial reform. For example, since 1996 the Chinese State Environmental Protection Agency has succeeded in closing down thousands of small-scale paper mills,[51] considered by most to be the worst offenders.[52] As another, perhaps more dramatic example of governmental intervention, in 1998 the Chinese government enacted a complete ban on logging in thirteen provinces and autonomous regions after devastating floods on the upper Yangtze, made worse by logging-facilitated soil erosion, cost thousands of lives and billions of dollars in damage, affecting over 250 million people.[53] Since then China's government has succeeded in reforesting approximately 20 million hectares of land, around a third of which are to be processed by timber-based paper mills in the future.

Still another possible explanation for APP's gradual change in behavior is that in the early part of the decade, APP received a line of credit from the Chinese government to bail it out of financial trouble. In late 2000, APP experienced a period of financial meltdown as the maturation of several of the group's long-term financial obligations came at a time when it was also carrying substantial short-term debts. Such a drastic deterioration in APP's financial position increased the risk exposure of Chinese financial institutions, because about half of the US$3.6 billion debt that the company incurred through Chinese expansion was owed to four large state-owned banks. Consequently in March 2001, these four banks, headed by the Bank of China, entered into a collective debt restructuring agreement with APP to ensure loan repayment that included suspension of APP's debt payments for six months and provision of letters of credit to enable the company to engage in foreign trade and raw material purchase.[54] It has also been estimated that since then the state-owned banks in China have forgiven at least US$660 million in loans extended to APP.

Given that APP has received substantial credit and loan forgiveness from the Chinese government, it is conceivable that such financial assistance could have been used as a carrot to stop APP from illegally logging natural forests. However, we argue that the risk exposure for Chinese banks, along with the fact that APP accounted for 29 percent of China's paper industry (valued at US$24 billion a year in 2004),[55] reduced the leverage of the Chinese government vis-à-

vis APP over environmental protection. The need to ensure both debt repayment and the continued viability of the paper industry likely meant that the Chinese government, motivated by financial interests, turned a blind eye to APP's environmental record, even though it was trying to enforce more rigorous oversight over the industry at the same time.

Finally, one could argue that the changes in APP's environmental behavior detailed above could be explained by the change in the company's ownership from Indonesian to Singaporean. As the latter country is presumably more environmental than the former, this could have helped to account for the reorientation of the company's environment strategies. However, although the company's headquarters moved to Singapore, it continued to rely on access to low-cost timber concessions in Sumatra for much of its competitive advantage. Between 1992 and 1998, Sinar Mas group developed APP into a major contender for market share and revenue in the world pulp and paper industry. To ensure the rapid expansion of APP, Sinar Mas moved its headquarters to Singapore. The move was viewed as an attempt to reduce the company's perceived risk premiums by investors and maximize its credibility in North America and Europe by "dressing it up like a multinational" and listing it on the New York Stock Exchange.[56] To the extent that low-cost timber supplies from Indonesia continued to be critical to the company's long-term development, APP's green credentials remained dubious even after the change in ownership location.

In short, the above discussion suggests that an explanation focusing on the role of environmental NGOs in enhancing APP's awareness of the importance of environmental protection, while important, does not by itself account for the gradual changes in APP's behavior. Moreover, there are weaknesses associated with arguments emphasizing the Chinese government's crackdown on the paper industry, APP's financial dependence on the Chinese government, or the change in the company's ownership location. This reinforces our finding about the importance of consumer pressure in export markets on APP's sustainability practices.

Conclusion: The Overall Impact of Foreign Investment on the Chinese Paper and Pulp Industry

The APP case detailed above lends support to our argument about both the influence of the environmental standards in the home country of investment and that of world market linkages. On the one hand, APP-China has received a considerable amount of negative publicity regarding illegal logging in southern

China.[57] Such negative media exposure is consistent with much of the criticism that APP's parent company, the Indonesia-based Sinar Mas Group, has received from environmental NGOs and activists over the years. It is also consistent with the country-of-origin argument regarding the environmental impact of FDI, as APP's questionable forestry practices in southern China can be explained by Sinar Mas Group's long-standing forestry practices in Indonesia, lax regulation on the part of Chinese officials, and APP's financial troubles that pushed it to meet production goals in the first few years of the operation's establishment.

On the other hand, however, our interviews and secondary research indicate that even for a company such as APP that has been in the international spotlight for alleged illegal forestry practices, pressure from customers in key export markets has served as a corrective to the company's environmental practices. Reinforced by negative campaigning by environmental NGOs and activists, such pressure emanating from the international marketplace has propelled the company to devote more attention and resources to environmental protection and to ameliorate the negative environmental impact of its China operations. While such changes in APP's environmental policies are ongoing and preliminary, they point to the potential for reputational and economic considerations to produce subtle yet incremental changes in firm behavior.

To be sure, the transformation in APP's behavior is far from complete. To the extent that APP's environmental record still leaves much room for improvement and to the extent that environmental NGOs will remain vigilant watchdogs of corporate behavior, continued NGO criticism of APP's environmental policies and performance is to be expected. However, the key point of our contention is that international trade linkages are generating subtle changes in APP's conduct as reflected in both APP executives' statements and in the company's emissions data. While discrepancies between the rhetoric and actual behavior of APP are likely to remain for some time, the fact that the company's overall policies and strategies toward environmental protection point in the right direction suggests the possibility of ongoing behavioral adaptation.

Importantly, our case study suggests that while negative media and NGO campaigns no doubt played a major role in precipitating such a change in behavior by exposing APP's illegal practices to public scrutiny, concern about bad reputation leading to potential loss of sales and shares in export markets was equally critical in APP's recent initiatives to strengthen environmental management and to improve its reputation as an environmentally responsible company.

In addition, it is important to note that while our case study does not provide direct evidence of the local diffusion of environmental technologies and

management systems, it seems that foreign investment in the Chinese pulp and paper industries did result in heightened competition for Chinese firms. In light of such competitive pressure from foreign firms, domestic companies increasingly had to innovate and to improve their management systems with regard to production, quality control, customer service, financial, personnel, and technological capacities in order to successfully meet the challenge in the Chinese market. The introduction of advanced technology, in particular, has helped domestic mills to become more efficient and less polluting. Interviews with independent researchers of the forest industry both in China and abroad lend credence to this argument. For example, Brian Stafford, an independent researcher and consultant in the pulp and paper industry in Australia and Asia, suggested that if the Chinese had been left to make do with their old industry, they would have had a lot more pollution than they now have. With foreign investment the industry has tripled in size. It has been transformed from the old vegetable-pulp-based sector to one that is based on wood or imported market pulp and has become a lot less polluting.[58] While some foreign-invested firms may do better than others, in general they have exerted upward pressure on domestic Chinese firms to improve their environmental practices.

CHAPTER 8

Implications, Caveats, and Future Research Questions

This project examines the impact of trade and foreign investment on the environment in China, a country that is undergoing both rapid industrialization and unprecedented environmental degradation. Our empirical analyses provide a strong critique of the race-to-the-bottom and pollution-haven arguments. Rather than leading to further environmental damage, China's economic integration has elevated domestic environmental standards by facilitating environmental norm diffusion, technology and management practices transfer, and through increased firm accountability to environmental product and process standards in developed markets. The findings in this analysis question the legitimacy of claims that cast globalization as necessarily environmentally degrading. This chapter discusses both the theoretical and policy implications of our findings and identifies questions for future research.[1]

THEORETICAL IMPLICATIONS

The findings of this project have implications both for the literature dealing with the overall impact of globalization on the environment and for studies of China's participation in the international economy. This section discusses the theoretical implications of our analyses.

Implications for the Literature on the Impact of Globalization on the Environment

The statistical analyses presented in the previous chapters suggest that international economic integration has elevated environmental standards in China.

