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Environmental Policy
Convergence**

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The CGG Preprint Series contains manuscripts by members of the Centre for Globalisation and Governance that will subsequently appear in professional journals and books. The documents are intended for limited dissemination.

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Foreword

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Research at the CGG emphasises social, political, cultural and economic dimensions of globalisation, and explores whether the process of globalisation has outgrown the governance structures of the international system of states and undermined the authority of the nation-state, leading to new global and multilevel governance structures. Globalisation and governance are thus not looked at in isolation; instead, we specifically address the ways in which the two phenomena interact and impact on each other.

Research is undertaken within five broad research areas:

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The Impact of International Institutions and Trade on Environmental Policy Convergence

Katharina Holzinger, Christoph Knill and Thomas Sommerer

Abstract

In recent years, there is a growing interest in the study of cross-national policy convergence, which is closely related to research on the domestic impact of globalisation. Yet we still have a limited understanding of the phenomenon of policy convergence. Does the strong growth of economic and institutional interlinkages between nation states lead to increasingly similar policies across countries? Under which conditions can we expect that domestic policies converge or rather develop further apart? In this article, we address this research deficit. From a theoretical perspective, we concentrate on the explanatory power of three factors often mentioned as important causes of cross-national policy convergence, namely regulatory competition, international harmonization and transnational communication. In empirical terms, we analyse, if and to what extent we can observe a convergence of environmental policies in Europe. For this purpose, we analyse the development of 40 environmental measures across 24 countries between 1970 and 2000. We observe in fact strong convergence of environmental policies over the last thirty years, as well as a clear rise in regulatory strictness. This development is mainly caused by international harmonization and to a certain degree by transnational communication, i.e.; it is rather an effect of global governance than of economic globalisation.

1 Introduction

In recent years, there is a growing and renewed interest in the study of cross-national policy convergence. There is an intensified debate on the convergence and divergence of national policies, which is closely related to research on the domestic impact of European integration (Europeanization) and globalization. Does the strong growth of economic and institutional interlinkages between nation states lead to increasingly similar policy measures across countries? Or is the search for convergence emerging from the domestic impact of globalization and European integration "an impossible quest" (Dimitrova and Steunenberg 2000, 201), as domestic responses to global or European challenges are strongly influenced by existing domestic structures and institutions (see, for example, Cowles *et al.* 2001; Héritier *et al.* 2001; Knill 2001)?

Yet we still have a limited understanding of the phenomenon of policy convergence. What explains the adoption of similar policies across countries over time? Under which conditions can we expect that domestic policies converge or rather develop further apart? Why do countries converge on some policy measures, but not on others? In the literature,

many factors have been suggested in order to account for the mixed empirical evidence of both convergence and divergence. However, there is still a lack of systematic theoretical and empirical investigations about their actual explanatory relevance.

In this article, we aim to amend this research deficit. In empirical terms, we analyze, if we can observe a cross-national convergence of environmental policies. We analyze the development of 40 environmental measures across 24 countries between 1970 and 2000. From a theoretical perspective, we concentrate on the explanatory power of two factors often mentioned as important causes of cross-national policy convergence, namely international economic and institutional interlinkages between nation states.

We define policy convergence as any increase in the similarity between one or more characteristics of a certain policy (e.g. policy instruments, policy settings) across a given set of political jurisdictions (e.g. states) over a given period of time. Policy convergence thus describes the end result of a process of policy change over time towards some common point (cf. Knill 2005). In this contribution we use the concept of σ -convergence focusing solely on the *degree* of similarity increases (for a discussion of the various notions of convergence cf. Heichel, Pape and Sommerer 2005). In particular, we are not interested in the *direction* of the convergence movement, i.e.; in changes of the strictness of environmental policies.

The article is structured as follows. In section two, we present our theoretical framework. The operationalization of variables and the data are described in section three. In section four, we present and discuss the results of our analysis. Summary and general conclusions to be drawn from our study are part of section five.

2 Theory and Hypotheses

In the literature, international factors play an important role in order to account for cross-national policy convergence (cf. Bennett 1991; Dolowitz and Marsh 2000; Drezner 2001; Gilardi 2005; Hoberg 2001; Holzinger and Knill 2005; Simmons and Elkins 2004). On the one hand, these factors refer to the extent to which countries are institutionally interlinked. In this context, emphasis is not only placed on convergence effects emanating from the harmonization of national policies through international or supranational law, but also on the effects of transnational communication and information exchange within institutionalized networks. On the other hand, regulatory competition emerging from the increasing economic integration of international markets has been identified as important factor that drives the mutual adjustment of policies across countries. In focusing on the explanatory relevance of these international factors, we do not neglect the potential influence emerging from domestic factors. Similarity or convergence of national conditions might trigger similar political responses and hence policy convergence (Bennett 1991, 231).

2.1 International Harmonization

International harmonization refers to a specific outcome of international cooperation, namely to constellations in which national governments are legally required to adopt *similar* policies and programs as part of their obligations as members of international institutions. International harmonization and more generally international cooperation presuppose the existence of interdependencies or externalities which push governments to resolve common problems through cooperation within international institutions, hence sacrificing some independence for the good of the community (Drezner 2001, 60; Hoberg 2001, 127). Once established, institutional arrangements will constrain and shape the domestic policy choices, even as they are constantly challenged and reformed by their member states. This way, international institutions are not only the object of state choice, but at the same time consequential for subsequent governmental activities (Martin and Simmons 1998, 743).

Under the heading of international harmonization, we also summarize convergence effects of conditionality, i.e., the exchange of domestic policy adjustments for membership in international institutions (cf. Schimmelfennig and Sedelmeier 2004). For the field of environmental policy in Europe, we consider this differentiation as not very helpful, as it is difficult to draw a clear analytical borderline between international negotiations characterized by symmetric or asymmetric relations of power and hence to judge, whether the power constellations imply a voluntary or an imposed agreement from the perspective of individual countries. There are no clear cases of imposition of an environmental policy.

To grasp of the effects of international harmonization on policy convergence, we suggest three analytical distinctions. First, international institutions differ in their harmonization effects. On the one hand, these effects arise from accession: Members ratify the treaty and have to comply with the respective requirements. This implies that convergence effects from accession occur only once. On the other hand, we can also conceive of harmonization effects through membership, if the institution in question has the competence and authority to produce regulatory output for its members, leading to enduring and steadily renewed harmonization effects over time.

This leads us to a second analytical distinction with regard to the policy-making capacity of international institutions towards their members. We differentiate between international institutions (including international organizations, regimes, treaties, protocols) and supranational institutions; i.e. the European Union (EU). In contrast to international institutions, the supranational character of the EU implies that harmonization effects emerge not only once from accession, but also from membership, as the institutions of the EU continuously develop and decide upon new legislative proposals. For international institutions, by contrast, harmonization effects basically emerge from accession.

Third, this distinction is also justified on the grounds that the EU and international institutions crucially differ in their obligatory potential; i.e., the extent to which compliance with legal obligation can actually be enforced. In the EU, such powers are comparatively well developed, given the direct effect and the supremacy of European law. International institutions, by contrast, not only lack these supranational characteristics of enforcement

power. They also reveal important differences in their obligatory potential and hence the extent to which they are able to enforce policy changes towards their members.

In view of the above considerations, we can formulate the following hypotheses on the impact of international harmonization on cross-national environmental policy convergence:

(H 1.1 – EU Membership): If n countries are member of the EU in t_0 , their environmental policies converge in the following periods.

(H 1.2 – EU Accession): If n countries join the EU between t_0 to t_1 , their environmental policies will converge during the same period.

(H 1.3 – Accession to International Institutions): The higher the score of common institutional accession (weighed by obligatory potential) of n countries from t_0 to t_1 , the more their environmental policies will converge during the same period.

