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# Can Differences In The Quality of Social Institutions and Social Capital Explain Cross-Country Environmental Performance?

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*Abstract*

Previous empirical work on the effects of social capital on measures of environmental performance across countries has been limited by data on social capital only being available for a relatively small number of countries. This paper makes use of a new data set measuring different dimensions of social institutions, a concept we argue is closely linked to social capital, for a much larger number of countries to analyse the relationship between social institutions and the environment across countries. There is evidence that some aspects of social institutions are associated with better environmental performance.

Keywords: social capital, social institutions, environment, cross-country

JEL Classifications: Z10, Q50

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## 1. Introduction

The Stern Review (Stern et al, 2006, p.i) argues that climate change is the "greatest and widest ranging market failure ever seen". There is little doubt that the issue of climate change has focused attention on the issue of environmental sustainability like never before. In an attempt to provide quantitative measures of a country's level of environmental sustainability, the Center for International Earth Science Information Network (CIESIN) at Colombia University, in collaboration with the World Economic Forum, have compiled an Index of Environmental Sustainability (ESI). This composite index includes data on a large number of variables, classified under 21 headings, including measures of pollution levels (including water and air quality), environmental management efforts, natural resource endowments, the extent of recycling, etc. Higher values of the ESI, which has a range of 0 to 100, indicate higher potential for environmental sustainability. In the 2005 dataset, the highest ESI score is recorded by Finland (75.1) and the lowest score by North Korea (29.2).

Why do some countries have higher levels of environmental sustainability than others? One possible explanation, but one that has received little attention in the cross-country literature, is the role of social capital, or social institutions. Drawing on a newly available data set, this paper empirically analyses the extent to which cross-country differences in social capital, and broader aspects of social institutions, can explain differences in environmental performance across countries.

Two of the most widely cited definitions of social capital are "features of social organisation, such as trust, norms, and networks, that can improve the efficiency of society" (Putnam et al, 1993, p.167) and "trust, cooperative norms, and associations within groups" (Knack and Keefer, 1997, p.1251). At the risk of generalising to some extent, most definitions of social

capital include the notions of trust and reciprocity, a shared set of cooperative norms and networks and/or connectedness between individuals.

These broader notions of social capital are very akin to informal institutions as defined by North. North (1990, p.3) defines institutions as 'the rules of the game in a society or, more formally, [they] are the humanly devised constraints that shape human interaction.' North also distinguishes between the concepts of formal and informal institutions. He defines formal institutions as rules that human beings devise (for example, laws and regulations enacted by governments). Informal institutions on the other hand include conventions, norms and codes of behaviour. As argued by Knowles (2007), in terms of definitions, social capital seems very similar to North's concept of informal institutions. For the remainder of this paper, we use the phrase "social capital" when discussing past work that has used this term, but use the phrase "social institutions" with reference to the data set used in our empirical work.

High levels of social capital and/or high quality social institutions are likely to facilitate co-operation by lowering the cost of collective action. When this cost is lowered, people are more likely to engage in collective activities and less likely to engage in unfettered private actions that have negative environmental effects. There is some evidence from micro data in developing countries that levels of social capital are positively correlated with environmental outcomes (see, for example, Isham et al, 2002; Katz, 2000). At the cross-country level there is only one paper (Grafton and Knowles, 2004) we are aware of that examines the correlation between social capital and environmental performance. Grafton and Knowles find somewhat mixed evidence regarding the relationship between social capital (as proxied by data on generalised trust, norms of cooperation and measures of group membership from the World

Values Survey) and environmental performance. Their empirical work is based on data for a relatively small number of countries, with the sample being dominated by high-income countries.

In this paper we measure social institutions using a number of proxies from a data set recently compiled by the World Bank (Foa, 2008). This data set contains data for over 100 countries, making it possible to analyse the relationship between social capital and other aspects of social institutions and environmental outcomes for a much larger number of countries than has been previously possible. We find evidence of a significant positive relationship between some dimensions of the quality of social institutions and environmental performance.

Section 2 reviews the existing cross-country empirical literature on environmental outcomes. Section 3 describes the social institutions dataset that is used in this study. Section 4 presents arguments as to why different dimensions of social capital/institutions may be correlated with environmental outcomes. Section 5 outlines the empirical model, with the empirical results being presented in Section 6. Section 7 concludes.

## 2. A Review of the Cross-Country Empirical Literature on Social Capital and the Environment

Grafton and Knowles (2004) analyse the relationship between social capital and national environmental performance, as measured by the ESI, for a sample of 35 countries, with their data sample being made up largely of high-income countries. Their social capital data are taken from the third wave of the World Values Survey (Inglehart et al, 2000). They employ three different proxies of social capital: *WVSTRUST*, *WVSCIVIC* and *WVSASSOC*.

