10

Environmental Regulation Models

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10.1 Introduction

Developing countries have progressively become more involved in debates about the global ecological crisis and environmental regulation. Most have already been confronted with impressive levels of natural capital losses due to pollution and the overuse of natural resources. Given the direct and indirect impact of pollution on living conditions, developing country regulators have progressively implemented policies designed to mitigate such degradation. At the local scale, conflicting social choices have arisen since wealth accumulation increases various sources of pollution. On the one hand, a broad consensus generally exists about the necessity of rapid GDP growth, even though economic expansion creates imbalances impacting the most vulnerable part of the population. On the other hand, ecological degradation has reached such high levels that it can

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eventually become harmful for local populations. The burden imposed on certain social groups can reach such unbearable levels, especially in terms of health, that social conflicts may emerge, with collective action sometimes triggering new regulations that translate new compromises into rules and norms.

In what concerns global pollution, emerging countries show complex and contradictory features. On the one hand, their accelerating path of wealth accumulation has transformed some of them into high pollution emitters. This means they should, therefore, acknowledge their emergent responsibility in fighting such global ecological issues as climate change. On the other hand, most emerging countries claim that they are not the real source of the problem, pressing industrialized countries to assume the overwhelming part of the responsibility. An original game thus takes place in the international arenas and organizations that deal with this type of pollution. Emerging countries are urged to join the world coalitions to act against global ecological degradation. However, they seek to minimize their participation in the collective effort, arguing that they need to develop their economies first. At the same time, they try to use these negotiations as a leverage factor to enhance their position in the international community. Whatever the results of such a game, their integration in international institutions certainly improves their ability to implement new types of regulation. The mechanisms of international investment aid, as well as know-how from other countries, give them opportunities to experiment with original solutions, under the aegis of international organizations such as the World Bank. By becoming increasingly involved in international institutions and governance, they have increased their ability to implement effective environmental regulation.

The literature concerning economic emergence and environmental institutions is still very scarce, particularly in what concern macro-comparative analyses. Most of the empirical literature consists in measuring and discussing environmental governance at micro-level. These results, based on household surveys, are of little interest in trying to compare institutional systems. They cannot be used for the construction of those general features that would help to characterize the institutional processes through which emerging countries integrate (or not) the environmental

dimension in their policies. The aim of this chapter is to study the appropriation of environmental concerns, and its institutional translation, for a comprehensive set of developing, emerging and industrialized countries. Since our analysis is comparative, it is based on macro-institutional cross-country data. The next section reviews the literature about environmental regulation in developing countries. The sections that follow present our indicators and show the results of the principal component and cluster analysis. The ensuing models of environmental governance are finally described and discussed.

10.2 Environmental Governance Models and Economic Development: A Review

One of the main specificities of emerging economies is that most of them have started to build environmental institutions in reaction to environmental degradation, without necessarily having reached the development levels at which ecology becomes a social issue. Their first stage of economic growth has mainly been based on industrialization, with little concern for environmental performance. The rapid pace of economic development, especially when pulled by cost-competitiveness, has generally implied high levels of negative environmental externalities, which directly impacts on health. Quite prematurely, the initial social compromises, by which populations traded rapid growth and structural transformation for the external costs generated by increasing pollution, have since become obsolete. Regulators have, therefore, been urged to design and implement more environmentally concerned policies that could durably modify the curve of polluting emissions (Munasinghe 1995). By essentially focusing on local pollution, emerging countries have introduced new institutions, regulations and norms aimed at reducing the undesirable effects of economic takeoff.

Although the research community has paid increasing attention to emerging economies' environmental concerns, there has, so far, been no comparative study of the macro-models of environmental governance that explicitly include these countries. The related literature can, in fact, be divided into three different strands: (i) macro-level analyses of the

relationship between economic development and various environmental issues, (ii) macro- and micro-level analyses of the relationship between overall regulation and environmental governance, and (iii) micro-level analyses of community-based ecosystem management institutional building.

The first strand of the literature is generally based on the assumption that the combined dynamics of economic development and the natural environment is not unidirectional. In the early 1990s (World Bank 1992), empirical studies showed the existence of an inverted-U relationship between the levels of GDP per capita and polluting emissions. These results suggested that the intensity of the ecological footprint depends on the stage of economic development (Borghesi 1999). In the less developed countries (LCDs), ecosystem degradation is generally limited to the consequences of some basic, mainly agrarian, activities. For instance, deforestation can be provoked by the spatial expansion of agricultural activities or by biomass combustion for heating habitations.

In consequence, polluting emissions have remained low in most non-industrialized developing countries. As a country develops, however, industrial sectors grow, and ecological degradation gradually multiplies and expands. Furthermore, two additional features exacerbate this phenomenon. First, although productive and domestic equipment is not efficient, priority is given to the accumulation of wealth and assets by households, whatever the adverse effects on the natural and social environment. Second, at a more aggregate level, rapid GDP growth acceleration exerts increasing pressure on those local infrastructures and institutions that are not able to control the social and environmental consequences. This literature suggests, however, the existence of an individual wealth threshold beyond which the relation inverts. Empirical findings show that the value of this threshold is close to the current income level of emerging countries (Stern 2004). Once a certain level of per capita GDP has been reached, it seems, therefore, easier to offset the tradeoff between economic growth and the preservation of ecosystems.