2.2 Transnational Communication

International institutions might cause cross-national policy convergence not only by legally binding rules and decisions, but also by non-obligatory factors. This expectation follows from various theoretical arguments developed in the field of organisation sociology. As emphasised by DiMaggio and Powell (1991), frequently interacting organisations, such as national bureaucracies, tend to develop similar structures and concepts over time. Policy convergence results from the striving of organisations to increase their social legitimacy by embracing forms and practices that are valued within the broader institutional environment. In this context, the establishment of international institutions and networks plays an important role in facilitating the exchange of new policy models and regulatory innovations across national borders (Strang and Meyer 1993).

Two ways of non-obligatory convergence can be distinguished. First, states might act mimetically to copy the successful policies of other states. The demand for similarity of structure and functioning, rather than increased efficiency drives the process of cross-national convergence (DiMaggio and Powell 1991). Second, the diffusion of professional knowledge via transnational networks or "epistemic communities", who share common beliefs and perceptions over policy problems and corresponding solutions to address these problems (Haas 1992) plays an important role in facilitating the cross-national diffusion of policy concepts by deliberation and learning.

Following the above distinctions, we assume that convergence effects of transnational communication will not unfold immediately with accession, but increase with the duration of membership. As there is no categorical difference between the EU and international institutions in this respect, there is no reason to differentiate between different types of institutions here. We also have to take into account that – similar to their obligatory potential – international and supranational institutions also reveal important differences in what we

refer to as their "communicative potential". This potential varies with frequency and breadth of interaction; i.e., the functional differentiation of transnational networks (Kern 2000, 267).

(H 2 – Institutional Membership): The higher the score of common institutional membership (weighed by communicative potential) of n countries in t_0 , the more their environmental policies will converge in the following periods.

2.3 Regulatory Competition

According to theories of regulatory competition, countries facing competitive pressures are expected to mutually adjust their policies, hence leading to cross-national convergence. Regulatory competition presupposes economic integration among countries. Especially with the increasing integration of European and global markets and the abolition of national trade barriers, the international mobility of goods, workers and capital puts competitive pressure on the nation states to redesign domestic market regulations in order to avoid regulatory burdens restricting the competitiveness of domestic industries. The pressure arises from (potential) threats of economic actors to shift their activities elsewhere, inducing governments to adjust their regulatory standards.

In the literature there is a broad debate about the extent to which these adjustments coincide with an upward or downward shift of regulatory levels (Drezner 2001, 57-59; Holzinger 2003a, 2003b; Scharpf 1997; Simmons and Elkins 2004; Vogel 1995). Given our focus on the degree rather than the direction of convergence, it is sufficient to consider that theories of regulatory competition predict an increase of policy similarity over time among countries exposed to competitive pressures, regardless of the regulatory level at which this convergence might occur.

Theories of regulatory competition generally predict that countries adjust policy instruments and regulatory standards in order to cope with competitive pressures emerging from international economic integration. The more exposed a country is to competitive pressures following from high economic integration (emerging from its dependence on trade of goods, capital and services with other countries); the more likely it is that its policies will converge to other states with international exposure. In other words, the degree of convergence depends on the level of competitive pressures to which countries are exposed. In this context, trade figures are usually referred to as a proxy for the economic interlinkage between countries (e.g. Simmons and Elkins 2004).

(H 3 – Bilateral Trade): The higher the trade flows between n countries in t_0 , the more their environmental policies will converge in the period between t_0 and t_1 .

Two qualifications apply, however. First, even in constellations of high economic integration, no competitive pressures will emerge in and between non-market economies. Second, adjustments are only expected for trade-related policies, such as product or process

standards. No convergence will occur for policies that are not directly related to products or to production processes, such as nature protection, or bird protection.

2.4 Other Factors

Policy convergence might not only be caused by international factors, but simply be the result of parallel domestic problem constellations that trigger similar responses. With regard to the environmental field, several factors have been suggested to account for this relationship. First, emphasis is placed on factors that facilitate the transfer and emulation of policies, hence leading to increases in cross-national policy similarity over time, in particular cultural ties between countries (e.g. in terms of language, religion or geographical proximity). These factors are expected to work even in the absence of strong international institutional integration between countries (cf. Holzinger and Knill 2005, Simmons and Elkins 2004).

A second factor refers to the relationship between the level of economic development of a country and the comprehensiveness and strictness of its environmental policy, as expressed by the "Environmental Kuznets Curve" (Panayotou 1993; Stern and Common 2001) which indicates that the level of environmental pollution grows with GDP up to a certain point, but then decreases again as a result of increasing political demand for environmental protection in rich countries.

Third, the convergence of domestic policies might be the result of similar demands for a comprehensive and stringent environmental policy, expressed, for instance, by the existence of green parties or environmental organizations. In a similar way, the confrontation with similar problem pressure (e.g. air pollution levels, population density) is expected to trigger similar policy responses.

Finally, the effects of pre-existing similarity of policies on convergence in later periods will be investigated. Theories of policy convergence through transnational communication and learning emphasize that the degree of existing similarity (or the number of earlier adopters of a policy) may influence the degree of convergence in the future (social emulation and herding effects). Moreover, the presence of a "saturation effect" can be assumed: If a group of countries has already very similar environmental policies, convergence towards each other will necessarily decrease over time. On the basis of these considerations, the following hypotheses can be formulated:

(H 4.1 – Cultural Similarity): The higher the cultural similarity among n countries, the more their environmental policies will converge.

(H 4.2 – Income Level): The higher the common income level of n countries and the more similar it is in t_0 , the more their environmental policies will converge in the following periods.

(H 4.3 – Political Demand): The higher the political demand for environmental protection in n countries and the more similar it is in t_0 , the more the environmental policies of both countries will converge in the following periods.

(H 4.4 Problem Pressure): The higher the environmental problem pressure in n countries and the more similar it is in t_0 , the more the environmental policies of both countries will converge in the following periods.

(H 4.5 – Pre-existing Policy Similarity): The more similar policies in n countries in t_0 the more their environmental policies will converge during the following periods, as long as the degree of similarity already reached is not yet very high.

3 Operationalization of Variables and Data

3.1 Dependent Variable

Selection of Policies and Countries

To assess the degree of environmental policy convergence we rely on data on 40 environmental policies that cover a broad variety of different environmental media (cf. Table A1 in the annex). For these policies, we have collected data on the dimensions of (1) the presence of a policy (i.e. does a country have a respective policy in place or not), (2) the concrete policy instruments applied, and (3) the precise settings of these instruments (e.g. limit values or tax rates). Of the 40 policies, trivially, all possess the presence-of-policy dimension, whereas on 28 possess the instruments and 21 a settings dimension.

In the most encompassing variable all 40 policies of the data set are included (see table A1 in the annex). In addition, the following subgroup variables are distinguished: First, we differentiate between trade-related and non-trade-related policies. According to the theory of regulatory competition, convergence effects should be stronger for trade-related policies. Second, we distinguish obligatory and non-obligatory policies. With obligatory policies the effects of international harmonization on convergence should be more pronounced, whereas with non-obligatory policies convergence effects should be a result of transnational communication¹.

To assess convergence, we compare the degrees of cross-national policy similarity at four points of time (1970, 1980, 1990, and 2000). The year 1970 represents the starting point of national and international environmental policy. In 1980, the first wave of laws had been passed in the more environmentally advanced countries. Moreover, various international organisations had launched environmental programmes and policies for the first time. In 1990 more or less comprehensive environmental policies had been put in place in almost all industrialised countries as well as international organisations. The year 2000, finally, represents the situation after the fall of the Berlin Wall, with growing trade relations between Western and Eastern European states, and with a number of Central and Eastern European (CEE) countries seeking membership in the EU. Therefore, according to the theories

¹ In coding the data, we take account of the fact that the same policy may shift from non-obligatory to obligatory over time, because it may have been introduced as an obligatory measure by some international institution only later (cf. Table A1 in the annex).

outlined above, over the last decade an overall approximation of environmental policies in Europe can be expected.

The 24 countries under investigation include the member states of the EU-15 (except Luxembourg), Norway, Switzerland, Poland, Slovakia, Hungary, Bulgaria, Romania as well as the United States, Mexico and Japan. The country selection thus includes different groups of countries with regard to the influence of EU-membership: the founding members of the EU, countries joining the EU in 1973, 1981/1986, 1995 and 2004, countries currently negotiating EU-accession, countries that are not members but closely affiliated with the EU (Norway and Switzerland) and three countries not institutionally integrated or affiliated with the EU.