First, foreign investors are not driven by a desire to seek out pollution havens in their choice of an investment location, as provinces that attract large amounts of FDI tend to engage in more rigorous environmental regulation. This result is buttressed by survey analyses of business executives of international and domestic firms. The survey evidence demonstrates that foreign-invested companies in China are more likely to engage in self-regulation, go beyond compliance in their own production facilities, and adopt green supply-chain policies that serve as a source of upward pressure on the environmental practices of domestic commercial partners. Consequently, they exert a private authority effect that helps to strengthen the implementation of China's environmental laws and regulations in the public sphere.

A key reason that trade and FDI exert a positive environmental impact is that business leaders view it as increasingly necessary to engage in behavior that harmonizes corporate environmental standards across jurisdictions to streamline operational efficiency, maintain brand legitimacy, and hedge against accusations of environmentally destructive conduct. The development of strong environmental credentials is increasingly considered by business executives to be an important component of business administration. Our survey analysis indicates that executives of foreign-invested companies operating in China attach considerable importance to the adoption of environmentally friendly production methods and management systems. These findings are buttressed by our macrolevel analysis of the impact of trade and FDI on the environmental performance of Chinese provinces. The fact that provinces more deeply embedded in global trade and production networks tend to exhibit superior environmental performance lends substantial support to Vogel's trading-up and Prakash and Potoski's investing-up arguments, indicating that these phenomena can take place outside of the developed world.

Second, our findings suggest that rather than engaging in deregulatory competition (or racing to the bottom), Chinese provincial officials are more concerned with ensuring the sustainability of export markets and increasing competitiveness of local firms by facilitating technology transfer and development through investment attraction. Further, these results suggest that supply-chain and firm self-regulatory pressure reduce the demands of foreign and domestic firms on provincial governments for environmental deregulation. In other words, demands from the private sector for deregulation are simply not loud enough, nor exit threats great enough, to compel officials to comply by supplying pollution havens. Because provincial officials have strong incentive to produce breakneck economic growth within their provinces, were exit

threats and investment demands great enough, it is not unreasonable to expect local official compliance to follow. The fact that this type of official behavior is not observable and that China is still economically expanding by leaps and bounds suggests that market mechanisms might be equally responsible for mitigating poor firm environmental practices.

Third, we find that export destinations matter. Provinces that export mostly to countries with stringent environmental regulations exhibit more sound environmental performance. We also found evidence supporting the country-of-origin argument with regard to FDI, a result that is further buttressed by our survey and research into the Chinese paper industry. While on average foreign firms tend to abide by China's environmental laws and display environmental behavior superior to domestic firms, the environmental standards in the investment source country similarly make a difference. Compared to investment from a country with lax local regulatory standards, MNCs originating from a country with rigorous standards are more likely to be constrained by such standards in their China operations. In other words, FDI serves to ratchet up the environmental standards in the host economy primarily when the home country itself has stringent environmental laws and regulations. This result lends support to the view that globalization leads firms to replicate the diverse home-country practices in their host operations, thus promoting cross-country divergence in corporate practices.[2]

Implications for Studies of China's Behavior in the International System

In addition to explicating the theoretical linkages between trade, FDI, and the environment, this study has implications for the study of China's behavior in the international system. China scholars have increasingly devoted attention to the influence of international forces on Chinese politics.[3] For example, David Zweig shows how Chinese leaders have gradually revised the national education policy to favor study abroad in an attempt to secure greater access to foreign educational resources.[4] Other studies have explored how international factors can affect the making and implementation of Chinese government policies in issue areas as diverse as intellectual property rights, human rights, and information technology.[5] In addition, scholars have increasingly sought to understand the influence of factors at the international level such as international regimes or foreign investment on China's environment.[6] However, the pathways through which international factors can influence China's environmental governance are only beginning to be understood.

An important study in this respect is Phillip Stalley's research on the impact of foreign investment on China's environmental policy. Through field studies of the environmental behavior of foreign firms, Stalley concludes that "integration with the international market does not inevitably lead to a ratcheting up of environmental standards nor does it unleash a race to the bottom."[7] He finds that while multinational corporations go "beyond compliance" in their own manufacturing facilities and adopt green supply-chain policies, the greening effect of foreign operations is not universal. Stalley maintains that while both foreign trade and FDI can exert upward pressure on environmental governance in China, they serve as a double-edged sword, as poorer Chinese localities that face a distinct disadvantage in attracting foreign capital tend to more frequently flout environmental regulation. As well, his survey analysis fails to yield a statistically significant relationship between firms' ties to foreign firms via sales and supply chains and environmental practices.[8] On the whole, Stalley's study reveals the bifurcated effect of the impact of trade and FDI on environmental practices in China.

The findings of this project, drawn from statistical analyses, firm-level survey analysis, and a case study, are more upbeat than those in the above work. Both our provincial-level statistical analyses and survey results lend strong support to arguments about the positive linkage between trade, FDI, and the environment. This project therefore represents an alternative account of the impact of globalization on the environment in China.

POLICY IMPLICATIONS

Our research has shown that market mechanisms should not bear the brunt of the blame for the depressing condition of the Chinese environment. In many respects China's trade and investment liberalization and economic integration have contributed to stronger environmental governance. In light of the Chinese experience, it is necessary to ask what, if anything, international actors with a stake in sustainable development can do to allow developing countries to enjoy the benefits of FDI while preventing and minimizing the associated negative environmental externalities.

First, our findings have important implications for NGOs in their search for effective solutions to global environmental problems. Specifically, our critique of the race-to-the-bottom argument challenges the view that free trade abets regulatory races, leading exporters in developing countries to exert pressure on their governments to relax environmental regulations to secure greater

access to export markets. This suggests that environmentalists and nongovernmental actors may need to revisit arguments about the negative impact of free trade on the environment. Recognizing that free trade can positively contribute to environmental protection, and that importing countries are able to influence the environmental standards in exporting countries, NGOs striving to safeguard the global environment may want to devote more attention to the restructuring of export patterns in developing countries to encourage greater trading linkages with countries with stringent environmental standards. This isn't to suggest that China shouldn't trade with, or receive investment from, the developing world; only that if it does, it should take great care to maintain stringent product and process standards on imports, and monitor and regulate the environmental performance of developing-world firms invested in China.

Moreover, NGOs should devote greater resources to exerting pressure on MNCs to stipulate environmentally friendly criteria in their supplier selections. By directly lobbying MNCs at home, NGOs may enhance the prospect of influencing the behavior of MNCs in the host countries. Likewise, developing-country governments may want to be more selective regarding the home country of potential investors. Care needs to be taken in screening foreign investment projects to minimize the negative environmental consequences of FDI.

Second, at the international level, the findings of this project reinforce the need for a global initiative to increase corporate accountability for foreign environmental practices. While corporations are increasingly engaging in self-regulation and transmission of environmental standards, international corporate environmentalism initiatives could act as additional external checks on corporate behavior. These initiatives could further instigate MNCs to adopt sound environmental practices that benefit developing countries.

Third, our findings underscore the need to broaden existing voluntary, self-regulatory initiatives to better involve developing countries in programs designed to promote sustainable corporate behavior. If the findings of this project are valid, then the greatest challenge to the environmental governance of developing countries may not reside in developed-world MNCs but in those originating from the developing world. It is thus imperative to strengthen existing initiatives to regulate corporate behavior in order to subject corporations from the developing world to more stringent operating standards and criteria. As most global programs guiding corporate behavior are primarily aimed at multinational corporations from the developed world, shifting the focus of these programs to developing countries may be the most effective and practical

way to influence corporate behavior and to tackle the negative consequences of foreign investment on the environment.