The explanations proposed for the U-shaped relationship are based on various features, which, we argue, are common to many emerging countries. First, as citizens become richer, they may become more concerned by the state of their immediate environment. Second, as industries develop, firms are affected by more intense competition. They thus seek

more efficient production processes via innovations, and consequently invest in upgraded, less polluting, equipment. Third, the composition effect, by which the GDP share of industry declines to the benefit of the service sector, allows the pollution that ensues from the accumulation of wealth to decline. The literature on the so-called "environmental Kuznets curve" (EKC) is interesting for our present purpose in two respects. On the one hand, the environmental Kuznets curve's tipping point concerns those emerging countries that have already taken off, but which remain as technological laggards. On the other hand, institution building plays a key role in the reversal of environment sensitivity to economic growth. The modification of citizens' behaviour concerning their environment may be endogenous to the creation of institutions dedicated to the preservation of urban and natural ecosystems.

This hypothesis of an inverted-U curve has been criticized, with the main critics pointing to its incapacity to explain the nature of the relations between economic development and the path of environmental degradations (Llorca and Meunié 2008). That hypothesis offers, nevertheless, interesting insights for categorizing environmental governance models. First, the EKC literature outlines the role of emerging countries in the ongoing globalized environmental path. Focaci (2005) shows, for example, that the economic growth-environmental degradation trends observed in Brazil, China and India differ from those recorded for industrialized countries. The author also insists on the innovative nature of their institutions regulating environmental issues. The paper outlines the original process by which regulators strive to reduce the ecological cost of their development strategies. Second, the EKC literature provides empirical tools to analyse the environmental trajectories of emerging countries. Robust statistical methods, which pave the way for more extensive comparative studies, have gradually developed. The decomposition approach is particularly helpful in disentangling the contributions of the various determinants (population, technology, wealth) to the changing dynamics of the growth–environment relationship. However, since the EKC literature has essentially compared environmental trajectories by focusing on performance variables (mainly polluting emissions) rather than on institutional ones, they fail to characterize and really compare the different forms of national environmental governance.

A second strand of the literature has addressed the natural resource curse, that is, the cumulative process of natural resource over-exploitation by developing countries whose economy ultimately relies on the rents drawn from exporting natural resources (Auty 1993; Robinson et al. 2006; Mehlum et al. 2006). Overall institutional quality seems to affect the way such extractive (oil, minerals) or renewable (lumber, fish) natural resources are used. Aidt (2010) finds a very robust negative correlation between a wide range of different corruption indices and growth in genuine wealth per capita, which he explains by the fact that rampant corruption can "put an economy on an unsustainable path along which its capital base is being eroded". Equally, Damania et al. (2003) have shown that corruption also tends to reduce environmental rules stringency, notably via its influence on liberalization policies when the traded sectors are pollution-intensive. Hence, the overall institutional quality certainly affects the nature and extent of the environmental regulations set up by developing countries.

The third strand of the literature dealing with environmental issues in emerging countries explores environmental governance, defined as "the establishment, reaffirmation or change of institutions to resolve conflicts over environmental resources" (Paavola 2007). Empirical works mainly implement micro-level studies of community-based environmental regulations. This literature essentially focuses on the design of local institutions governing the collective and individual use of common pool resources. It concludes on the (observed) superiority of local over centralized rules to manage common pool resources, in terms of both individual incentives and outcomes (Ostrom 1990). Environmental institutions are analyzed as tools through which agents cooperate locally to reach common resource-use objectives. By securing the outcomes of such collective action processes, local institutions appear to be the most effective governance device to manage common-pooled natural resources (Vatn 2009). Although these analyses are mainly based on microeconomic studies, with their results being consequently highly context-dependent and weakly comparable on a cross-national basis (Anderies 2011), they can, nonetheless, be useful for our purpose insofar as they inform about the patterns of creation and enforcement of environmental institutions in developing economies. First, these coalitions organize modes of multilevel environmental governance (Bache and Flinders 2004) that operate both at centralized and local level. These features are addressed

in our work. Second, emerging countries are all characterized by huge overall patterns of socioeconomic and technical change. Social models are deeply modified under the combined influence of a (much larger than before) middle class emergence, the greater role of foreign firms and the diffusion of new cultural references. The consequences of such changes for natural ecosystems are twofold. On the one hand, ecological degradation sprawls and deepens, with the intensity and frequency of conflicts over ecological resources worsening. On the other hand, environmental conflicts involve an increasing number of heterogeneous actors. Because environmental issues are fundamentally collective, environmental regulations imply the creation of coalitions to influence social compromises about the way natural capital is used or wasted, as a production resource (Safarzyńska and van den Bergh 2010).[1] Since environmental regulation is a recent phenomenon, even for developing countries, it is likely that each developing or emerging country will find its own innovative way of dealing with the specific form of environmental issue it faces.