For the collection of the data, a questionnaire has been developed that was completed by environmental policy experts for each country. The information provided by the country experts was crosschecked with regard to existing databases.

Measuring Convergence: The Pair Approach

Our measurement of convergence is based on an approach in which the unit of analysis are country pairs². Accordingly, convergence implies an increase of policy similarity between a certain pair of countries over time. The pair approach offers several advantages for the purpose of our study. First, compared to standard approaches for measuring σ -convergence (e.g. the variation coefficient) it offers a more direct way to compare domestic policy changes and avoids a number of pitfalls (cf. Holzinger 2006). Second, as it is not based on aggregate figures like the coefficient of variation, it allows for using a convergence variable as the explanandum in a quantitative model. Third, it comprises any shift of convergence or divergence between countries. Fourth, it can be used for both categorical and metrical data, whereas the coefficient of variation can only be applied to metrical data. Thus, using the pair approach, the various dimensions of the policies in our sample (presence-of-policy, instruments and settings) can be integrated into one measure. Finally, the hypotheses can be tested more directly with country pairs than at the level of individual countries: It is the *common* membership of a pair (or group) of countries in an international institution which, for instance, is assumed to increase policy convergence among these countries via international harmonization or via transnational communication.

To be sure, also the pair approach implies certain weaknesses. Methodologically, the pair approach may not be entirely independent from the composition of the sample: the score of a certain country pair can be determined by the score of other country pairs. However, this disadvantage also holds for other approaches, because the comparison to a point of reference that is defined by the composition of the sample is immanent to the concept of convergence. Moreover, the pair approach raises the number of cases from 24 countries to 276 country pairs. As the number of original subjects does not change, this increase may lead to overconfidence in the quantitative models. Therefore the significance of these models has to be interpreted carefully. Weighing up strengths and weaknesses, however, the pair approach

² The use of country pairs or dyads is relatively new to the study of policy convergence (an example is Barrios, Görg and Strobl 2003), but rather common in other research areas, such as in the study of international conflicts (Bremer 1992; Kinsella and Russett 2002).

offers the opportunity of an innovative and direct access to the study of convergence, measuring the increase or decrease of policy similarity between countries on the bilateral level.

Calculation of Policy Convergence

To measure policy convergence, the dataset is transformed from country level to dyads for each pair of countries. The number of combinations is calculated by the binomial coefficient, where double pairs (countries A and B, countries B and A) were eliminated, such that each pair is unique.

The similarity scores as an interim step to the measurement of convergence are calculated as follows: The assessment of similarity is trivial for the presence-of-policy and the instrument dimensions. When comparing the presence-of-policies and similarity of instruments, score "1" means that the countries A and B have the same policy or the same instrument, whereas "0" means that they are dissimilar. For setting dimension, by contrast, we apply a normalized metrical score from 0 to 1 based on differences between limit values of country A and B, leading to a similarity scale between 1 (limit values are identical) and 0 (country pair with the most dissimilar setting values). For all other values gradual similarity is assessed by weighting the distance between two settings with the maximum distance for each item and for each point in time. The maximum distance is controlled for outliers by calculating the range between the 90% and the 10% quantile of the empirical distribution.

Summing up the similarity scores for all dimensions, we thus arrive at a similarity scale from "0 to 89" points (40 plus 28 plus 21). For better interpretation and for reasons of comparability with other scales, all scores are transformed to percentage scales, with e.g. the maximum of 89 points corresponding to 100% similarity of environmental policies.

The similarity scores can easily be transformed to convergence scores. Convergence is measured by changes in percentage points of absolute similarity between t_0 and t_1 . Those policy items that have already shown complete similarity in t_i for country pair \underline{AB} are not included in the calculation of the convergence score of the following periods. This operation avoids the inclusion of saturation effects, i.e. an underestimation of convergence. The exact formulae can be found in Table A2 in the annex.

3.2 Independent Variables

International Harmonization

Following our theoretical considerations, we distinguish between three variables to analyze the effects of international harmonization: "EU membership", "EU accession", and "accession to international institutions". With regard to "EU membership" and "EU accession", we use a dummy variable of common EU membership of a country pair. As date of accession we use the beginning of the accession talks, as usually the candidate country already begins with the adoption of the *acquis communautaire* at that point in time. The third variable takes account of the effects of accession to other international institutions. To measure these effects, we collected data on the membership of countries in 34 international

organizations and regimes. The common membership score is weighted by the institutions' obligatory potential (for the exact calculation of the indices see Table A3 in the annex). Changes of the score between t_0 and t_1 are taken as a proxy for convergence effects through accession to international institutions.

Transnational Communication

This variable consists of common membership data for all (including EU) international institutions. This data are weighted by the institutions' communicative potential and the length of a country's membership in the institution (assuming that effects of communication increase with membership duration and hence a country's embeddedness into a certain communication network) (see Table A3 in the annex for details). It is difficult to separate harmonization effects from effects of transnational communication. This variable, however, should clearly indicate the communication effects that go beyond pure harmonization: if there are no changes in membership in institutions that do not have the possibility of internal harmonization, institutional effects cannot be the result of harmonization.

Regulatory Competition

To measure the degree of economic interlinkage between countries we use data on bilateral trade flows. While trade flows are usually captured by an index of trade openness, the bilateral analysis of trade flows is more appropriate for the pair approach. As for other indices of openness, the trade volume is weighted by the size of the national economy. We apply the GDP of the smaller market in order to operationalize more precisely the dependence on international trade. We include only trade flows between market economies, as trade between non-market economies (e.g. CEE countries before 1989) is not expected to unfold effects focused upon by theories of regulatory competition.

Other Variables

For the measurement of cultural similarity, an index has been developed (including religion, language, geographical proximity) which allows for the calculation of similarity scores for each country pair (Table A3 in the annex). For the measurement of income levels, we use an interaction variable of per capita income difference between two countries and absolute income figures. We use the GDP per capita of the poorer country in order to measure the economic development of a country pair as taking the average income rate of both countries would lead to an inaccurate estimation for country pairs with a high difference in income levels. To measure the existence of domestic political demand for a comprehensive and stringent environmental policy, the influence of green parties is measured by commonalities of a country pair regarding electoral success, membership in parliament, and participation in government of green parties. A high score is attributed to a country pair, if green parties are equally highly influential in both countries. As with income, we use an interaction variable that also includes the difference between the two countries. Environmental problem pressure is tested with two variables, the level of CO₂-emissions per capita and population density. Although both are rather rough indicators, they should serve as general proxies for problem pressure through environmental pollution. To represent the common pressure in a county

pair, the lower level of emissions and the lower figures for population density are included. Again, the difference between the two countries is accounted for by using an interaction term. Finally, for measuring the level of pre-existing similarity of policies, we use a variable that consists of the level of similarity between country pairs in the previous period. The descriptive statistics of the independent variables are given in Table A4 in the annex.

4 Findings

Table 1 provides an aggregate description of our empirical findings. It contains the results for the whole sample used in the pair approach and for all policy subgroups, including information on mean values of policy similarity for 276 country pairs (in %) with respect to four points of time (1970, 1980, 1990 and 2000). Moreover, the results for similarity increases, i.e. policy convergence, between these points are provided. The last column gives the convergence results for the pooled data, i.e., the average of all three decades.

First of all, the results show that in general similarity grows considerably from 1970 to 2000 (from 0.04 to 0.56), a finding that holds also for all subgroups of items under investigation. Second, convergence effects are highest during the 1990s (0.37). Third, in 2000 similarity effects are most pronounced with regard to presence-of-policy dimension (0.65), followed by instruments (0.61), with settings being least developed (0.33). The picture is similar for policy convergence (pooled: 0.27; 0.24; 0.12) Fourth, when looking at policy types, it becomes apparent that similarity increases for trade-related policies are more pronounced than for policies not related to trade. A similar statement applies for the distinction between obligatory and non-obligatory items, with similarity effects being generally stronger in the former case. This clear picture of convergence is underlined by the fact that there are rarely any diverging country pairs. For the presence-of-policy dimension less than 1 % of the pairs diverged at some point in time; the figure is highest for the settings dimension during the 1990s (21 %). In the following, we will investigate in more detail to what extent these results can be understood in light of our independent variables.