CAVEATS

Before proceeding, a few caveats are in order. First, as this project is based on a China case study, critics may question its relevance to the broader race-to-the-bottom literature. How generalizable are these findings? In response, we argue that to the extent that China represents the largest developing country in the world, with one of the world's fastest-growing economies and an enormous (and growing) ability to affect the global ecology, findings from this study should provide crucial country-level evidence that casts doubt on the race-to-the-bottom hypothesis. If multinational companies do not flock to areas of lax environmental regulation in their search for low labor and other production costs in China, and if the presence of foreign capital tends to ratchet up, instead of pulling down, Chinese environmental performance, then it also should substantiate arguments about the positive environmental spillovers of the economic globalization process elsewhere.

Second, how relevant is this cross-*provincial* analysis to cross-*national* variation in environmental standards? The pollution-haven hypothesis addresses the question of whether foreign firms locate production to developing countries largely based on comparisons across countries. Critics may therefore question how much foreign firms' locational choices within China are independent of their choice to locate plants in China over other world regions. However, while this project does not specifically examine whether considerations about host-country environmental regulatory stringency drive foreign firms' decision to locate production in China over other countries, it takes the decision to locate plants in China as given and asks the following question: What accounts for foreign firms' locational choice across Chinese provinces? In light of the substantial cross-provincial variation in FDI inflows and environmental regulatory stringency, such an approach is justified. The fact that provincial officials have such strong incentives to promote economic growth in their provinces, and that they have the ability to adjust their enforcement of environmental regulations from the central government, suggests that if one were to witness the RTB and PH arguments in effect, China would be a plausible place to do it.

Third, the province as a unit of analysis does not accommodate the potential for environmental pollution in one province to spill over into neighboring provinces. However, the fact that the emissions data we used are recorded at the

firm site, and that firms pay levies based on these emissions, indicates that interprovincial pollution spillovers, while important, likely do not impact firm locational choices. Were pollution-intensive firms to site production facilities on or near provincial borders, emissions would still be recorded, and levies paid, at emission points-of-origin. Further, cross-border pollution spillovers are possible at every level of analysis, from subnational to country levels.

QUESTIONS FOR FUTURE RESEARCH

This research focuses on the impact of economic integration on the Chinese environment. However, it does not address a number of questions that may be important to understanding China's role in influencing the global ecology. This section lays out several questions that merit greater scholarly scrutiny.

Further Explorations of the Sources of China's Environmental Plight

This project has highlighted the positive role of trade and foreign investment in improving environmental quality in China. For that reason, it has left out the following question: if trade and foreign direct investment do indeed have the ratcheting-up effect as posited, then why is China's environment in such a deplorable condition? There are two potentially useful avenues of tackling this question: one is to consider the potential for the scale effect of globalization to overwhelm the technique effect, and the other is the possibility that the root causes of China's environmental woes are linked to domestic politics.

First, it is necessary to take into consideration the scale, technique, and income effects of free trade in order to fully understand the impact of trade on the global environment. Our study of how trade and FDI affect the spatial distribution of pollution in China suggests that trade and investment can create demand for cleaner production processes, management systems, and environmentally friendly technologies in a way that is consistent with the conjectures of the technique effect. However, this does not preclude the technique effect from being overwhelmed by the sheer scale of China's economic activities. While the improvement in China's environmental management systems and production processes and technologies represents an important dimension of the country's growing participation in the global economy, it is after all just one of the many dimensions of its global economic engagement.

Second, in discussing the impact of globalization on the Chinese environment, this research has adopted a "second-image reversed" approach, by look-

ing at how the forces of economic globalization, which are exogenous to the state, drive policy outcomes within the state. While the domestic sources of China's environmental problems are not the focus of this project, it would be interesting to examine how forces endogenous to China, such as interest groups, institutions, and nongovernmental organizations, shape policy outcomes. Such an approach may allow us to better assess the contributing factors to China's current environmental plight.

For example, this research does not address the impact of nongovernmental organizations on the Chinese environment. Nevertheless, environmental NGOs are increasingly influencing the debate over environmental policy formulation and implementation, and shaping China's strategy toward global environmental management.[9]

Similarly, political institutions have great power to shape Chinese environmental policy. Previous studies have examined how conflicts among political actors, refracted through political institutions, influence policy outcomes in issue areas such as intellectual property rights or dam building.[10] For example, in examining the politics of intellectual property rights in China, Mertha argues that even though external pressure for enhanced IPR protection has prompted the Chinese government to sign on to IPR agreements that are on a par with international standards, the substantial variation in the implementation of such agreements across issue areas (e.g., copyrights vs. patents) cannot be understood without taking into consideration the political tussles that take place among various bureaucratic actors in China. Therefore, it is possible that factors within China such as bureaucratic politics, interest group lobbying, and NGO activism that are not addressed in this book similarly influence the variation in environmental policy outcomes. Future studies could undertake the "second image" approach and examine how domestic politics in China affects environmental policy and performance.

In short, there remains a need to extend the focus of analysis from the central government in Beijing to regional, bureaucratic, and societal actors. Instead of treating China as a unitary actor, future studies could extend the focus of analysis beyond Beijing to probe how various domestic actors interact with external factors to influence policy implementation on the ground.

China's Involvement in Global Environmental Regimes

Another potential research avenue concerns China's activities in global environmental regimes and the effectiveness of that involvement.[11] Recently China

has become more active in international environmental diplomacy. For example, China has been playing a proactive international role in some technical areas such as biodiversity and has taken a strong initiative toward water conservation and wildlife protection.[12] In addition, it has played a leading role in proposals to establish a green GDP, to include environmental performance as one of the criteria for evaluating staff performance and promotion, and to promote the use of hotlines for reporting environmental offenses.[13]

It would therefore be worthwhile to take an inside-out approach to examine how domestic politics in China affects the country's environmental management and, by extension, its role in global environmental regimes. For example, on several key issues affecting the global environment, China's stance promises to be critical. While Chinese leaders have indicated a willingness to participate in talks to curb global warming, they insist that developed countries should take a leadership role in addressing pollution and are firmly against proposals to impose mandatory quotas of reductions in greenhouse gas emissions on any country.[14] As China remains one of the world's principal emitters, whether or not it will cooperate with the United States on this issue to reach a compromise on a new protocol beyond 2012 has strong implications for the effectiveness of global environmental governance. The degree to which China can engage in such a cooperative endeavor is in turn likely to be affected by the preferences and resources of domestic Chinese actors.

Is There a Race to the Bottom in Issue Areas Besides the Environment?

While there is a burgeoning body of literature examining the domestic implications of China's growing participation in world markets, the social and economic consequences of this phenomenon warrant further analysis. For example, in his examination of the impact of FDI on human rights in China, Michael Santoro argues that multinational corporations engaging in a market-building as opposed to a cost-minimizing strategy in China are likely to exert a positive impact on human rights in that country as they tend to operate with enhanced transparency, adhere to meritocratic principles, and engage in other practices that enhance the power of employees within the firm.[15] In highlighting how such processes lay the social and economic bases for democratic transitions, Santoro provides a favorable account of the social impact of FDI in China.

Doug Guthrie examines the impact of FDI on the corporate practices of Chinese domestic firms, finding that inward FDI leads to the convergence of

Chinese firm behavior with global best practices. Drawing on extensive fieldwork in Chinese domestic firms in Shanghai, he argues that as these firms engage in a process of imitation, they increasingly shy away from practices characteristic of traditional Chinese firms such as the use of informal agreements and personal connections (*guanxi*) to embrace the more rational managerial strategies that characterize firms in the West.[16]

Similarly, Thomas Moore analyzes China's participation in global regulatory regimes, focusing in particular on the impact of the Multifiber Arrangement (MFA) on Chinese firms.[17] He argues that as the MFA contains provisions that discriminate against developing-country exporters, it has exerted upward pressure on Chinese exporters to improve the quality of their products, thus aligning the practices of Chinese firms closer to prevailing global market standards.