There is a growing need to characterize environmental governance models, at a sufficiently aggregate level, so that they can be compared internationally. That is what we propose to do in this chapter.

10.3 Assessing Models of Environmental Governance

Environmental concerns are recent, and developing countries' public authorities have tended to build their ecological governance schemes mainly by experimenting with hybrid systems. Since our methodological focus was placed on institutional systems, we chose to limit our data on *environmental performance* and to introduce only institutional variables in our dataset. Although the data on environmental institutions in developing and emerging countries is extremely scarce, we were able, nonetheless, to extract five particularly relevant variables from the Environmental Sustainability Index (ESI Report 2005) in order to com-

[1] Recent trends of research try to combine ecological economics and political ecology to highlight the influence of social conflicts on environmental governance (see the special issue of Ecological Economics under the direction of Martinez-Alier 2010).

pare national types of ecological governance. Three of these variables assess complementary dimensions of the institutional system. WEFGOV synthesizes the environmental part of the World Economic Forum survey (WEF). The authors of the ESI database implement a principal component analysis (PCA), with each country receiving a score that reflects the effectiveness of *local* environmental institutions. ISO14 corresponds to the number of firms with ISO 14001 certification per billion dollars of GDP (in purchasing power parity). This variable is used as a proxy of private sector involvement in ecological regulations. The code EIONUM stands for the number of memberships in environmental intergovernmental organizations. It reflects the involvement of the nation in global regulation. Two additional variables were then introduced to enhance the description. CSDMIS measures the percentage of variables missing from the CGSDI "Rio to Johannesburg Dashboard", which is interpreted here as an indication of the opacity of public authorities in the environmental domain. PRAREA corresponds to the percentage of total land area under protected status and is interpreted as an estimation of the efforts made for biodiversity preservation.

We have reduced the initial sample of 154 countries by eliminating those for which less than 50% of variables were known, and controlled for the representativeness of the remaining sample. In the overall analysis, corresponding mean values have been used to cancel out the likely influence of the remaining missing observations. Data sources, data summary statistics and simple correlations between considered variables are reported in Tables 10.5 and 10.6 of the Appendix to this chapter.

10.4 Models of Environmental Governance

This chapter presents a two-stage empirical analysis based on multidimensional statistical methods. The first stage aims at creating a set of uncorrelated factors, called principal components, in order to replace an original set of multidimensional quantitative variables by new variables that are linear combinations of the initial variables, with these components explaining most of the variance in the original dataset. In a second stage, we draw models of environmental governance from cluster analysis.

10.4.1 The Main Patterns of Environmental Governance Differentiation

We now proceed to the PCA of our five selected active variables. Three categorical variables describing the geographical localization, HDI level and socioeconomic situation of each country have been used to characterize our models.[2] Table 10.1 shows PCA eigenvalues and active and supplementary variables correlations with each factor. Figures 10.1 and 10.2 respectively show the projection of active variables on the first factorial plan the projection of the active individuals on the same plan.

The number of components to be retained depends on (i) the proportion of total variance explained by each component, (ii) the absolute variance explained by each component (the eigenvalue of each component retained should exceed one, and (iii) the capacity of each component to be interpreted meaningfully. By examining the results of the PCA, we can extract two principal components, accounting for approximately 71% of the total variance.

The first component explains more than half of the total variance, highlighting a clear dichotomy. All variables of "good environmental governance" are concentrated on the right-hand side. This could reveal

Table 10.1 PCA Eigenvalues and active variable-axes correlations

	PC1	PC2	PC3	PC4	PC5
Eigenvalues	2.5625	0.9931	0.7587	0.3485	0.3372
% of variance	51.25	19.86	15.17	6.97	6.74
Cumulative %	51.25	71.11	86.29	93.26	100
Environmental opacity	−0.82	−0.07	−0.35	0.04	0.44
Regulation effectiveness	0.85	−0.08	−0.24	−0.44	0.16
Private sector involvement	0.69	−0.31	−0.57	0.31	−0.07
Global cooperation	0.80	0.01	0.45	0.22	0.34
Biodiversity focus	0.23	0.94	−0.24	0.07	0.02

Data sources: Author's calculations on data collected from WEF survey, FEA (Germany), UIA, CGSDI, and UNEP; for details, see Table 10.5

[2] Note that these variables do not affect the construction of principal factors. In order to back up PCA results, twenty-five bootstrap replications of the initial sample were implemented in order to provide confidence intervals for the projected variables coordinates. This bootstrap procedure shows that the position of active variables on the first factorial plan is stable, thus confirming the robustness of our PCA results.