Table 1 Policy Similarity and Policy Convergence: Mean Values in % for 276 Country Pairs

| | <i>Policy Similarity</i> | | | | <i>Policy Convergence¹</i> | | | |
|---|----------------------------------|-------------|-------------|-------------|---------------------------------------|--------------|--------------|---------------|
| | <i>1970</i> | <i>1980</i> | <i>1990</i> | <i>2000</i> | <i>1970s</i> | <i>1980s</i> | <i>1990s</i> | <i>Pooled</i> |
| Pair-approach all policies (89 items) | 0.04 | 0.14 | 0.29 | 0.56 | 0.10 | 0.18 | 0.37 | 0.22 |
| Presence of policy (40) | 0.03 | 0.12 | 0.30 | 0.65 | 0.09 | 0.20 | 0.51 | 0.27 |
| Policy instruments (28) | 0.06 | 0.21 | 0.38 | 0.61 | 0.16 | 0.21 | 0.36 | 0.24 |
| Settings (21) | 0.00 | 0.07 | 0.17 | 0.33 | 0.06 | 0.10 | 0.18 | 0.12 |
| Trade-related policies (63) | 0,04 | 0,17 | 0,35 | 0,64 | 0,14 | 0,22 | 0,45 | 0,27 |
| Non trade-related policies (26) | 0,04 | 0,07 | 0,16 | 0,38 | 0,03 | 0,10 | 0,27 | 0,13 |
| Obligatory policies (9 / 24 / 36 / 45) | 0,04 | 0,26 | 0,45 | 0,67 | 0,23 | 0,34 | 0,49 | 0,35 |
| Non-obligatory policies (80 / 65 / 53 / 44) | 0,05 | 0,09 | 0,19 | 0,45 | 0,06 | 0,09 | 0,30 | 0,15 |
| 1 | corrected for saturation effects | | | | | | | |

4.1 Method of Analysis

The models we apply basically refer to a pooled data set of three cross-sectional assessments of convergence for the 1970s, the 1980s and the 1990s. Each of the three cross-sectional models includes observations on 276 country pairs. As introduced above, in all models the dependent variable refers to the change rate of policy similarity from the beginning of a decade to its end, indicated in percentage points.

We apply regression models with standard OLS estimations. In order to answer the main research question on the influence of international driving forces behind growing similarity of domestic environmental policies, we use a stepwise approach (see Table 2). We start with regression models that show the explanatory potential of variables for international harmonization (EU accession, EU membership, accession to international institutions) (model 1). In models 2 and 3, the variables for transnational communication (membership in international institutions) and regulatory competition (bilateral trade) are added. Model 4 shows the explanatory potential for our control variables, while in model 5 all variables are taken together, including a time variable.

Variance inflation statistics indicate problems for a robust estimation of coefficients. While the stepwise approach may already uncover changes in coefficients, we apply additionally use partialized models to cope with the problem of multicollinearity and complex interlinkage. This procedure allows for an assessment of the relative importance of the main variables compared to the other independent variables.

For the models 6 to 11 in Table 2, the common influence of covariates is systematically (i.e.; sequentially) partialized out of the regression coefficients. The independent variables are orthogonalized: through bivariate regression and subsequent residualization, they are made stochastically independent from each other. For subordinate variables in the order, only the

unstandardized residual from the bivariate regression with their respective higher-ranking variables is included in the equation. The coefficient of a subordinated independent variable only includes information on effects *which go beyond* the (common) effect of higher-ranking covariates. The goodness of fit of the multivariate model is not affected by this orthogonalization of independent variables.

The partializing out of effects of lower-ranking variables takes place stepwise. Variables are brought into an order and categorized into different groups. Each variable is orthogonalized by all variables of higher ranking groups. To explain this procedure, we use model 6 for which the following regression equation applies:

$$y = c + \beta_{1y} x_1 + \beta_{2y} x_2 + \beta_{3y} x_3 + \beta_{(4-123)y} x_{4-123} + \beta_{(5-1234)y} x_{5-1234} + \beta_{(\hat{a}-12345)y} x_{\hat{a}-12345} + \beta_{(t-12345\hat{a})y} x_{t-12345\hat{a}} + e$$

In this basic version of the partialized regression, five different groups for orthogonalization are composed by the following twelve variables: variables x_1 to x_3 are harmonization variables (group 1), x_4 is communicative potential (group 2), x_5 is trade (group 3), x_{c_i} represents the control variables c_i (group 4) and x_t the time variable (group 5).

The hierarchical order chosen in model 6 implies the following theoretical expectations with regard to the ordering of variables. First, effects on environmental policy convergence decrease in the following order: they are strongest for international harmonization (including the variables EU accession, EU membership, accession to international institutions), followed by transnational communication and regulatory competition. As regards the other variables (cultural similarity, income, political demand, problem pressure and pre-existing similarity of policies), our interest is not so much on their contribution to the explanation of convergence, but on a potential effect that might go beyond the main variables. They are hence residualized on the five variables referring to the three main driving forces of convergence. The time variable is conceived as the lowest ranking variable, as it is correlated with many covariates and no explicit theoretical expectation has been formulated. This way only the time effect that goes beyond the influence of all other variables enters the regression. Its coefficient is thus expected to be much lower than in the non-partialized model.

To be sure, model 6 is only one option of bringing the different variables into a hierarchical order. Depending on the concrete theoretical expectations, other models are conceivable. To avoid theoretical arbitrariness, we have run five additional partialized regression models, each with different hierarchical orderings. At the top of the rankings in models 7 to 11 are the communicative potential variable, the trade variable, and the most important control variables, i.e., the level of economic development, pre-existing similarity, as well as the time variable. The equation is similar to the one for model 6. In Tables 2 and 3, the variables in the highest rank are marked in bold letters for each model.

The pooled models are complemented by cross-sectional models (Table 3). This allows us to compare causal effects in the decade models with effects over the whole period and to investigate potential changes in the importance of causal mechanisms over time. The analyses thus provide more differentiated and more reliable results. For the models in Table 3, we use

the partialized model 6 as a basis. The reason for this choice is that the harmonization variables show not only the largest effect in model 6, where they are ranked highest, but also have rather strong influence in all other partialized models.

4.2 Overall Model Fit

The models presented in Tables 2 and 3 show satisfying results for the overall explanation of variance and the fit of the model. For the pooled model that includes all explanatory variables (model 5 in Table 2), referring to the whole policy sample the degree of explained variance is very high, with a corrected r^2 of .67. Also model 3, which includes only the main independent variables shows a high fit (r^2 .63). By contrast, the contribution of control variables is rather limited (see model 4).