However, while the above-cited works posit that FDI can lead to economic and social convergence between China and the developed world, other scholars have reached different conclusions. For example, Yasheng Huang argues that as FDI has served to substitute, rather than complement, domestic entrepreneurship, it has set back the Chinese private sector development.[18] Mary Gallagher assesses the impact of FDI on Chinese democratization prospects.[19] While acknowledging that the competitive pressure exerted by FDI has forced China's state-owned enterprises to increase their efficiency and improve their labor standards, she contends that because FDI has fragmented labor and limited labor's ability to challenge the central government, it has delayed democratic reforms.

In short, scholars are of different opinions about the social and economic impact of FDI in China. It is important that there are relatively few works directly engaging the race-to-the-bottom hypothesis to examine the impact of FDI on such issues as labor standards or human rights. Consequently, it would be interesting to subject the race-to-the-bottom argument to empirical testing in other areas. For example, research questions similar to those motivating this project could be posed for the issue of labor standards. One could ask questions such as whether foreign investors are attracted to areas of lax labor standards and whether provinces that have received more FDI also tend to provide better labor rights protection or have fewer labor disputes. Questions could also be asked about whether foreign investors from developed countries offer better labor rights protection, and if there exists sectoral variation in labor rights protection.

Indeed, there is anecdotal evidence that solely foreign-owned firms and joint ventures established with Western capital tend to treat their workers better than their counterparts established with capital from Hong Kong, Taiwan,

or South Korea.[20] Such discrepancies in the labor practices of Western versus Asian firms have sometimes been attributed to the institutional culture of industry, including the institutional practices pertaining to the treatment of workers, in the firms' respective home countries. Martin King Whyte, for instance, noted that the smaller and more labor-intensive firms established with capital from Hong Kong, Taiwan, and South Korea come from societies with few constraints from either organized trade unions or the state on the treatment of workers.[21] Motivated by a desire to save on labor costs, these firms tend to enforce a complex set of rules and detailed fines regarding worker behavior.[22] Consequently, reports abound in Chinese government and trade union presses about cases of abuse by such firms. Such evidence provides tentative support to the investing-up argument as it relates to labor standards, suggesting that MNC subsidiaries tend to replicate the prevailing institutions and practices in their home country in the LDC host. Future studies could more systematically test such a hypothesis.

The Environmental Implications of China's International Environmental Initiatives and Growing Outbound Foreign Investment

Alternatively, one could ask questions about how China's international environmental initiatives affect domestic environmental governance. By 2006 China had signed bilateral environmental cooperation agreements with forty-two countries.[23] While on the one hand, through its participation in global environmental governance, the Chinese government promotes the view that developing countries should be accorded differential treatment in complying with international standards due to their need for rapid industrial catch-up; on the other hand, Beijing seems to expect that it may be able to leverage international environmental agreements to pressure domestic manufacturers and other vested interests to take initiatives to combat pollution. If, as Falkner's case study of China's experience with genetically modified food suggests, China's participation in international organizations and treaties serves to induce domestic policy change by exerting a socializing and learning effect on Chinese actors,[24] then China's growing participation in global environmental regimes may indeed affect Chinese environmental politics. Future studies could engage in more detailed analysis of this issue to delineate the pathways through which participation in international environmental regimes influences the Chinese environment.

Furthermore, the impact of China's foreign investment in other developing

countries or regions on their environmental governance is worthy of further investigation.[25] For example, Chinese investment in Latin America and Africa has seen a steady increase in recent years.[26] If our argument about how environmental regulatory enforcement in the home country of FDI influences environmental standards and performance in the host country is valid, and if the diffusion of corporate environmentalism has yet to be extended to most Chinese firms, as the survey data in chapter 6 suggests, then one would expect that FDI originating from developing countries may lead to further neglect of environmental protection. Whether such a dynamic is at work and whether the investing-up argument extends to Chinese FDI in regions such as Latin America or Africa therefore warrant further examination.

The Impact of the Global Economic Recession on China's Environmental Commitment

Since mid-2008, the global economy has been mired in the worst economic downturn since the Great Depression, prompting questions about the impact of the global economic recession on the commitment of both Chinese and Western firms to sound environmental standards. At first blush, it appears that the belt-tightening necessitated by the global economic crisis could have created incentives for corporations to look for ways to cut back on expenditures, thus generating downward pressure on the environment. However, a closer analysis would suggest that the picture might be far more complicated, as companies that have been able to successfully weather the financial crisis storm seem to be holding up their commitment to responsible corporate behavior. Wal-Mart, for example, has been able to maintain its market share and has continued to exert pressure on its suppliers to meet environmental and labor standards. For example, in July 2009, in the heart of the economic recession, Wal-Mart released its "Sustainability Index" initiative to map the sustainability of its products worldwide. This is a bold step for any corporation, but especially one as large as Wal-Mart in the midst of an economic recovery.[27] Instead of generating downward pressure on the environment across the board, the crisis may have led those who were able to come out of it relatively unscathed to continue to abide by stricter standards while leading those struggling to cope with the economic downturn to scale back their environmental commitments. The unfolding of the crisis in the future could help us reach more definitive conclusions on this issue.

CONCLUSION

In conclusion, this book adopts multiple methodologies to critically assess the pollution-haven and race-to-the-bottom hypotheses. The empirical evidence presented in previous chapters suggests that foreign investors are not driven by emission cost savings in their investment decisions. Nor are provincial governments in China motivated by the competitive dynamics of business attraction to engage in environmental deregulation. Indeed, not only can trade serve to transfer the more stringent environmental product and process standards prevalent in environmentally regulated countries to their primary exporters, FDI can exert a similar effect due to self-regulation by multinational corporations, the transfer of pollution abatement technology, and the transfer of corporate environmental norms, thus facilitating convergence with home-country practices.

While the empirical findings generated by a case study of China are country specific, they do have implications for other countries at similar developmental stages. In addition, as China represents one-fifth of the world population and a significant proportion of the world's manufacturing and production activities, it is an important case to test competing theories of the environmental impact of globalization. Our findings could thus potentially be generalized to other developing countries. Future studies could extend this approach to other developing countries to both assess the validity of the theories presented in this research and identify new dimensions of the globalization-environment linkage.

It should be noted that while this project emphasizes the positive environmental spillovers of trade and market liberalization, it does not suggest that enhanced public surveillance of corporate environmental conduct and global initiatives to promote corporate responsibility are unnecessary. Indeed, while in general multinational corporations can contribute to stronger environmental governance, the establishment of global environmental governance programs would act as a useful external check on corporate behavior.

Moreover, while there are many voluntary, self-regulating environmental initiatives, most of these initiatives have targeted multinational corporations from the developed world. However, our study suggests that businesses from developing countries with lax environmental regulations may pose the greatest threat to Chinese environmental governance. Consequently, it may be necessary to involve developing countries more closely in voluntary environmental initiatives to ameliorate the negative environmental impact of their outward foreign investment.

If trade and FDI are not to blame for China's environmental woes, then it

may be necessary to strengthen domestic environmental governance in China by expanding the participation of public and private actors in the environmental policy process. For example, our case study of the APP indicates that the media and environmental NGOs are increasingly serving as corporate watchdogs by exerting pressure on highly polluting firms to modify their behavior. Organizations such as the Institute of Public and Environmental Affairs directed by the Chinese environmentalist Jun Ma have developed the first public database of Chinese water pollution. These data have exposed to public scrutiny companies that have excessively polluted China's waterways.[28] While there are limits to the extent of civil society participation in China's political system, the gradual expansion of such public participation should generate incremental changes in the long term.