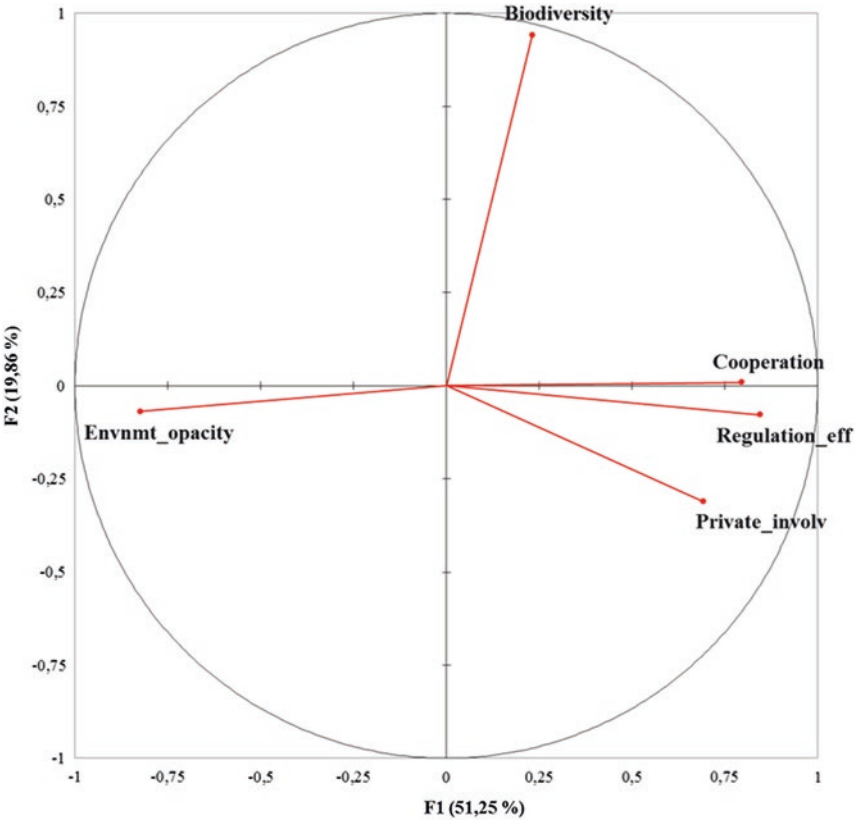

Fig. 10.1 Projection of active variables on the first factorial plan. Data source: Author's calculations; see Table 10.5 for details

a cumulative process in which the effectiveness of local institutions, private sector involvement and participation in international coalitions all self-reinforce. As a consequence, the lack of transparency may be a symptom of a weakness of the institutional architecture, possibly due to a lack of ecological awareness. The individual country projection reported in Fig. 10.1 shows a clear opposition, along the first component, between countries endowed with complete and efficient environmental regulation systems, and countries with ineffective or absent structures. When compared with the rest of the world, rich countries stand out as exhibiting significantly higher institutional consistency and efficiency.

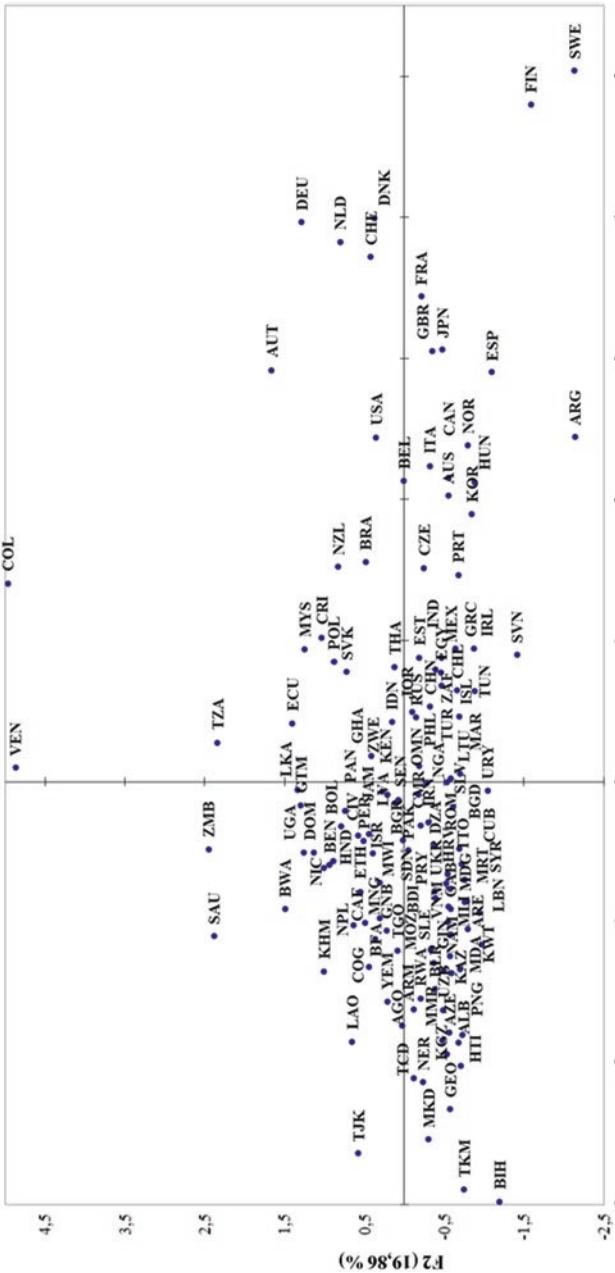

Fig. 10.2 Projection of active individuals on the first factorial plan. Data sources: Author's calculations