Table 2 Regression results, policy convergence of 40 policies with pooled data, stepwise approach and partialized models

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---------------------------|--------|--------|--------|--------|---------|---------------|---------------|---------------|---------------|---------------|---------------|
| Constant | ._** | ._** | ._** | ._** | ._** | ._** | ._** | ._** | ._** | ._** | ._** |
| EU-Membership | .132** | -.029 | -.020 | | .052** | .132** | -.027 | .075** | .077** | .077** | .112** |
| EU- Accession | .104** | .058** | .057** | | .044** | .104** | .057** | .102** | .093** | .061** | .041** |
| Accession to Institutions | .629** | .479** | .474** | | .400** | .629** | .451** | .628** | .648** | .501** | .317** |
| Institutional Membership | | .489** | .505** | | .161** | .426** | .650** | .405** | .357** | .260** | .120** |
| Bilateral Trade | | | -.038 | | -.070** | -.033 | -.033 | .204** | -.033* | -.032 | -.013 |
| Cultural Similarity | | | | .016 | .084** | .054** | .054** | .054** | .053** | .056** | .073** |
| GDP per Capita * Diff | | | | -.045 | .151** | .017 | .017 | .017 | .224** | -.013 | .104** |
| Green Parties | | | | .159** | -.016 | -.007 | -.007 | -.007 | -.007 | -.056** | -.014 |
| CO2 | | | | -.042 | -.053** | -.053** | -.053** | -.053** | -.052** | -.061 | -.051** |
| Population Density | | | | .044 | .024 | .029 | .029 | .029 | .029 | .097** | .023 |
| Policy similarity in t-1 | | | | .514** | -.104** | -.011 | -.011 | -.011 | -.010 | .546** | -.056** |
| Time | | | | | .442** | .185** | .185** | .185** | .185** | .160** | .721** |
| R ² | 0.45 | 0.63 | 0.63 | 0.32 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| N | 828 | 828 | 828 | 828 | 828 | 828 | 828 | 828 | 828 | 828 | 828 |

** = significant at the level of $p < 0,05$ * =significant at the level of $p < 0,01$. Standardized coefficients for OLS-estimation

Table 3 Regression results, policy convergence of all policies, pooled data, decade-data and policy subgroups, based on model 6

| | <i>All</i> | <i>All</i> | <i>All</i> | <i>All</i> | <i>Obligat.</i> | <i>Non-</i> | <i>Trade-</i> | <i>Non Trade-</i> |
|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------|
| | <i>Policies</i> | <i>Policies</i> | <i>Policies</i> | <i>Policies</i> | <i>Policies</i> | <i>Obligat.</i> | <i>Related</i> | <i>Related</i> |
| | <i>Pooled</i> | <i>1970s</i> | <i>1980s</i> | <i>1990s</i> | | <i>Policies</i> | <i>Policies</i> | <i>Policies</i> |
| Constant | ._** | ._** | ._** | ._** | ._** | ._** | ._** | ._** |
| EU Membership | .132** | .326** | .063 | .165** | .285** | -.014 | .149** | .052** |
| EU Accession | .104** | -.093 | -. ¹ | .062 | .038 | .135** | .082** | .169** |
| Accession to Institutions | .629** | .383** | .564** | .435** | .500** | .629** | .640** | .296** |
| Institutional Membership | .426** | .103** | .197** | .003 | .296** | .454** | .382** | .587** |
| Bilateral Trade | -.033 | .125** | -.009 | -.055 | -.041* | .038 | -.035 | -.004 |
| Cultural Similarity | .054** | .083* | .192** | .021 | .121** | .003 | .090** | -.062** |
| GDP per Capita * Diff | .017 | .228** | .179** | .092* | .086** | .061** | .030 | -.044* |
| Green Parties | -.007 | -. ² | -.004 | -.039 | -.072** | .053** | -.048** | .103** |
| CO2 | -.053** | .049 | -.112** | .099* | .089** | -.141** | -.054** | -.026 |
| Population Density | .029 | .019 | .224** | -.151** | .003 | .063** | .034 | -.023 |
| Psim | -.011 | .105* | -.318** | .024 | .061** | -.015 | -.020 | .173** |
| Time | .185** | - | - | - | .017 | .183** | .122** | .179** |
| R ² | 0.67 | 0.34 | 0.51 | 0.20 | 0.50 | 0.54 | 0.63 | 0.54 |
| N | 828 | 276 | 276 | 276 | 828 | 828 | 828 | 828 |

** = significant at the level of $p < 0,05$ * =significant at the level of $p < 0,10$. Standardized coefficients for OLS-estimation

1 No accession during the 1980s, as accession negotiations with Spain, Portugal and Greece started before 1980 (see chapter 4).

2 No green parties before 1980.

The fit of the model also varies strongly if the three decades are analyzed separately. Table 3 shows that the explanatory potential of the model for convergence between 1980 and 1990 is rather high (r^2 .51), but lower for the 1970s (r^2 .34) and the 1990s (r^2 .20). While this variation can be related to changes in the effectiveness of some causal mechanisms, the difference to the pooled model is caused by a parallel development over time of the dependent variables and some crucial covariates that leads to a much higher correlation than for the cross-sectional approach.

4.3 Discussion of Results

In the following sections the results of the regression analysis are presented for each of the explanatory factors separately. We proceed in the following way. First, we analyze the effects

for the whole policy sample for each variable. Second, we compare the effects for the different decades under study. Third, we differentiate between policy subgroups. Sometimes reference is made to bivariate correlations (cf. Table A4 in the annex).

International Harmonization: Effects of EU Membership

Our findings indicate a positive correlation between EU membership and cross-national policy convergence, hence basically confirming our theoretical expectations. However, although significant, EU membership is not the strongest predictor of convergence. While the standardized coefficient is at .132 in the partialized model 6 (in which the common explanatory potential of EU and other covariates is totally assigned to EU membership), r^2 declines to 0.52 in model 5 which includes all independent variables.

Moreover, the correlation between EU membership and convergence varies over time (see Table 3). The general impact of EU membership is strongly positive for the 1970s (.326), but very weak for the 1980s (.062), while increasing again for the 1990s (.165). This observation is in line with the general development of EU environmental policy (Weale et al. 2000). During the 1970s, the increasing environmental activities of the EU caused strong convergence effects for its then member states. In this period, the EU introduced binding regulation on nine out of 19 obligatory policies in our data set, whereas only four obligatory measures affecting our policy sample were enacted between 1978 and 1990. Except for changes in existing legislation, very limited additional harmonization pressure emerged from the EU level. Between 1990 and 2000, by contrast, the number of adopted policies related to our sample increased to six, hence explaining the higher effect on convergence observed for the 1990s.

The impact of EU membership also varies strongly with regard to policy convergence in different subgroups. In general, effects are much stronger for obligatory and trade-related items than for policies that are not obligatory or not related to trade. This result is consistent with the fact that EU environmental policy has been strongly influenced by the concern for the creation of a common market (Hildebrand 1993). As a consequence, EU activities predominantly concentrate on trade-related policies and the harmonization of domestic product and process standards in order to avoid market distortions.

In general, effects of EU membership are not as dominant as one would expect. What are the reasons for this surprising finding? First, until 1990 only twelve countries were members of the EU, and, for the two decades before, significantly less than the half of the sample; i.e., over the whole period, EU members form only a small part of the country sample. Second, non-member countries oriented their policy towards EU legislation.³ Third, our data shows significant differences between EU member states due to discrepancies in implementation, as environmental directives usually leave considerable leeway to domestic policy-makers.⁴ Finally, in case of minimum harmonization, one would not expect total convergence among EU-member states anyway.

³ Austria and Switzerland for example applied the same limit values for sulphur content in gas oil as the EU during the 1980s.

⁴ For example, Germany and the Netherlands had different car emission standards in 1980 in spite of being

International Harmonization: EU accession

Also EU accession and prospective membership show effects on policy convergence. Similar to the influence of EU membership, the partialized model 6 shows a moderate effect (.104) which, however, declines strongly when considering model 5 (which includes all variables).

The separate analysis for each decade sheds light on the dynamics of EU accession effects. For the 1970s a negative though not significant effect has been found (-.093). Greece, Portugal and Spain are responsible for this. It implies that they did not implement the environmental *acquis* already from the beginning of the accession talks in 1978 but only after actual accession. The coefficient for accession during the 1990s is positive (.062), however not very accentuated. This could be the consequence of the two enlargements during the 1990s. The first enlargement process beginning in the early 1990s refers to the Scandinavian states and Austria. The second process starting from the mid-1990s onwards included five CEE countries of our sample (Poland, Hungary, Slovakia, Bulgaria and Romania). A differentiation between the two groups shows that for the first group, there is even a negative effect, while for the second a more pronounced positive effect can be found. The EFTA countries already had environmental policies similar – and sometimes stricter – to the EU members; thus, the convergence effect was not that strong for this group, whereas for the CEE countries the accession process produced significant convergence.