Likewise, the central government in Beijing should play a more forceful role in enforcing environmental regulation. In addition to increasing governmental investment in environmental protection, Beijing should develop stronger mechanisms to supervise and regulate the behavior of local governments and to penalize local behavior that either directly or indirectly challenges central injunctions.

In addition, enhancing the role of the private sector in China's environmental governance could generate fruitful results. Our survey chapter indicates that despite China's growing economic integration, there remains a considerable gap between wholly domestically owned firms and foreign-invested firms in terms of environmental management systems and operating procedures. Consequently, it may be necessary to develop mechanisms of information sharing between domestic and foreign firms. Stalley suggests that both Chinese and foreign governments could play an important role in this process by sponsoring forums that allow firms to share environmental management best practices.[29] Such mechanisms may provide valuable opportunities for domestic firms with limited knowledge of environmental management systems to close the gap with foreign firms, thus helping to foster the development of corporate environmental norms within China.

While trade and market liberalization have made positive contributions to environmental governance in China, they are far from panaceas for the country's environmental problems. In light of the ongoing environmental challenges in China, improvement in governmental oversight of corporate environmental behavior and the harnessing of private sector participation in the policy process remain daunting tasks. Both are likely necessary to avoid the unfortunate trade-off between industrialization and environmental degradation and to ensure the long-run sustainability of the Chinese economy.

Notes

CHAPTER 1

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CHAPTER 4

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13. Chien-Hsun Chen, "Regional Determinants of Foreign Direct Investment in Mainland China," *Journal of Economic Studies* 23, no. 2 (1996): 18–30.

14. Lv Na and William S. Lightfoot, "Determinants of Foreign Direct Investment at the Regional Level in China," *Journal of Technology Management in China* 1, no. 3 (2006): 262–78.

15. Ashoka Mody and Krishna Srinivasan, "Japanese and US Firms as Foreign Investors: Do They March to the Same Tune?" *Canadian Journal of Economics* 31, no. 4 (1998): 778–99; A. Enisan Akinlo, "Foreign Direct Investment and Growth in Nigeria: An Empirical Investigation," *Journal of Policy Modeling* 26, no. 5 (2004): 627–39; Minghong Lu, *The Locational Determinants of Foreign Direct Investment* (Nanjing: Nanjing University Press, 2000).

16. It can be argued that this is especially the case in China as labor mobility between Chinese provinces remains low.

17. Qian Sun, Wilson Tong, and Qiao Yu, "Determinants of Foreign Direct Investment across China," *Journal of International Money and Finance* 21 (2000): 79–113; Masahisa Fujita and Dapeng Hu, "Regional Disparity in China, 1985–1994: The Effects of Globalization and Economic Liberalization," *Annals of Regional Science* 35, no. 1 (2001): 3.

18. Dali Yang, "Patterns of China's Regional Development Strategy," *China Quarterly* no. 122 (June 1990): 230–57.

19. Chen, "Regional Determinants of Foreign Direct Investment in Mainland China."

20. A number of studies have found a relationship between wage or labor cost, and FDI. See, for example, Jagdish N. Bhagwati and T. N. Srinivasan, *Lectures on International Trade* (Cambridge: MIT Press, 1983); Coughlin et al., "State Characteristics and the Location of Foreign Direct Investment within the United States"; Wang and Swain, "Determinants of Foreign Direct Investment in Transforming Economies."

21. All of the models are estimated using the XTPCSE command in STATA 9.

22. Nathaniel Beck and Jonathan N. Katz, "What to Do (and Not to Do) with Time-Series Cross-Section Data," *American Political Science Review* 89, no. 3 (1995): 634–47.

23. Test results for each of these regions are available from the authors.

24. We divide the raw data by the number of reporting enterprises in each province so that the emission data reflects per-unit emission levels by province.

25. One potential criticism of using emission levels to measure regulatory stringency is that emission levels do not reflect efforts at enforcement. Consequently, we follow the lead of Javorcik and Wei (2004) and include actual observed percentage reduction in emissions of the above pollutants into the analysis. Javorcik and Wei argue that such measures can be viewed as "result-based, enforcement-effort-adjusted" measures of the "strength of the environmental standard in the countries." Javorcik and Wei, "Pollution Havens and Foreign Direct Investment," 1–32.

26. We include this variable to take into account the possibility that changes in emissions of the above pollutants may be due to changes in output.

27. Javorcik and Wei take a similar approach to measuring regulatory stringency with regard to the first specification, and Xing and Kolstad, "Do Lax Environmental Regulations Attract Foreign Investment?" do the same with the second.

28. As in our analysis of the pollution-haven hypothesis, we had to limit our analysis to the 1996–2004 period due to data availablity. In addition, as the *China Statistical Yearbook* only provides data for sulfur dioxide and industrial soot emission starting in 1996, our statistical analysis of these two variables is confined to the 1997–2004 period.

29. It should be noted that prior research (i.e., Xing and Kolstad, "Do Lax Environmental Regulations Attract Foreign Investment?") has demonstrated the use of pollution emissions as an effective proxy for environmental protection.

30. These results are available from the authors upon request.

31. Data on the annual exchange rate of the Chinese yuan against U.S. dollar is obtained from the *China Statistical Yearbook.*

32. *World Development Report 1992: Development and Environment* (New York: Oxford University Press for the World Bank, 1992); Nemat T. Shafik and Sushenjit Bandyopadhyay, "Economic Growth and Environmental Quality: Time Series and Cross-Country Evidence," World Bank Policy Research Working Paper, WPS 904, 1992; Selden and Song, "Environmental Quality and Development"; Grossman and Krueger, "Economic Growth and the Environment"; Shafik and Bandyopadhyay, "Economic Growth and Environmental Quality."

33. Grossman and Krueger, "Economic Growth and the Environment"; Shafik and Bandyopadhyay, "Economic Growth and Environmental Quality"; Copeland and Taylor, "Trade and Environment."

34. Energy Information Administration, "China: Environmental Issues, 2003." Available at http://www.eia.doe.gov/emeu/cabs/chinaenv.html (accessed May 15, 2006).

35. Hua Wang and Yanhong Jin, "Industrial Ownership and Environmental Performance: Evidence from China," *Environmental and Resource Economics* 36, no. 3 (2007): 255–73.

36. Herman L. Boschken, "Turbulent Transition and Organizational Change: Relating Policy Outcomes to Strategic Administrative Capacities," *Review of Policy Research* 7, no. 3 (1988): 477–99.

37. Klaus Hubacek, "The Role of Land in Economic Development: A Structural Approach Towards Sustainability" (PhD diss., Rensselaer Polytechnic Institute, 2000).

38. Clas Eriksson and Ficre Zehaie, "Population Density, Pollution, and Growth," *Environmental and Resource Economics* 30, no. 4 (2005): 465–84.

39. These results are available from the authors upon request.

40. Economy, *The River Runs Black,* 105–12.

41. The term *fragmented authoritarianism* refers to the greater responsiveness of China's bureaucratic agencies to their functional, "line" authorities than to the horizontal coordinating bodies at the various geographical levels. For a detailed discussion of this phenomenon, see, for example, Lieberthal, *Governing China.*

42. Economy, *The River Runs Black.*

43. Javorcik and Wei, "Pollution Havens and Foreign Direct Investment"; Eskeland and Harrison, "Moving to Greener Pastures?"

44. See, for example, Grossman and Krueger, "Environmental Impacts of a North American Free Trade Agreement"; Antweiler et al., "Is Free Trade Good for the Environment?"