The second component explains one fifth of the total sample inertia. The absence of correlation with the other four variables shows that there is no prerequisite (such as the effectiveness of an existing set of environmental institutions) to implement biodiversity "hot spots" regulations (Myers et al. 2000). This result highlights the singularity of national policies explicitly geared towards biodiversity preservation. First, we should note that the creation of a protected area (PA) does not imply high levels of law effectiveness. The specificity of ecosystem preservation, which often consists in involving local populations in the conservation scheme, allows governments or local authorities to enact policies even when the other environmental sectors remain poorly regulated (Oliveira 2002). The ability of regulators to promulgate PAs also depends on the natural potential of their country. If a country possesses remarkable landscapes or big biodiversity reserves, the preservation objective can be more easily promoted and enforced. Moreover, the classical conflict between economic development and environmental protection is generally less critical for PA implementation. One possible explanation is to be found in the growing role of tourism (Sims 2010), which provides local populations with long-term additional financial resources.

It is worth noticing that the international community has launched strategic programmes in support of biodiversity preservation schemes, with many national experiments having received international financial support. This fact may also explain the absence of correlation between the PRAREA variable and the other four variables. International efforts to preserve the remaining zones of special interest for biodiversity act as an exogenous influence, irrespective of the effectiveness of institutional systems.

10.4.2 The Three Environmental Governance Models

On the basis of the information provided by the PCA, we carried out a mixed classification procedure in order to establish homogeneous and meaningful clusters of countries regarding environmental governance. The mixed classification procedure consists of a hierarchical cluster analysis and a consolidation of the relevant partition[3] through k-means-

[3] The so-called relevant partition, i.e., the relevant number of clusters, is derived from the analysis of the dendrogram and the analysis of two indicators that respectively measure (i) the improvement

like iterations. As such a procedure assigns each individual to one or the other of the identified clusters, we decided to create a supplementary cluster (the idiosyncratic cluster) in order to account for countries whose position is not clear-cut. This cluster brings together countries whose position in the initial multidimensional scatter of points is close to the barycentre.[4]

The cluster membership reported in Table 10.2. Table 10.3 shows the comparative means of each active and supplementary variable by clusters and permits a thorough examination of clusters. Table 10.4 presents the frequencies of informative variables concerning the type of country (industrialized, emerging, developing or less developed), the geographical area and the HDI category (low to very high). Table 10.4 lists the countries belonging to each cluster and Fig. 10.3 maps them in a world atlas.

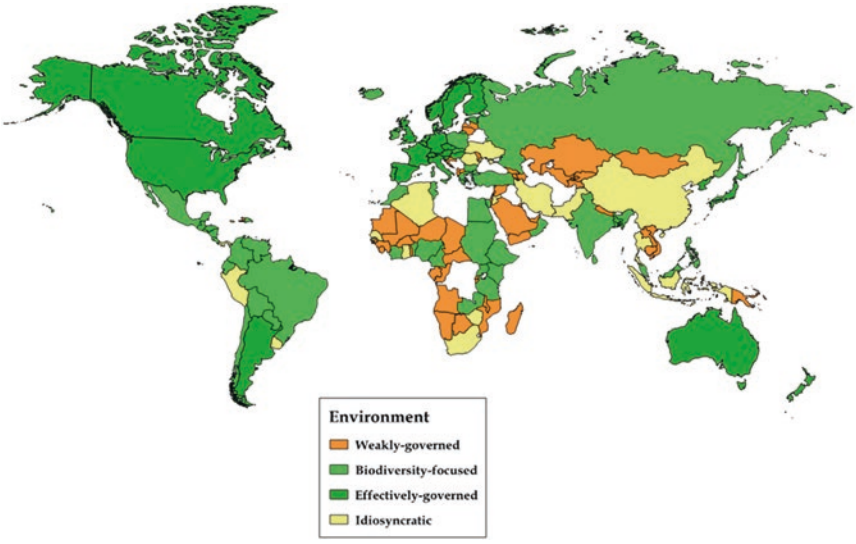

Fig. 10.3 World map of the environmental governance models

of the inter- to intra-cluster variance ratio from a given partition to another and (ii) the impact of k-means consolidation on that ratio.

[4] More specifically, the standardized Euclidian distance between these countries and the barycentre is below half the median distance.