International Harmonization: Accession to Institutions

Our theoretical expectation that international harmonization can also be effective through the accession to international institutions other than the EU are fully confirmed by our results. The influence of this variable is clearly stronger than the influence of the EU variables (.629 in the partialized model 6). Moreover, the size and direction of the effect are quite robust. This can be seen in model 5 (.400) that includes the whole set of variables. This indicator of the degree to which national governments are subjected to international hard law seems to be a very precise predictor of policy convergence. This is not surprising, as we expect international regulatory cooperation to be effective beyond mere EU-effects. In this context, it should be emphasized that there is no tautological relationship between this variable and the dependent variable, as there are many steps from the adoption of international agreements to the domestic implementation of these agreements and therefore many obstacles to overcome.

While the effects are generally very strong, there is certain variance over time, with coefficients being most pronounced for the 1980s (.575) and lowest for the 1970s (.383). The weaker effect for the 1970s and the peak in the second decade can be related to the fact that many international environmental regimes like the Convention on Long-Range Transboundary Air Pollution or the Vienna Convention for the Protection of the Ozone Layer have been entered into force after 1980. The slight decrease of the positive effect for

subject to the same EU requirement.

the 1990s may be caused by the high level that institutional integration already reached in our country sample.

The existence of a very pronounced positive effect can also be observed for the convergence of all policy items, but also to all policy subgroups. The explanatory power of accession to international institutions for policy convergence is at a similarly high level for obligatory, non-obligatory and trade-related policies.

In sum, the variables referring to international harmonization turn out to be an influential predictor for the occurrence of policy convergence from 1970 to 2000. This effect is the dominant one for the regression model 5 that includes all independent variables. For this reason, the partialized model with all other variables being subordinate to the harmonization variables (model 6) was chosen as the basis for the models presented in Table 3. As a consequence, harmonization effects might be overestimated with respect to their absolute size in these models, but not with respect to their relative size.

Transnational Communication: Institutional Membership

Our regression results indicate not only strong convergence effects resulting from international harmonization, but provide support for the expected impact of communication and information exchange in transnational networks, as well. The effect of common membership in international institutions on cross-national policy convergence as a result of international interlinkage that cannot be linked to the outcome of international law (.489 in model 2) is comparable to that of international harmonization. The variable's maximum explanatory potential becomes apparent in the partialized model 7 (.650), in which all other coefficients can be interpreted only in terms of their effect beyond the effect of membership in international institutions. Moreover, model 6 shows that the strong positive influence persists (.426), even when only those effects of common institutional membership are included that go beyond those of international harmonization. Common membership in institutions with high communicative potential is hence one of the most influential factors in order to account for cross-national policy convergence.

The influence of common membership varies across decades, however. For the 1970s (.103) and 1980s (.197), this variable makes a positive contribution to the explanation of convergence of all policy items, while for the 1990s this effect disappears completely. This striking change in the effects of transnational communication can be explained by the fact that country pairs with strong communicative interlinkage, due to saturation effects, converged to a lesser extent during the 1990s than in earlier periods. A closer look at the degree of policy similarity already reached before the 1990s reveals that communication did not affect the convergence between these countries in the 1990s.

The overall statement about the strong explanatory power of transnational communication also holds for the different policy subgroups. While effects are strong for all groups, they are particularly pronounced for policies that are non-obligatory or not related to trade. This can be traced to the fact that for the convergence of obligatory as well as for trade-related items, there is no significant communication effect exceeding the one of harmonization variables. The nevertheless considerable effect with regard to obligatory items

need not constitute a contradictory finding in this context. For instance, it is rather plausible that policies adopted at the level of the EU might receive broader international attention, hence fostering the spread of these policies also between those countries that are not (yet) EU member states. It should be noted that until 1990, only 30 percent of all country pairs shared EU membership. Moreover, countries that are interlinked for a longer time might introduce obligatory policies more quickly.

Regulatory Competition: Bilateral Trade

In contrast with the other variables analyzed so far, our findings provide no broad support for the hypothesis that a high degree of economic interlinkage between countries leads to increasing similarity of their domestic policies. It is only for model 8, in which all variables are subordinate to bilateral trade, that the correlation between bilateral trade openness and convergence is significant and clearly positive (.204). In the more comprehensive models the trade effect disappears and the coefficient is even slightly negative. These results are consistent with the findings of other studies that do not find support for such a trade effect on convergence or diffusion (cf. Drezner 2001; Simmons and Elkins 2004).

An important factor accounting for these findings might be the fact that the variables for economic and institutional integration are to some extent characterized by an endogenous relationship. This holds true in particular for the EU. Institutional integration leads to increased trade flows, and the existence of economic interlinkage is a strong incentive to cooperate in political institutions at the international level. Our results suggest that the latter factor is more important than the first. While there is no trade effect beyond harmonization and communication in model 6 (-.033), the coefficients for institutional variables are relatively stable regarding their subordination to trade openness in model 8. This supports the conjecture that the influence of competition is less important and overridden by institutional integration. It seems plausible that potential competition effects were anticipated by the involved countries and subsequently reduced by international harmonization.

This interpretation is supported when looking at the effects of regulatory competition over time. Trade effects that go beyond harmonization are pronounced and significantly positive for the 1970s (.125), when international cooperation in environmental policy has just started. This effect completely disappears over time and is even negative for the 1990s. Thus, for convergence in recent years, trade dependence seems to play a minor role.

Regardless of the policy subgroup under investigation, we find no significant impact of bilateral trade on policy convergence. Of particular interest is the fact that for trade-related policies (where effects of regulatory competition should be most pronounced), the coefficient is even negative. This again supports the above interpretation that trade effects were anticipated by international harmonization.

Other Variables

With regard to the explanatory relevance of other variables, our findings reveal rather mixed results. First, with regard to *cultural similarity*, we observe a weak positive effect on cross-

national policy convergence (.084) in model 5, as well as for all partialized models. These effects vary over time. While effects are most pronounced for the 1980s, they almost disappear for the 1990s. This trend is confirmed in the bivariate regression (Table A4). The strong effects of cultural similarity during the 1970s and 1980s are observed in a period that is characterized by a strong expansion of environmental policies, both at the European and the national level. It is well conceivable that this dynamic development particularly inspired countries to transfer and copy innovative policies from culturally similar and neighbouring countries. This interpretation is supported by the fact that for the 1990s (which is generally seen as an era of environmental policy stagnation) cultural similarity is no relevant causal factor behind convergence. This development goes along with the increasing importance of international institutions and seems to have been substituted by this mechanism, implying that during the 1990s, especially peripheral countries came closer to the core group of European countries. With regard to subgroups, cultural similarity effects are surprisingly strong for obligatory policies. As this cannot be attributed to EU effects (this is excluded because of the partialization), the explanation might again be found in the emulation of EU policies by culturally similar countries that were not yet EU member states.

Turning to our second control variable, we find support for the hypothesis that a high and similar *level of income* of a country pair leads to convergence. We observe positive income effects on convergence model 5 that includes all variables (.151). However, the coefficients decrease strongly when it comes to effects beyond institutional interlinkage. Comparing the partialized models 6, 7 and 9, we find a similar scenario as for regulatory competition: While institutional effects are robust in model 9 that is orthogonalized by the income level, income effects disappear in models 6 and 7 (where institutional harmonization and communication rank highest in the order of variables). Similar to regulatory competition effects, this can be interpreted as the non-existence of an independent effect of economic development on convergence. A further parallelism to trade effects is the existence of a positive influence on convergence independent from institutional effects only for the first and second decade, but not for the 1990s. This development can be traced to two factors: rich countries were already very similar and did not converge any further, whereas poor countries converged during the 1990s.

Third, our results provide very limited support for the hypothesis on the influence of *political demand* on cross-national policy convergence. A significant positive influence can only be observed in model 4 (.151), when all main variables under study are excluded. This statement also holds when different decades are analyzed. The only policy subgroup models where an effect is confirmed that goes beyond the influence of the main project variables have been those for convergence on non-obligatory and non-trade related items. We therefore find effects on convergence of policy items that are less linked to international interdependence and harmonization – which is in line with the expectation that political demand affects domestic policy choice. In general, however, this variable does not seem to be an independent complementary mechanism that influenced cross-national policy convergence in recent years. The lack of effects during earlier decades, by contrast, is hardly surprising, given the fact that until the mid-eighties, only few green parties existed in the countries under study.