45. Also see Antweiler et al., "Is Free Trade Good for the Environment?"

CHAPTER 5

1. Vogel, *Trading Up.*

2. Lofdahl, *Environmental Impacts of Globalization and Trade;* Matthew A. Cole, Robert J. R. Elliott, and Per G. Fredriksson, "Endogenous Pollution Havens: Does FDI Influence Environmental Regulations?" *Scandinavian Journal of Economics* 108, no. 1 (2006): 157–78.

3. Josh Ederington and Jenny Minier, "Is Environmental Policy a Secondary Trade Barrier? An Empirical Analysis," *Canadian Journal of Economics* 36, no. 1 (2003): 137–54.

4. For example, Vogel and Rugman document several examples of trade restrictions imposed under an environmental guise, with equal support from domestic industrial producers protecting their financial interests and environmentalists speaking for the adverse effects of minimal regulation. See David Vogel and Alan M. Rugman, "Environmentally Related Trade Disputes between the United States and Canada," *American Review of Canadian Studies* 27, no. 2 (1997): 271–92. For arguments about the "Baptist and Bootleggers" coalitions, see, for example, Vogel, *Trading Up,* 20; Bruce Yandle, "Bootleggers and Baptists: The Education of a Regulatory Economist," *Regulation* 7, no. 3 (1983): 12–16; and Jason F. Shogren, "The Optimal Subsidization of Baptists by Bootleggers," *Public Choice* 67, no. 2 (1990): 181–89.

5. On this point, see Ederington and Minier, "Is Environmental Policy a Secondary Trade Barrier?"

6. Alireza Naghavi, "Multilateral Environmental Agreements and Trade Obligations: A Theoretical Analysis of the Doha Proposal," CERI Working Paper on Energy, Environment, and the Economy no. 5, 2005.

7. Vogel, *Trading Up.*

8. Purba Rau and Diane Holt, "Do Green Supply Chains Lead to Competitiveness

and Economic Performance?" *International Journal of Operations and Production Management* 25, no. 9 (2005): 898–916.

9. See, for example, Robert D. Klassen and Curtis P. Mclaughlin, "The Impact of Environmental Management on Firm Performance," *Management Science* 42, no. 8 (1996): 1199–1214.

10. Rau and Holt, "Do Green Supply Chains Lead to Competitiveness and Economic Performance?"

11. Suzanne Berger, "Introduction," in *National Diversity and Global Capitalism,* ed. Suzanne Berger and Ronald Dore (Ithaca: Cornell University Press, 1996), 5.

12. Ibid., 1.

13. Robert O. Keohane and Helen V. Milner, eds., *Internationalization and Domestic Politics* (New York: Cambridge University Press, 1996).

14. For studies that emphasize the distinctiveness of the national political economy and corporate strategies, see, for example, Suzanne Berger and Ronald Dore, eds., *National Diversity and Global Capitalism* (Ithaca: Cornell University Press, 1996); Linda Weiss, *The Myth of the Powerless State: Governing the Economy in a Global Era* (Cambridge: Polity, 1998).

15. Geert Hofstede, *Culture's Consequences: International Differences in World-Related Values* (Beverly Hills, CA: Sage Publications, 1980).

16. Wendy L. Hansen and Neil J. Mitchell, "Globalization or National Capitalism: Large Firms, National Strategies, and Political Activities," *Business and Politics* 3, no. 1 (2001): 5–19.

17. Michael E. Porter, *The Competitive Advantage of Nations;* see also Peter A. Gourevitch and James Shinn, *Political Power and Corporate Control: The New Global Politics of Corporate Governance* (Princeton: Princeton University Press, 2007).

18. Louis W. Pauly and Simon Reich, "National Structures and Multinational Corporate Behavior: Enduring Differences in the Age of Globalization," 5.

19. See, for example, Stephen H. Hymer, *The International Operations of National Firms* (Cambridge: MIT Press, 1976).

20. Richard E. Caves, *Multinational Enterprise and Economic Analysis* (Cambridge: Cambridge University Press, 1996).

21. See, for example, Alexandre O. Vera-Cruz and Gabriela Dutrénit, "Spillovers from MNCs through Worker Mobility and Technological and Managerial Capabilities of SMEs in Mexico," *Innovation: Management, Policy, and Practice* 7, no. 2–3 (2005): 274–97.

22. Brian J. Aitken and Ann E. Harrison, "Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela," *American Economic Review* 89, no. 3 (1999): 605–18; Beata Smarzynska Javorcik, "Does Foreign Direct Investment Increase Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages," *American Economic Review* 94, no. 3 (2004): 606–27; Beata Smarzynska Javorcik and Marina Spatareanu, "Disentangling FDI Spillover Effects: What Do Firm Perceptions Tell Us?" in *Does Foreign Direct Investment Promote Development?* ed. Theodore H. Moran, Edward M. Graham, and Magnum Blomström (Washington, DC: Institute for International Economics, 2005), 45–72.

23. Magnus Blomstrom and Ari Kokko, "Multinational Corporations and Spillovers,"

Journal of Economic Surveys 12, no. 3 (1998): 247–77; Lee Branstetter, "Is Foreign Investment a Channel of Knowledge Spillovers? Evidence from Japan's FDI in the United States," *Journal of International Economics* 68, no. 2 (2006): 325–44; Jonathan E. Haskel, Sonia C. Pereira, and Matthew J. Slaughter, "Does Inward Foreign Direct Investment Boost the Productivity of Domestic Firms?" *Review of Economics and Statistics* 89, no. 3 (2007): 482–96; Wolfgang Keller and Stephen R. Yeaple, "Multinational Enterprises, International Trade, and Productivity Growth: Firm-level Evidence from the United States," *Review of Economics and Statistics* 91, no. 4 (2009): 821–31.

24. Ross, "China: Environmental Protection, Domestic Policy Trends, Patterns of Participation in Regimes and Compliance with International Norms," 823–26.

25. For example, China has 18,979 ISO registered companies at the end of 2006, making it the country with the second largest number of ISO adoptions in the world after Japan, which has 21,779 ISO registered companies as of the end of 2006. However, this by no means suggests that China is a regulatory leader, as normalized adoption rates among different countries vary widely. See "Worldwide Number of 14001," http://www.ecology.or.jp/isoworld/english/analy14k.htm (accessed October 19, 2010).

26. These data are available at the following Web site: http://eng.cnas.org.cn/index.htm1 (accessed December 29, 2008).

27. Data on exports and FDI by source country at the provincial level are taken from various provincial-level statistical yearbooks. These data are available at http://www.chinadataonline.org, a site maintained by the University of Michigan.

28. We experimented with using emission levels of soot, wastewater, and solid waste as alternative measures of pollution in a province. Since the use of these alternative measures of pollution does not affect our central findings, we only report models using SO_2 emission levels in this chapter.

29. Grossman and Krueger, "Economic Growth and the Environment."

30. Prakash and Potoski, "Investing Up."

31. Grossman and Krueger, "Economic Growth and the Environment."

32. Nathaniel Beck and Jonathan N. Katz, "Time-Series Cross-Section Issues," manuscript, 2004. Available at http://www.nyu.edu/gsas/dept/politics/faculty/beck/beckkatz.pdf (accessed March 25, 2010).

33. Chen, "Regional Determinants of Foreign Direct Investment in Mainland China."

34. Xing and Kolstad ("Do Lax Environmental Regulations Attract Foreign Investment?") take a similar approach.

35. H. Jeffrey Leonard, *Pollution and the Struggle for a World Product: Multinational Corporations, Environment, and International Comparative Advantage* (Cambridge: Cambridge University Press, 1988); Mani and Wheeler, "In Search of Pollution Havens?"; Adam Jaffe, Steven Peterson, Paul Portney, and Robert Stavins, "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?" *Journal of Economic Literature* 33, no. 1 (1995): 132–63.