Table 10.2 Classification of countries in the different clusters

Cluster 1: *Weakly governed*				
Albania	Angola	Armenia	Azerbaijan	Belarus
Bosnia and Herzegovina	Botswana	Burkina Faso	Burundi	Cambodia
Central African Republic	Chad	Congo, Rep.	**Croatia**	Cuba
Gabon	Georgia	Guinea-Bissau	Guinea	Haiti
Israel	Kazakhstan	Kuwait	Kyrgyz Republic	Lao PDR
Latvia	Lebanon	Lithuania	Macedonia, FYR	Madagascar
Malawi	Mali	Mauritania	Moldova	Mongolia
Mozambique	Myanmar	Namibia	Nepal	Niger
Papua New Guinea	Rwanda	**Saudi Arabia**	Sierra Leone	Syrian Arab Republic
	Togo	Turkmenistan	United Arab Emirates	Uzbekistan
	Yemen, Rep.	Tajikistan	Vietnam	
Cluster 2: *Biodiversity-focused*				
Bangladesh	Benin	**Bolivia**	**Brazil**	**Bulgaria**
Cameroon	**Chile**	**Colombia**	Costa Rica	**Cote d'Ivoire**
Dominican Republic	**Ecuador**	**Egypt, Arab Rep.**	**El Salvador**	Ethiopia
Greece	Guatemala	Honduras	Iceland	**India**
Ireland	Kenya	**Malaysia**	**Mexico**	**Morocco**
Nicaragua	**Nigeria**	Oman	Paraguay	**Philippines**
Poland	**Russian Federation**	Slovak Republic	**Sri Lanka**	Sudan
Tanzania	**Tunisia**	**Turkey**	Uganda	**Venezuela, RB**
Cluster 3: *Effectively governed*				

Argentina	Australia	Austria	Belgium	Canada
Czech Republic	Denmark	Estonia	Finland	France
Germany	**Hungary**	Italy	Japan	**Korea, Rep.**
Netherlands	New Zealand	Norway	Portugal	**Slovenia**
Spain	Sweden	Switzerland	United Kingdom	United States
Cluster 4: *Idiosyncratic*				
Algeria	**China**	Ghana	**Indonesia**	**Iran, Islamic Rep.**
Jamaica	**Jordan**	**Pakistan**	Panama	**Peru**
Romania	Senegal	**South Africa**	**Thailand**	Trinidad and Tobago
Uruguay	Ukraine	**Zimbabwe**		

Note: Bold characters denote emerging countries, in the sense that they have been considered as such by at least one of the following institutions: Boston Consulting Group, BNP Paribas, IMF or Standard and Poor's

Table 10.3 Compared means of active, supplementary and informative variables by cluster

	Weakly governed	*Biodiversity-focused*	*Effectively governed*	*Idiosyncratic*	All
Environmental opacity	**33.67** ***(6.95)***	**19.88** ***(5.58)***	**11.57** ***(7.23)***	20.07 *(3.31)*	23.29 *(10.44)*
Regulation effectiveness	**29.15** ***(5.99)***	32.79 *(7.63)*	**50.48** ***(7.05)***	32.83 *(4.47)*	34.66 *(10.09)*
Private sector involvement	**0.189** ***(0.43)***	**0.306** ***(0.38)***	**3.52** ***(2.67)***	0.45 *(0.48)*	0.88 *(1.75)*
Global cooperation	**5.71** ***(3.43)***	**12.15** ***(3.89)***	**16.76** ***(6.19)***	10.28 *(1.71)*	10.29 *(5.74)*
Biodiversity focus	**8.75** ***(8.32)***	**17.01** ***(16.57)***	14.47 *(9.26)*	9.89 *(5.63)*	12.50 *(11.87)*
GDP per capita (constant 2005 $ – PPP)	**6297** ***(9806)***	**7896** ***(8643)***	**29,081** ***(8145)***	6342 *(4366)*	11,043 *(12,164)*
HDI	**0.518** ***(0.177)***	0.595 *(0.156)*	**0.854** ***(0.043)***	0.599 *(0.150)*	0.615 *(0.191)*
Gini index	38.54 *(6.97)*	**44.37** ***(8.95)***	**31.70** ***(4.77)***	42.25 *(9.60)*	40.33 *(8.99)*

Note: The values that significantly differ (5% level) from those of other clusters (independent samples *t*-test) are in bold

Data sources: Author's calculations on data collected from WEF survey, FEA (Germany), UIA, CGSDI, and UNEP; for details, see Table 10.5

In the first cluster, called *weakly governed*, all the mean differences are significant. The cluster average values are lower for all the indicators of institutional effectiveness, while the opacity indicator has a higher value than for the other groups. Countries in this first cluster therefore failed to organize any structured and controlled relationship with their ecosystem. Unsurprisingly, most of these nations correspond to poor countries whose livelihood relies heavily on those extensive agricultural activities which would be most impacted by more stringent ecological regulations. For instance, more forest protection may prevent slash-and-burn cultivation, and consequently trigger social conflicts in poor developing countries (Geist and Lambin 2002). Actually, the lack of well-designed ecological institutions goes hand in hand with the global