Fourth, a similar conclusion can be drawn for the two variables measuring environmental problem pressure (CO₂ emissions and population density). Almost all multivariate pooled models show only a minor or no explanatory power. However, certain exceptions to this general statement apply: On the one hand, for CO₂ emissions, significant positive effects exist for the period of the 1990s and the subgroup of obligatory policies. Both effects can be causally linked to the catching-up of CEE countries where environmental problem pressure has been very high, although without consequences on policy making before 1990. On the other hand, effects for population density are especially pronounced for the 1980s and the subgroup of non-obligatory policies. The subgroup effects are due to the fact that in the group of non-obligatory items there is a high share of water policies, which are generally of particular relevance in densely populated areas. The strong effects for the 1980s might be caused by the strong development of environmental policy activities in industrialized countries during that period.

The results for the level of income, political demand and environmental problem pressure are less surprising if we recall that we analyse their effect of the *degree* of convergence. For all three factors, however, we would rather expect a causal effect on the *direction* of convergence, namely that they drive into the direction of stricter environmental policies.

Fifth, for *pre-existing policy similarity* model 4 and the partialized model 10 indicate a very high positive correlation with convergence (.514, .546). The same is true for the bivariate correlation (Table A4). This suggests that those country pairs that already have a high degree of similarity of their environmental policies subsequently converge stronger than country pairs that are more dissimilar. In the general multivariate model, however, no independent effect is found that goes beyond the influence of international driving forces of convergence. The analysis by decades helps to account for this contradictory picture. We find significant positive effects for the 1970s (.105), a negative effect for the 1980s (-.318) and an insignificant effect in the 1990s. The 1970s were a period in which environmental pioneer countries became more similar. Consequently, in the next decades their potential to further converge shrank. This development can be interpreted as a consequence of saturation effects: convergence between some countries had already reached a high level in the 1980s. Hence, there was not much potential left to converge any further in the following period. At the same time, those countries which were dissimilar before (as they had no or not many policies in place) show much higher convergence rates in the 1990s. That is, convergence is now better explained by previous dissimilarity. This turn can be ascribed to the fundamental changes in the environmental policies of the CEE countries and Mexico. Therefore, the negative and lack of correlation for the later periods indicate a process of catching-up of the laggard countries.

Finally, it has to be noted that also *time* has an influence on cross-national policy convergence.⁵ We have no specific theoretical expectations about the effects of this variable. It represents the dynamics of this relatively new policy area and it includes various aspects that drive the development of environmental policy in general, which have not been included

⁵ For the interpretation of the time effect, our cross-sectional decade models in table 3 serve as point of reference.

to this analysis, such as technological progress, diminishing costs of environmental protection, and singular events like acid rain, the nuclear disaster in Chernobyl, or the concerns about the greenhouse effect. For the pooled data, time is highly correlated with policy convergence, even for the overall model 5 (.442) and for all models with partialized variables, in which the time effect beyond all other variables is still significantly positive. Moreover, model 11 shows that the time factor has a very strong effect if all other factors are partialized out (.721). However, even in this model harmonization, transnational communication and income have some explanatory power.

5 Conclusion

In conclusion, our analysis of the convergence of environmental policies indicates several general findings. First, our results show that the similarity of environmental policies of the countries under study strongly increased during the observed period (1970 to 2000). As expected, the degree of convergence varies across policy types. It is more pronounced for obligatory and trade-related policies than for non-obligatory and not trade-related policies.

Second, we find that these developments can be explained in particular by the effects of international harmonization and transnational communication. International harmonization, which was operationalized by three variables (EU membership, EU accession, and accession to international institutions other than the EU) contributes most to the explanation of convergence. In this context, the explanatory power of the EU variables is much less pronounced than accession to international institutions. The effects of transnational communication on environmental policy convergence are of almost the same size as those of international harmonization. Communicative interaction within international organisations obviously has very strong effects on the convergence of environmental policies. Communication effects are particularly pronounced with respect to non-obligatory and not trade-related policies. When there is already a harmonized policy at the international level, there is not much room left for transnational communication to influence further convergence. As trade related policies are more often subject to international harmonization than not trade related policies, there is an overlap of this group with obligatory policies.

Third, compared to the institutional variables, there is little support for effects of regulatory competition on cross-national policy convergence. We find no effect of trade that goes beyond the effects of harmonization or communication. Thus, political Europeanization and globalization seems to have stronger effects on policy convergence than economic globalization.

Fourth, also the explanatory power of the other variables controlled for in the analysis is generally rather limited. While certain effects can be observed for income and cultural similarity, political demand and environmental problem pressure are of minor relevance. The effects vary strongly, however, depending on the models applied. It should be emphasized, however, that quite strong effects can be observed for pre-existing policy similarity. Countries which had already a high degree of similarity converged stronger in subsequent

periods, while in the later periods we observe a process of catching-up of the laggards' countries.

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Annex

Table A1 List of policy items

| | Presence of policies | Policy Instruments | Policy Settings | Trade-related policies | Obligatory policies (since...) |
|---|----------------------|--------------------|-----------------|------------------------|--------------------------------|
| Sulphur content in gas oil | • | • | • | • | 1975 |
| Lead in petrol | • | • | • | • | 1978 |
| Passenger Cars NOx emissions | • | • | • | • | 1977 |
| Passenger Cars CO emissions | • | • | • | • | 1970 |
| Passenger Cars HC emissions | • | • | • | • | 1970 |
| Large Combustion Plants SO ² emissions | • | • | • | • | 1988 |
| Large Combustion Plants NOx emissions | • | • | • | • | 1988 |
| Large Combustion Plants Dust emissions | • | • | • | • | 1988 |
| Coliforms in bathing water | • | • | • | | 1976 |
| Hazardous substances in detergents | • | • | | • | 1973 |
| Efficient use of water in industry | • | | | • | |
| Industrial discharges in surface water Lead | • | • | • | • | |
| Industrial discharges in surface water Zinc | • | • | • | • | |
| Industrial discharges in surface water Copper | • | • | • | • | |
| Industrial discharges in surface water Chromium | • | • | • | • | |
| Industrial discharges in surface water BOD | • | • | • | • | |
| Soil protection | • | | | | |
| Contaminated sites policy | • | • | | | |
| Waste recovery target | • | | | | 1994 |
| Waste landfill target | • | | | | 1994 |
| Glass reuse/recycling target | • | • | • | | |
| Paper reuse/recycling target | • | • | • | | |
| Promotion of refillable beverage containers | • | • | | • | |
| Voluntary deposit system beverage containers | • | | | • | |
| Noise emissions standard from lorries | • | • | • | • | 1970 |
| Motorway noise emissions | • | • | • | | |
| Noise level working environment | • | • | • | • | 1977 |
| Electricity from renewable sources | • | • | | • | |
| Recycling construction waste | • | | | • | |
| Energy efficiency of refrigerators | • | • | | • | 1992 |
| Electricity tax for households | • | • | • | | |
| Heavy fuel oil levy for industry | • | • | • | • | 1992 |
| CO ² emissions from heavy industry | • | • | | • | |
| Forest protection | • | • | | | |
| Eco-Audit | • | | | • | 1993 |
| Environmental impact assessment | • | | | | 1985 |
| Eco-labelling | • | | | • | 1992 |
| Precautionary principle: reference in legislation | • | | | | |
| Sustainability: reference in legislation | • | | | | |
| Environmental/ sustainable development plan | • | | | • | |