WVS*TRUST* measures the proportion of the population who answer "most people can be trusted" to the question "generally speaking do you think that most people can be trusted, or that you can't be too careful in dealing with people?" *WVSCIVIC* is an index measuring the extent to which people think certain behaviours (such as cheating on your taxes, or avoiding a fare on public transport, if you had the chance) can be justified. *WVSASSOC* measures the extent of membership of different voluntary groups (such as church or religious groups and sports clubs). These social capital proxies were first used in cross-country empirical work by Knack and Keefer (1997), in the context of explaining cross-country differences in the rate of economic growth.

Grafton and Knowles find a significant *negative* correlation between both *WVSTRUST* and *WVSASSOC* and the ESI, which is counter to expectations, but a significant positive correlation between *WVSCIVIC* and the ESI. Grafton and Knowles also analyse the relationship between what they term "public social capital" and the environment. Public social capital is proxied by a measure of democratic accountability and a measure of the extent of corruption, both of which in North's typology would be classified as formal institutions. Both proxies are generally insignificant. Of the other control variables they include (such as income per capita, measures of ethnic and religious diversity and population density), only population density (with a negative sign) and income per capita (with a positive sign) are significant in the majority of specifications. Grafton and Knowles (2004, p.366) argue that their "findings provide very little empirical support for the hypothesis that higher levels of social capital and related variables improve cross-national environmental quality", but note that these results should be regarded as preliminary, given the difficulties associated with measuring social capital.

A related literature analyses the effect of democracy on cross-country environmental outcomes. It is possible that in a democracy citizens are more informed about environmental issues (due to freedom of the press, for example) and can express their preferences regarding environmental issues at the ballot box (Payne, 1995). In addition, to the extent that environmental issues often have a long-run focus, and that autocratic leaders are more short-sighted than the median voter, democracies may enjoy better environmental outcomes than non-democracies (Congleton, 1992). A counter argument would be that democratic leaders are often only elected for a few years, while autocratic leaders stay on for decades, thus the incentive would be for the unaccountable democratic leader to make a quick profit by selling natural resources before they are voted out of office – a version of the "tragedy" of the commons. On the other hand, to the extent that democracy is associated with free market economies with little regulation, this may lead to market failures which place pressure on the environment (Neumayer, 2002). Contrary to this, western liberal democracy tends to be associated with clearer and more stable property rights, leading to greater incentives for protection and sustainable use of natural resources. Hence, in theory, democracy could have either a positive or negative effect on environmental performance.

Previous empirical work on the relationship between democracy and the environment across countries is inconclusive, with measures of democracy being positive in some studies and negative in others. There is some evidence that whether democracy has a positive, negative or insignificant effect depends on which environmental outcomes are being explained. Midlarsky (1998) finds a significant negative correlation between democracy and $CO_2$ emissions and soil erosion by both water and deforestation, but a significant positive relationship between protected land area and democracy. Neumayer (2002) finds a significant positive correlation between democracy and environment commitment (as proxied by

whether countries have signed multilateral environmental agreements). Frederiksson et al (2005) find that the number of environmental lobby groups has a negative effect on the lead content of gasoline, but only in countries with a high degree of political competition (as proxied by the percentage of votes not going to the ruling party). Scruggs (1999) finds an index of corporatist political institutions and environmental group membership to be significantly positively correlated with an index of environmental outcomes for a sample of 17 industrialised countries. Torras and Boyce (1998) find that countries with higher levels of political and civil liberties tend to have lower emissions of a number of pollutants, especially in low-income countries.

## 3. The Social Institutions Data

As noted above, previous empirical work on the link between social capital and the environment has been hampered by a lack of data on social capital and social institutions of sufficient quality and cross-country coverage. In our empirical work we proxy for social capital and other aspects of social institutions using six indices recently produced by the social development indicators project of the World Bank (Foa, 2008). These indices combine 200 items, from some 25 sources, into six social institutional clusters: inclusion of minorities (*INCLUSION*), gender equity (*GENDER*), intergroup cohesion (*COHESION*), levels of crime and personal trust (*TRUST*), local community (*COMMUNITY*), and civic engagement (*CIVIC*). For each cluster, items are combined using a latent variables approach, as adopted in the generation of the Worldwide Governance Indicators and Transparency International's Corruptions Perceptions Index (Kaufmann et al 1999, 2007; Lambsdorff 2006). The intuition behind these procedures is that each set of indicators represents some implicit value of the underlying phenomenon in each society, on differing scales, with differing country samples,

and with varying degrees of measurement error. Assuming that errors are uncorrelated across sources, indicators can be combined to reduce the aggregate level of error.