Table 10.4 Compared frequencies of informative variables by cluster

	Weakly governed	*Biodiversity-focused*	*Effectively governed*	*Idiosyncratic*	All
OECD	1.9	7.3	76	0	16.9
East Asia and Pacific	11.5	4.9	4.0	16.7	8.8
Eastern Europe and Central Asia	30.8	12.2	16.0	11.1	19.9
Latin America and the Caribbean	3.8	34.1	4.0	27.8	16.2
Middle East and North Africa	11.5	9.8	0	16.7	9.6
Sub-Saharan Africa	38.5	24.4	0	22.2	25.0
South Asia	1.9	7.3	0	5.6	3.7
Total	*100*	*100*	*100*	*100*	*100*
Low HDI	48.0	27.5	0	22.2	29.3
Middle HDI	26.0	40.0	0	38.9	27.1
High HDI	22.0	22.5	8.0	38.9	21.8
Very high HDI	4.0	10.0	92.0	0	21.8
Total	*100*	*100*	*100*	*100*	*100*
Industrialized countries	28.8	9.8	80.0	5.6	29.4
Emerging countries[a]	5.8	56.1	20.0	61.1	30.9
Developing countries	23.1	19.5	0	27.8	18.4
Less developed countries	42.3	14.6	0	5.6	21.3
Total	*100*	*100*	*100*	*100*	*100*

[a]Emerging countries are those that have been considered as such by at least one of the following institutions: Boston Consulting Group, BNP Paribas, IMF or Standard and Poor's

Data sources: Author's calculations

lack of an institutional framework, and the ensuing weak enforcement of socioeconomic regulation. *Weakly governed* countries (poor and some former socialist countries) exhibit significantly weak overall environmental regulation.

It is worth underlining that 28.8% of the *weakly governed* cluster countries are ex-USSR former Socialist economies that have inherited both extraction-based growth regimes and highly polluting and obsolete industries from the former Socialist era (Ichikawa et al. 2002). They all embarked, in the 1990s, upon transition strategies that accelerated the destruction of the state's capacity to set up and enforce any efficient environmental regulation. As they were not bound by institutional constraints, short-term-focused economic agents have significantly endangered ecosystems. This explains the limited involvement of the private sector in the environmental regulation that is observed for this cluster. Moreover, since poor and ex-USSR countries are absent from international community arenas, they have not extensively benefited from international support to build efficient regulative systems.

The second cluster (*biodiversity-focused*) is particularly interesting for our purposes, since it is mostly composed of emerging countries (56.1%). As shown in Table 10.3, this group exhibits two strong characteristics. The *biodiversity-focused* type includes both developed and poorer countries, which, because they are endowed with exceptional local environmental resources, have been driven to adopt "hot spot" preservation policies. These policies appear to be generally effective, irrespective of a country's particular local institutional performance and overall level of development. These countries are characterized by strong involvement in biodiversity preservation and international negotiations.

The emerging responsibility for global ecological stakes (such as greenhouse gas emissions, fossil energy consumption) of these countries should have prompted them to effectively establish more stringent environmental regulations. Unfortunately, however, they have kept on performing badly in terms of environmental regulation. As a consequence, their growing involvement in international agreements has been interpreted, at least for the biggest emerging countries, as a means of reinforcing their emerging diplomatic power (Papa and Gleason 2012). This seems to be the case for China in the domain of green technologies. In fact, it is not clear whether that trend of growing

international involvement will really help public authorities, or provide them with additional incentives, to implement effective internal policies. Even though pollution is on the increase and ecological constraints become more severe with greater wealth accumulation, economic growth and poverty alleviation remain the top priority of most developing countries' governments (Andresen 2007). In our empirical results, the indicator for environmental regulation effectiveness is not statistically significant. The countries of this cluster also fail to involve their private sector, perhaps because of their international strategies. Very often, their specialization in world trade is based on their comparatively low costs. In the environmental sector, this strategy prompts low-cost firms to let environment-related external costs remain uncontrolled. The countries of the *biodiversity-focused* cluster, just like those of the *weak governance* model, are characterized by weak environmental governance and a particularly low degree of private sector involvement in ecological awareness and protection. At the same time, however, this group is more involved in international regulation than the *weakly governed* countries, which indicates the emerging global political responsibility of its members.

The third cluster is clearly the group of the more environmentally friendly systems. Not surprisingly, almost all rich and industrialized countries belong to this cluster. Argentina is the only non-European emerging economy to be found in this group. The *effectively governed* type is mainly composed of OECD countries which have developed complete schemes of environment protection and preservation, and whose private and public actors are deeply involved in global regulation.

10.5 Conclusion

Environmental regulation is an institutional domain that is conspicuously absent from studies of capitalism, whether they refer to developed or developing countries. In the environmental sphere, emerging countries seem to be characterized by a complex and contradictory dynamic.

They follow two potentially conflicting objectives: economic development and environmental protection. Although several leading developed and developing countries have resisted attempts to enforce global environmental regulation, many developing countries have already started to incorporate this environmental dimension, notably by establishing national preservation schemes.

Despite the limited availability of relevant data, certain interesting results have come to the fore in this study in what concerns emerging economies. Four main lines of national environmental governance differentiation can be observed in our sample of countries: (i) the effectiveness of the local institutions governing natural resources, (ii) the degree of private sector involvement, (iii) the extent of the country's participation in international coalitions and (iv) the biodiversity protection intensity. Whereas the first three features are mutually reinforcing and correlated to income per capita, the fourth would seem to be independent of all three. This feature is, moreover, particularly relevant in describing emerging middle-income countries' environmental governance. These four models of environmental governance have been identified as *biodiversity-focused*, *weakly governed*, *effectively governed* and *idiosyncratic*.