36. Daly, "The Perils of Free Trade."

37. Andrew A. King and J. Myles Shaver, "Are Aliens Green? Assessing Foreign Establishments' Environmental Conduct in the U.S.," *Strategic Management Journal* 22, no. 11 (2001): 1069–85.

CHAPTER 6

1. See, for example, Rappaport and Flaherty, *Corporate Responses to Environmental Challenges.*

2. Morton Winston, "NGO Strategies for Promoting Corporate Social Responsibility," *Ethics and International Affairs* 16, no. 1 (2002): 71–87.

3. Tatiana Kostova and Srilata Zaheer, "Organizational Legitimacy under Conditions of Complexity: The Case of the Multinational Enterprise," *Academy of Management Review* 24, no. 1 (1999): 64–81.

4. Christmann and Taylor, "Globalization and the Environment," 444.

5. Glen Dowell, Stuart Hart, and Bernard Yeung, "Do Corporate Environmental Standards Create or Destroy Market Value?" *Management Science* 46, no. 8 (2000): 1059–74.

6. Rugman and Verbeke, "Corporate Strategy and International Environmental Policy," 819–33; Rugman, Kirton, and Soloway, *Environmental Regulations and Corporate Strategy.*

7. Matthew Kraatz, "Learning by Association? Interorganizational Networks and Adaptation to Environmental Change," *Academy of Management Journal* 41, no. 6 (1998): 621–43; Bing Zhang, Jun Bi, Zengwei Yuan, Junjie Ge, Beibei Liu, and Maoliang Bu, "Why Do Firms Engage in Environmental Management? An Empirical Study in China," *Journal of Cleaner Production* 16, no. 10 (2008): 1036–45.

8. The respective numbers of ISO 14001 adoptions for Japan, the United States, and Canada are 21779, 8,081, and 2,578. Data are available at http://www.ecology.or.jp/isoworld/english/analy14k.htm (accessed October 19, 2010).

9. These rankings are per capita, population standardized. Standardization calculations completed by the authors. For data, see http://www.ecology.or.jp/isoworld/english/analy14k.htm (accessed October 19, 2010).

10. Magali A. Delmas, "Barriers and Incentives to the Adoption of ISO 14001 by Firms in the United States," *Duke Environmental Law and Policy Forum* 11, no. 1 (2000): 1–38.

11. See, for example, Christmann and Taylor, "Globalization and the Environment."

12. The correlation between ISO 14001 adoption and EMS certification is 0.738, and the relationship is significant at the 0.05 level for a 2-tailed test; the correlation between ISO 14001 adoption and overall compliance success is 0.305, a relationship that is statistically significant at the 0.01 level for a 2-tailed test; and the relationship between EMS certification and overall compliance success is 0.438, and the correlation is statistically significant at the 0.05 level for a 2-tailed test.

13. See table 6.1 for the rating scale for these questions.

14. The rating scale for this question is the same as the one used for the *Multinational customer* variable. See table 6.1 for a detailed description.

15. Aseem Prakash, "A New-Institutionalist Perspective on ISO 14000 and Responsible Care," *Business Strategy and the Environment* 8, no. 6 (1999): 322–35.

16. Shiyang Li, "Environmental Treaties: Inconvenience or Opportunity?" http://www.globalenvision.org/library/1/1397 (accessed September 24, 2008).

17. Garcia-Johnson, *Exporting Environmentalism.*

CHAPTER 7

1. For a detailed discussion of the pulp and paper industry in newly industrializing countries in Southeast Asia, see, for example, David Sonnenfeld, "Contradictions of Ecological Modernization: Pulp and Paper Manufacturing in South-East Asia," *Environmental Politics* 9, no. 1 (2000): 235–56.

2. Paper is considered one of the four greatest inventions of ancient China. Many sources site Cai Lun as the inventor of paper in CE 105, the date it was first imperially recorded. However, recent archaeological evidence suggests that the actual date was probably 200 years prior. See http://ipst.gatech.edu/amp/collection/museum_invention_paper.htm (accessed August 3, 2008).

3. See, for example, Xin Ren, "Cleaner Production in China's Pulp and Paper Industry," *Journal of Cleaner Production* 6, no. 3–4 (1998): 349–55; Jintao Xu, "China's Paper Industry: Growth and Environmental Policy during Economic Reform," research report prepared for the Economy and Environment Program for Southeast Asia (2003); Wayne B. Gray and Ronald J. Shebegian, "Optimal Pollution Abatement—Whose Benefits Matter and How Much?" *Journal of Environmental Economics and Management* 47, no. 3 (2004): 510–34; Brian Stafford, "Environmental Aspects of China's Papermaking Fiber Supply," prepared for Forest Trends by Brian Stafford and Associates Pty Ltd. (2007).

4. These figures were reported by Li Xinmin, the vice-director of SEPA's pollution control department, and detailed by Xiaohua Sun, "New Tech Urged to Abate Paper Making Pollution," China Daily Online (2005). Available at http://www.chinadaily.com.cn/english/doc/2005-11/01/content_489390.htm (accessed August 2, 2008).

5. Chao Liang, "New Technology Combats Paper Mill Pollution," China Daily Online (2005). Available at http://www2.chinadaily.com.cn/english/doc/2005-07/27/content_463634.htm (accessed August 5, 2008).

6. For example, in May 2007, the Chinese government announced that it would close down thousands of small-capacity straw pulp mills, with a total production capacity of about 3 million tons a year, across the country. Chris Lang, "Pulp Mill Watch Fact Sheet Country Profiles: China," June 2007. http://www.pulpmillwatch.org/media/pdf/China_profile.pdf (accessed January 27, 2009).

7. State Forest Administration, *The Tenth Five-Year Plan for the Development of China's National Forest Industry,* Beijing, China (2002). Cited in Christopher Barr and Christian Cossalter, "China's Development of a Plantation-based Wood Pulp Industry: Government Policies, Financial Incentives, and Investment Trends," *International Forestry Review* 6, no. 3–4 (2004): 267–81.

8. Barr and Cossalter, "China's Development of a Plantation-based Wood Pulp Industry."

9. *China Statistical Yearbooks, 2002, 2006.*

10. http://en.app.com.cn/About%20APP.htm (accessed December 8, 2008).

11. In addition, Sinar Mas was a member of the Roundtable on Sustainable Palm Oil (RSPO), a voluntary industry initiative the key mission of which was to develop a certification system for the production of sustainable palm oil. However, due to charges that its members, including Sinar Mas, have been engaged in the continued destruction of rainforests and peatlands, the RSPO has been subjected to much criticism and has by

now become largely discredited. See "Sinar Mas: Sustainable Palm Oil Menace," Greenpeace briefing. http://www.greenpeace.org/raw/content/seasia/en/press/reports/sinar_mas_indonesian_palm_oil_menance.pdf (accessed January 23, 2009).

12. Christopher M. Barr, *Banking on Sustainability: Structural Adjustment and Forestry Reform in Post-Suharto Indonesia* (Washington, DC: WWF Macroeconomics Program Office, 2001).

13. John Aglionby, "Fishermen Driven to Illegal Logging As Pulp Factory Poisons River," *The Guardian,* June 26, 2001, 9; Paul Brown, Steven Morris, and John Aglionby, "Rainforests Hit By Paper Trail to UK," *The Guardian,* June 26, 2001, 1; Paul Brown and John Aglionby, "British Money Fuels Cycle of Debt and Destruction," *The Guardian,* June 26, 2001, 9; Steven Morris, "Offices, Schools, Hospitals at the End of Paper Trail from Diminishing Forests," *The Guardian,* June 26, 2001, 9.

14. Human Rights Watch, "Without Remedy: The Role and Responsibility of Arara Abadi, APP, and the Sinar Mas Group," available at http://www.hrw.org/en/node/12378/section/8 (accessed January 15, 2009).