The first cluster, inclusion of minorities (*INCLUSION*), is a measure of discrimination against vulnerable groups such as indigenous peoples, migrants, refugees, or lower caste groups. Items included in this cluster are responses to survey questions such as whether respondents feel discrimination in their society, estimates of economic disparities between ethnic groups, and the proportion of respondents who themselves would discriminate against other ethnicities, religions, or castes.

The second cluster, gender equity (*GENDER*), specifically estimates levels of discrimination against women. Included in this cluster are data on health, educational, and wage-related gender disparities, as well as data on the norms of discrimination that sustain these over time, such as the proportion of managers who believe men have more right to a job than women, or the proportion of parents who believe that boys should be prioritised in access to education.

The third area, inter-group cohesion (*COHESION*), reflects the extent of social conflict among ethnic, religious, or other social identity groups. Unlike the inclusion measure, which evaluates latent discrimination against salient identity groups in society, *COHESION* uses data on overt conflict, such as ratings on the level of ethnic and religious tensions, or the number of riots, assassinations, and acts of terrorism.

The fourth area, crime and personal trust (*TRUST*), is an enhanced measure of general social trust, and brings together standard social trust items with data on the "trustworthiness" of others, based on criminal and related activity.

The fifth area, strength of community (*COMMUNITY*) measures the level of engagement in local associations and networks. Strength of community is measured using data on levels of engagement in local voluntary associations, time spent socializing in community groups, and membership of developmental organizations.

Finally, the sixth area is the level of civic engagement (*CIVIC*), which measures the extent to which social practices encourage a more active and critical interaction with political authorities. The strength of civil society is measured using survey data on participation in civic activities such as petitions or marches, access to media through newspaper and radio, and the density of international civil society organizations. Civic engagement differs from measures of formal political institutions, such as the *DEMOC* measure produced as part of the Polity dataset, as it measures the specifically social practices and norms that 'make democracy work'. These informal institutions include a high level of civic informedness regarding political debates and policies, a willingness among citizens to express their views through civic forums such as community meetings or the press, and mobilisation to place pressure on officials to deliver better public services, for example via protest or petition. Studies such as Putnam et al. (1993) have identified these practices as essential for maintaining government efficacy, in addition to the existence of formal rules such as elections and constitutional guarantees of civil liberties, which are measured by the *DEMOC* variable.

The premise behind the construction of each of these indices is that they constitute measures of social institutions, understood as the informal norms and conventions that pattern human interaction (North 1990). Because this encompasses a wide range of human customs and

practices, from among the universe of total possible institutions, these six clusters have been chosen as they constitute *social institutions*, that is, the set of institutions which lead to gains in public welfare by i) improving allocative efficiency, ii) reducing transaction costs, and iii) enabling collective action. The first two clusters, *INCLUSION* and *GENDER*, capture the allocative aspect, by measuring the extent to which all individuals within a society are able to participate equally in social and economic opportunities, without discrimination based on religion, ethnicity, caste, or gender, and thereby make the fullest use of their knowledge of skills. The second two clusters, *COHESION* and *TRUST* capture the contribution of social institutions to transaction costs, by measuring the extent to which cooperation among actors requires additional monitoring and enforcement of contracts. Finally, the clusters for *COMMUNITY* and *CIVIC* capture the contribution of social institutions to the possibility of collective action, whether within a community, or between the public at large and providers of public goods and services, in the form of the state.

**4. The Relationship Better Social Institutions and the Environment**

In this section of the paper we present arguments as to why higher quality social institutions may be beneficial for environmental outcomes. In doing so we refer to the six dimensions of social institutions measured by the World Bank social development indicators project.

It was suggested in Section 3 that *INCLUSION* and *GENDER* can be thought of as proxies for the extent that different groups are able to participate in society, with *INCLUSION* measuring the extent to which minority groups are able to participate, and *GENDER* focusing on participation of women. *COHESION* and *TRUST* can be thought of as measuring the extent of trust and norms of reciprocity and cooperation within society. Finally, *COMMUNITY* and

*CIVIC* can be conceived as measuring the possibilities for collective action, with *CIVIC* measuring the extent of political engagement and *COMMUNITY* the extent of engagement with more localised institutions.