Appendix

Table 10.5 List of the variables used

Code	Label	Source
WEFGOV	Regulation effectiveness	WEF survey
ISO14	Private sector involvement	Federal Environment Agency, Germany
EIONUM	Global cooperation	Union of International Associations
CSDMIS	Environment opacity	Consultative Group on Sustainable Development Indicators
PRAREA	Biodiversity focus	United Nations Environment Program

Table 10.6 Data summary statistics—mean value (standard deviation)

Variables	All	OECD	East Asia and Pacific	Europe and Central Asia	Latin America and the Caribbean	Middle East and North Africa	Sub-Saharan Africa	South Asia
CSDMIS	23.29 *(10.43)*	11.63 *(6.67)*	23.91 *(10.33)*	28.18 *(12.67)*	21.05 *(5.47)*	28.10 *(9.78)*	28.19 *(6.29)*	18.26 *(3.64)*
WEFGOV	34.66 *(10.09)*	51.69 *(6.34)*	33.13 *(6.10)*	33.17 *(7.27)*	30.21 *(6.72)*	34.82 *(6.82)*	28.40 *(5.18)*	29.73 *(2.69)*
ISO14	0.88 *(1.75)*	2.61 *(2.47)*	0.61 *(0.73)*	1.06 *(1.69)*	0.72 *(2.10)*	0.38 *(0.48)*	0.07 *(0.14)*	0.11 *(0.09)*
EIONUM	10.29 *(5.74)*	17.44 *(5.81)*	8.42 *(4.60)*	4.96 *(3.54)*	11.73 *(3.17)*	10.23 *(4.25)*	9.50 *(4.15)*	9.80 *(5.07)*
PRAREA	12.50 *(11.87)*	14.28 *(9.96)*	12.14 *(8.87)*	8.37 *(6.59)*	18.37 *(19.47)*	7.69 *(11.33)*	12.69 *(9.96)*	11.90 *(10.41)*

Variables	All	Low HDI	Middle HDI	High HDI	Very high HDI
CSDMIS	23.29 *(10.43)*	28.07 *(6.36)*	23.60 *(8.86)*	25.62 *(10.85)*	13.79 *(10.19)*
WEFGOV	34.66 *(10.09)*	27.08 *(4.35)*	30.95 *(5.83)*	33.92 *(5.81)*	50.13 *(6.47)*
ISO14	0.88 *(1.75)*	0.04 *(0.09)*	0.26 *(0.35)*	0.88 *(1.88)*	2.82 *(2.34)*
EIONUM	10.29 *(5.74)*	8.69 *(4.17)*	8.94 *(4.70)*	8.93 *(5.10)*	15.17 *(6.86)*
PRAREA	12.50 *(11.87)*	12.19 *(9.66)*	13.38 *(16.45)*	11.09 *(10.41)*	14.09 *(9.32)*

Variables	All	Industrialized countries	Emerging countries[a]	Developing countries	Less developed countries
CSDMIS	23.29 *(10.43)*	20.87 *(13.77)*	19.51 *(7.36)*	27.62 *(7.79)*	29.22 *(6.25)*
WEFGOV	34.66 *(10.09)*	42.91 *(12.24)*	34.50 *(6.53)*	30.89 *(5.22)*	26.74 *(4.62)*
ISO14	0.88 *(1.75)*	1.79 *(2.29)*	1.04 *(1.88)*	0.22 *(0.41)*	0.04 *(0.10)*
EIONUM	10.29 *(5.74)*	11.33 *(8.51)*	11.71 *(3.89)*	9.44 *(3.37)*	7.52 *(3.60)*
PRAREA	12.50 *(11.87)*	11.25 *(9.20)*	14.50 *(15.70)*	11.65 *(9.44)*	12.02 *(10.61)*

[a]Emerging countries are those that have been considered as such by at least one of the following institutions: Boston Consulting Group, BNP Paribas, IMF or Standard and Poor's

Data sources: Author's calculations on data collected from WEF survey, FEA (Germany), UIA, CGSDI, and UNEP; for details, see Table 10.5

Table 10.7 Simple correlations between WCI variables

Variables	CSDMIS	WEFGOV	ISO14	EIONUM	PRAREA
CSDMIS	**1**	**−0.557**	**−0.371**	**−0.658**	−0.162
WEFGOV	**−0.557**	**1**	**0.595**	**0.521**	0.152
ISO14	**−0.371**	**0.595**	**1**	**0.338**	0.022
EIONUM	**−0.658**	**0.521**	**0.338**	**1**	0.107
PRAREA	−0.162	0.152	0.022	0.107	1

Note: Bold characters denote a significant correlation at the 5% level
Data sources: Author's calculations on data collected from WEF survey, FEA (Germany), UIA, CGSDI, and UNEP; for details see Table 10.5

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