15. "APP's Expansion in China," Greenpeace Briefing, 2004, available at http://www.greenpeace.org/raw/content/china/en/press/reports/app_expansion.pdf (accessed January 18, 2009).

16. Liu Bing, "APP's Illegal Logging in China," World Rainforest Movement Bulletin No. 98 (September 2005), http://www.wrm.org.uy/bulletin/98/China.html (accessed November 19, 2008).

17. The institute's Web site can be found at http://www.ipe.org.cn.

18. "Paper Tigers—APP's Polluting China Arm Seeks IPO," Greenpeace Report, 2005, available at http://www.greenpeace.org/china/en/news/app-paper-tiger (accessed November 17, 2008).

19. Ibid.

20. Justin Grant and Ritsuko Ando, "Staples Cuts Ties with APP on Environment Worry," Reuters, February 8, 2008. http://www.reuters.com/article/rbssConsumerGoodsAndRetailNews/idUSN0844455620080208 (accessed November 17, 2008).

21. "Supermarket Chain Withdraws Paper Goods after Forest Complaint," Deutsche Presse-Agentur, August 26, 2007.

22. Carrie LaFrenz, "Woolies Shareholders Asked to Pressure Firm to Cut Ties with APP," *Sydney Morning Herald,* June 5, 2008. http://news.smh.com.au/business/woolies-pressured-to-cut-ties-with-app-20080605-2m8c.html (accessed November 3, 2010).

23. Interview with APP-China, November 30, 2008.

24. Interview with a researcher affiliated with the Chinese Academy of Forestry, October 2008.

25. http://www.goldeastpaper.com/About_Us.htm (accessed November 19, 2008).

26. Unless otherwise noted, information presented in this and subsequent sections draws heavily on authors' interviews with APP-China and Gold East, September–November 2008.

27. Interview with APP-China, November 30, 2008.

28. "Environmental Revolution of the Paper Industry—APP's Development in China," *China Daily,* May 17, 2005.

29. Ibid.

30. Annie Zhu, "Green Promise—APP China Recently Hosted the 'Paper Contract with China,'" *PPI Magazine,* RISI, November 2008. www.risiinfo.com/technology archives/PPIMagNovember-Green-promise.html (accessed January 16, 2009).

31. "APP Issues Sustainable 'Paper Contract,'" *China Daily* online, June 22, 2008.

32. Examples of the specific commitments made by APP in the "Paper Contract with China" include the following: "a) APP will only establish plantations on government-approved lands and in compliance with the terms of the planning of the national forestry development; b) One-sixth of mature plantation will be harvested annually. After harvesting timber, APP China will replant all trees that were processed. Five-sixths of the plantations will continue to grow and mature, allowing for sustainable development; c) Consume no more than 10 tons of water per ton of paper produced, compared with China's standard at 20 tons; c) The COD (chemical oxygen demand) emission levels will not exceed 0.61 kg/ton of paper produced; d) Consume no more than 28 tons of water per ton of pulp produced, compared with China's standard at 80 tons; e) The COD emission levels will not exceed 2.16 kg/ton of pulp produced; and f) APP China will continue to deal with 100% of solid waste produced in a scientific and sustainable way during the pulp and paper making process." Zhu, "Green Promise."

33. Interview with Gold East Paper, October 20, 2008.

34. Interview with APP-China, October 27, 2008.

35. Ibid.

36. Zhu, "Green Promise."

37. Interview with Gold East Paper, October 22, 2008.

38. "Environmental Revolution of the Paper Industry—APP's Development in China," *China Daily,* May 17, 2005, S12.

39. Interview with APP-China, October 27, 2008.

40. Interview with Gold East Paper, October 20, 2008.

41. Ibid.

42. Interview with APP-China, October 27, 2008.

43. Ibid.

44. Ibid.

45. Ibid.

46. Interview with Gold East Paper, October 20, 2008.

47. Interview with APP-China, October 27, 2008.

48. "APP China Pushes Green Initiative in Making White Paper," *China Daily,* April 12, 2008. Available at http://www.chinadaily.com.cn/china/2008-04/12/content _6611838_3.htm (accessed November 17, 2008).

49. 2008 Gold East Paper Environmental Report, 7.

50. "Environmental Revolution of the Paper Industry."

51. Consistent data on precisely how many of these small mills were closed are not publicly available. An often-cited estimate of approximately 4,000 small straw- and reed-based mills has not been confirmed. It has been estimated that many of these mills continue to operate unofficially. Dequan He and Christopher Barr, "China's Pulp and Paper Sector: An Analysis of Supply-Demand and Medium Term Projections," *International Forestry Review* 6, no. 3–4 (2004): 254–66.

52. The elevated pollution intensity of these mills exists in part because they process

low-quality straw-based paper, which discharges almost ten times as much wastewater and COD per ton of output. Mills of this type are dispersed widely across China and found in rural locales where behavioral monitoring is presumably sparse. In contrast, the larger, more efficient, timber-based paper mills, producing higher-quality paper products, are predominantly located in coastal areas where access to timber imports is more readily available. Straw-based pulping was at one time widely encouraged by the Chinese government to stem forest harvest. Although the government now discourages the process because of its pollution intensity, selling waste vegetable matter for paper production remains a source of livelihood for many rural farmers. The farmers' alternative of burning the waste matter is also counterproductive as it increases air pollution and reduces income flow. This is further illustrative of the often-conflicting nature of rapid economic growth and environmental protection, a common dilemma for the Chinese government and its citizens. Cited in Ping Wang and Yonghong Liao, "Current Situation of Cleaner Production in Chinese Pulp and Paper Industry and Experience on Cleaner Production Audit," paper delivered at International Conference on Cleaner Production, Beijing, September 2001.

53. "Trees vs. People? PRC Natural Forest Protection." http://www.usembassy-china.org.cn/sandt/yunnan-forest-one.htm (accessed October 10, 2008).

54. Christopher Barr, "The Financial Collapse of Asia Pulp & Paper: Moral Hazard and Pressures on Forests in Indonesia and China," poster presented at "The Lessons from the Chinese Forest Policy Experience: An International Symposium," Dujiangyan, Sichuan, June 20–23, 2001.

55. Samuel Shen, "Fund's Bid for China Pulp Firm Collapses," *International Herald Tribune,* July 31, 2006, 12.

56. Christine Hill, "Asia Pulp & Paper's Fall from Grace," *Global Finance,* December 1, 1998. Available at http://findarticles.com/p/articles/mi_qa3715/is_199812/ai_n8819044/ (accessed July 22, 2009).

57. See, for example, "Asia Pulp & Paper Increases Investment in China Despite Illegal Logging Charges," Ethical Corporation Archive, November 19, 2004, http://www.ethicalcorp.com/content.asp?ContentID=3220 (accessed March 9, 2009); "Greenpeace Clashes with Asian Pulp and Paper over Another China Project," AFP, March 2005. Available at http://findarticles.com/p/articles/mi_kmafp/is_200503/ai_n14743052 (accessed March 9, 2009).

58. Interview with Brian Stafford, director of Brian Stafford and Associates Pty Ltd., September 2008.

CHAPTER 8

1. It should be noted that our approach differs from other studies of the impact of FDI on the environment in China. For example, Gallagher's qualitative case study of the influence of FDI in China focuses only on the automobile sector. A report released by the International Institute for Sustainable Development takes an ex ante approach to examine the impact of China's WTO accession on the environmental performance of six sectors. Kelly Sims Gallagher, *China Shifts Gears: Automakers, Oil, Pollution, and Development* (Boston: MIT Press, 2006); *An Environmental Impact Assessment of China's WTO*

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