### *4.1 Participation (GENDER and INCLUSION)*

We noted in Section 3 that when all members of society are able to participate fully in that society, making use of the skills and knowledge set that they have, that this is likely to improve allocative efficiency within society. If some groups within a society could potentially contribute to improved environmental outcomes, but are excluded from active participation in that society, then this will obviously have a negative environmental impact. Hence we would expect a positive correlation between our measures of participation and environmental outcomes.

A growing literature supports the view that societies with greater gender inclusion may achieve better environmental outcomes. Especially in rural areas of developing countries, rural women depend on communal resources for subsistence needs, due to the lack of access to private land, employment, and other productive assets (Agrawal, 1994). Prasal et al (1987) attribute this close relationship to necessity. Based on their four village study in rural Nepal, they report that women have a more responsible attitude towards forests than men because it plays an important role in their daily lives. As female children and women are responsible for collecting firewood and fodder, additional hardship they and their children would face as a result of depleted forests would motivate them to become more responsible than their male counterparts. Thus, the division of labor within the household and women's responsibility towards procuring resources such as water, fuel and wood, make women both more dependent on common property resources and at the same time more vulnerable to the

negative externalities of natural resource degradation (Manion, 2002). Forest protection movements such as "Chipko", in what is now known as the Uttarakhand Hills in India, in which women play a major role, confirm women do understand vulnerabilities and can mobilize and demonstrate in favor of environmental protection, if needed (Karan, 1994).

Molinas (1998) in an empirical study drawing on data from 104 peasant cooperatives in Paraguay, finds that the degree of cooperation within these cooperatives increases with the level of female membership. Turning to groups concerned specifically with the environment, Westermann et. al., (2005) compare the performance of 46 natural resource management (NRM) groups across 20 countries in Latin America, Africa and Asia. They find that women's groups tend to behave more collaboratively and have greater capacity to sustain collective action than groups made up entirely of men, or mixed groups containing both men and women.

The arguments summarised above suggest that women may be more conscious of environmental issues than men. If this is true, then we would expect that excluding women from full participation in decision making will have a negative effect on environmental measures.

### *4.2 Trust, Cooperative Norms and Reciprocity (COHESION and TRUST)*

People are more likely to act in the common interest when they have a high degree of trust in others. Even the slightest doubt in the mind of people that others in their community are not trustworthy will result in the breakdown of cooperative norms, including those with respect to the environment. High degrees of trust and cooperation also reduce transactions costs, making it easier to resolve collective action problems.

Katz (2000) details a number of informal rules and norms that have evolved to govern the use of communally owned forests in the Western Highlands region of Guatemala. For example, many communities allow members the unrestricted right to gather fallen trees and branches for firewood, as long as the wood is only for the use of their family, but the felling of a live tree requires the authorisation of a local committee. The existence of such norms presupposes either a high degree of trust that others will adhere to these norms, or sanctions against those who fail to adhere to the norms. The trust required for cooperative norms to be sustained may well be the result of intergroup cohesion, which may itself result from the density of local networks.

### *4.3 Possibilities for Collective Action (COMMUNITY and CIVIC)*

Theoretically, given that most environmental resources are common property resources, their sustainable use and protection requires collective action. That is, one would expect *a priori* that communities with higher quality institutions that promote collective action would do better on environmental management. This theoretical argument is supported by micro-evidence. For example, based on case studies in Sri Lanka and Indonesia, Isham (2002) demonstrates that differences in social capital can explain differences in indicators of environmental quality, such as access to clean water, and suggests that investment in social capital should be considered alongside potential investment in physical and human capital during the planning of development projects. Also in Sri Lanka, research by Uphoff and Wijayaratna (2000) shows that cooperation between rural farmers over sharing access to water can lead to an increase in agricultural yield even in the drought season.

Gebremedhin et. al. (2003) empirically demonstrate that connectedness in the community, in the sense of the extent to which members of the community interact with each other, plays an important role in redressing resource degradation and increasing community wealth. Katz (2000) finds that open access resources are much better managed in the Western Highlands region of Guatemala, where she argues social capital is high, than in the El Petén region, where the level of social capital is lower. She suggests (p.121) that "where social capital exists among natural resource users, it fosters a sense of ownership and respect for boundaries, and provides the foundation for use rules, monitoring, and enforcement mechanisms which helps preserve the natural resource base. In contrast, an absence of social capital in a situation where property rights is poorly defined can lead to resource mining in both private and common property regimes."

As argued in Section 3, *COMMUNITY* and *CIVIC* capture the contribution of social institutions to the possibility of collective action. When there is a high degree of engagement with the local community (*COMMUNITY*), be it through formal or informal networks, this is likely to make it easier to resolve collection action problems, such as the management of common property resources or internalising externalities that are localised in nature. Dealing with these issues at a national level requires a high degree of engagement with political authorities (*CIVIC*).