Table A2 Calculation of Convergence Scores

| | |
|--|--|
| Similarity Score for Policy-Presence and Instruments Dimension | <p>(1) $SP_{x, \underline{AB}} = 1 \Leftrightarrow P_{x,A} = P_{x,B} > 0$</p> <p>$SP_{x, \underline{AB}} = 0 \Leftrightarrow P_{x,A} \neq P_{x,B} > 0$</p> <p>(2) $SI_{y, \underline{AB}} = 1 \Leftrightarrow I_{y,A} = I_{y,B} > 0$</p> <p>$SI_{y, \underline{AB}} = 0 \Leftrightarrow I_{y,A} \neq I_{y,B} > 0$</p> <p>$SP_x$ refers to the similarity of policy x, SI_y to the similarity of instrument y, P_x to the presence of policy x and I_y to the instrument y, and \underline{AB} to the dyad of countries A and B.</p> |
|--|--|

| | |
|---|---|
| Similarity Score for Settings Dimension | <p>(3) $SS_{z, \underline{AB}} = 1 - \frac{ S_{z,A} - S_{z,B} }{S_{z,90} - S_{z,10}}$</p> <p>where SS_z is the similarity of setting z, $S_{z,A}$ and $S_{z,B}$ the level of policy setting z for countries A and B and $S_{z,90}$ and $S_{z,10}$ the 90% and the 10% quantile of the empirical distribution of setting z in the sample.</p> |
|---|---|

| | |
|-----------------------------------|--|
| Calculation of Convergence Scores | <p>(4) $CP_{x \Delta t1; \underline{AB}} = SP_{x,t1; \underline{AB}} - SP_{x,t0; \underline{AB}}$</p> <p>$CI_{y \Delta t1; \underline{AB}} = SI_{y,t1; \underline{AB}} - SI_{y,t0; \underline{AB}}$</p> <p>$CS_{z \Delta t1; \underline{AB}} = SS_{z,t1; \underline{AB}} - SS_{z,t0; \underline{AB}}$</p> <p>where CP_x is the convergence of policy x, CI_y the convergence of instrument y and CS_z the changes in similarity scores of setting z, $SP_{x,t1(t0)}$, $SI_{y,t1(t0)}$, $SS_{z,t1(t0)}$, similarity scores at t_1 (t_0) and Δt_1 the</p> |
|-----------------------------------|--|

period between t_0 and t_1 .

Aggregation of
Convergence Scores

$$(5) \quad \sum_{x1}^{x_n} CP_{x_i, \Delta t1; \underline{AB}} = \frac{\sum_{x1}^{x_n} SP_{x_i, t1; \underline{AB}} - SP_{x_i, t0, \underline{AB}}}{n - k}$$

$$\sum_{y1}^{y_n} CI_{y_i, \Delta t1; \underline{AB}} = \frac{\sum_{y1}^{y_n} SI_{y_i, t1; \underline{AB}} - SI_{y_i, t0, \underline{AB}}}{n - k}$$

$$\sum_{z1}^{z_n} CS_{z_i, \Delta t1; \underline{AB}} = \frac{\sum_{z1}^{z_n} SS_{z_i, t1; \underline{AB}} - SS_{z_i, t0, \underline{AB}}}{n - k}$$

where n is the size of the subgroup of policies x_i , instruments y_i , and settings z_i and $k \in \{1, 2, \dots, n\}$ is the number of policies, instruments, or settings with $SP_{x_i, t0; \underline{AB}} = SP_{x_i, t1; \underline{AB}} = 1$ ($SI_{y_i, t0; \underline{AB}} = SI_{y_i, t1; \underline{AB}} = 1$ or $SS_{z_i, t0; \underline{AB}} = SS_{z_i, t1; \underline{AB}} = 1$). The difference is weighted not by the number of policy items but with the factor $1/(n-k)$.

Table A3 Indicators and Index Construction

| <i>Indicator</i> | <i>Categories</i> | <i>Value</i> | <i>Scale</i> | <i>Aggregation</i> | |
|-----------------------------------|---|------------------|--------------|---------------------|--------------------|
| | | | | Index // normalised | Cronbachs α |
| Institutional Interlinkage | | | | | |
| Institutional membership | Membership in 35 international institutions | (0/1) | 0 – 35 | | |
| <u>Encompassingness</u> | | | | 0 – 9 // 0 – 1 | 0,8 |
| - Policy areas (1 – 14) | Almost all areas (>10) Many areas (5 – 1) One or few areas (<5) | 3 2 1 | 0 – 3 | | |
| - Scope of environmental issues | All environmental issues Various environmental issues One environmental issue only | 3 2 1 | 0 – 3 | | |
| - Importance of issues | Environmental policy is important, but not the only issue Environmental policy plays a dominant role Environmental policy is not very important | 3 2 1 | 0 – 3 | | |
| <u>Obligatory potential</u> | | | | 0 – 10 // 0 – 1 | 0,6 |
| - Type of law | Supranational law International hard law International soft law | 3 2 1 | 0 – 6 | | |
| - Monitoring | Monitoring by court Specialized monitoring body Reporting Diplomacy | 4 3 2 1 | 0 – 4 | | |
| <u>Communicative potential</u> | | | | 0 – 40 // 0 – 1 | 0,8 |

| | | | |
|-----------------------------------|--|--------------|--------|
| - Frequency of interaction | Number of annual meetings of national representatives | (0,33 – 150) | 0 – 10 |
| - Number of organisational bodies | Organisation bodies where national representative meet | (0 – 10) | 0 – 10 |
| - Permanence of Representation | Existence of permanent national representative | (0/1) | 0 – 10 |
| - Size of staff | Number of permanent employees in environmental departments | (0-574) | 0 – 10 |

Economic Interlinkage

| | | |
|--|---|----------|
| Bilateral trade openness _{ij} | $(Exports_{i \rightarrow j} + Exports_{j \rightarrow i}) / total\ GDP_{i \leftarrow j}$ $\forall i, j \in \{WTO, market\}$ | 0-40.964 |
|--|---|----------|

Other Variables

| | | | | |
|--------------------------|---|-------------------------|-------|-----|
| Cultural similarity | Existence of a common border Sharing of a common language Common historical and religious tradition | (0/1) (0/1) (0/1) | 0 – 3 | 0,7 |
| Level of income | GDP/capita in US \$ | 1158- 45.496 | | |
| Political demand | Electoral success of green parties Membership in parliament Participation in government | (0/1) (0/1) (0/1) | 0 – 3 | 0,8 |
| Population density | persons per sq | 13-466 | | |
| CO ₂ emission | Metric tons per capita | 2-22 | | |

Table A4 Descriptive Statistics of Independent Variables

| <i>Variable</i> | <i>Mean</i> | <i>Std. dev</i> | <i>Min</i> | <i>Max</i> | <i>Bivariate correlation with policy convergence</i> | | | |
|--|-------------|-----------------|------------|--------------|--|--------------|--------------|--------------|
| | | | | | <i>pooled</i> | <i>1970s</i> | <i>1980s</i> | <i>1990s</i> |
| Common EU-Membership | 0.17 | 0.37 | 0 | 1.00 | .21 | .29 | .30 | .09 |
| Common EU- Accession | 0.12 | 0.32 | 0 | 1.00 | .15 | .19 | -.01 | .07 |
| Common Accession to International Institutions, weighted by Obligatory Potential | 13.83 | 8.23 | 0 | 41.65 | .64 | .41 | .59 | .40 |
| Common Membership in International Institutions, ighted by Communicative Potential | 46.47 | 30.77 | 6.53 | 124.82 | .63 | .39 | .50 | -.07 |
| Bilateral Trade Openness | 14.88 | 37.19 | 0 | 409.64 | .20 | .34 | .23 | -.10 |
| Income Difference * Income Level GDP/capita | 348455918.1 | 333690517.9 | -1531.0 | 1439388053.0 | .12 | .27 | .34 | -.01 |
| Cultural Similarity | 0.64 | 0.76 | 0 | 3.00 | .23 | .52 | .37 | -.16 |
| Influence of Green Parties* Difference in Influence | 0.24 | 0.85 | 0 | 4.00 | .31 | - | .18 | .07 |
| CO ₂ -Emissions per capita * Difference in Emissions | 93.47 | 45.91 | 0 | 340 | .00 | .35 | -.09 | .17 |
| Population Density * Difference in Density | 21203.88 | 18317.99 | 0 | 122512.00 | .14 | .11 | .17 | .01 |
| Pre-existing Similarity | 0.16 | 0.14 | 0 | 0.62 | .55 | .32 | .09 | -.12 |

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