## 5. The Empirical Model

The previous section of the paper presented arguments as to why we might expect a significant positive association between higher quality social institutions, as measured by the social development indices, and environmental performance. There is evidence of such a

relationship at the micro level. The key focus of this paper is whether differences in social institutions can explain *cross-country* differences in environmental performance. This section of the paper gives details of our cross-country empirical model, with the empirical results being presented in the next section.

The equation to be estimated is given by:

$$(1) \qquad ESI_i = \alpha + \beta_1 SOC_i + \beta_2 INDUST_i + \beta_3 lnPOP_i + \beta_4 DEMOC_i + \beta_5 GDP_i + \beta_6 GDP^2_i + e_i$$

Where *ESI* is the Environmental Sustainability Index and *SOC* is an indicator of social institutions. In addition we include a number of control variables: *INDUST* is the share of industry in GDP, *POP* is population density, *DEMOC* is a measure of the extent of democracy, *GDP* is GDP per capita measured in international dollars, *e* is the country-specific error term and *i* is country i. Full definitions of all variables, and information on data sources are given in the appendix. To avoid potential problems with multicolinearity, we include only one of the six measures (*CIVIC*, *GENDER*, *COMMUNITY*, *CRIME*, *COHESION*, *INCLUSION*) at a time. We also construct an index of social development (*SDINDEX*) by calculating the average of the six measures of social institutions, for the countries that have data on all six measures.

Our dependent variable is the Environmental Sustainability Index (ESI) for 2005. Our choice of control variables is largely guided by past cross-country empirical work on environmental outcomes (see, for example, Grafton and Knowles, 2004; Midlarsky, 1998). *GDP* and $GDP^2$ are included to control for the possibility of an environmental Kuznets curve. The environmental Kuznets curve hypothesis posits that there is an inverted-U relationship

between environmental degradation and income per capita (see, for example, Dasgupta et al, 2002; Torras and Boyce, 1998), implying a U-shaped relationship between income per capita and the ESI. It also seems likely that countries that are more densely populated are likely to suffer from more environmental pressure, all else equal. Hence, we include the log of population density as a control variable. We also include industry value added as a share of GDP (*INDUST*) to control for the possibility that industrial activity places more pressure on the environment than does either the agricultural or services sectors of the economy. Reasons for including *DEMOC* were discussed in Section 2.

## 6. Empirical Results

The empirical results obtained from OLS estimation of equation (1) are reported in Table One, with each column of the table including a different social institutions measure. Preliminary testing suggested some problems with heteroscedasticity, hence the t-statistics reported are based on heteroscedasticity-consistent standard errors, following White (1980). *CIVIC* and *GENDER* are both significant at the five percent level, with the expected positive sign. The remaining four social capital indicators are all statistically insignificant. The social development index, which is an average of the six measures of social institutions, is positive and statistically significant at the ten percent level.

[Table One about here]

Turning to the results for the other control variables, population density is negative and significant at the one percent level in all specifications, confirming that densely populated countries tend to have poor environmental outcomes, all else equal. The democracy variable is positive and significant in most specifications, suggesting more democratic countries have

higher levels of environmental sustainability, all else equal. *GDP* and $GDP^2$ are generally insignificant and *INDUST* is insignificant in all specifications. The $R^2$ ranges from 0.483 to 0.605, depending on which of the social capital measures are included. Hence, approximately half of the cross-country variation in the ESI can be explained by the variables included in our regression model.

The significance of some of the non-social institutions right-hand-side variables varies across the columns. There are two possible reasons for this. The first is that it really does matter which form of social institutions is included in the regression equation. An alternative explanation is that the results are sensitive to which countries are included in the regressions. The sample size varies from 68 countries (Columns (iii) and (vii)) to 113 (Column (ii)). This is a direct result of the fact that data are available for more countries for some of the social institutions measures than others.

It seems important, therefore, to check whether the results reported in Table One are sensitive to the country sample. We test for this in two different ways. The first is to omit influential observations from the sample, and the second is to re-estimate the Table One results for a common sample of 68 countries. The results obtained when influential observations are omitted are reported in Table Two. Influential observations were identified by calculating the RSTUDENT, or studentised residual, statistic for each observation. Using the cut-off of an absolute value of 2 suggested by Belsley, Kuh and Welsch (1980) a small number of observations were identified as being influential, with some variation across columns. The notes to Table Two state which observations were identified as influential on this basis. Just because an observation is influential does not necessarily mean it should be omitted from the

sample, but it is informative to check whether the results obtained in Table One are robust to these countries being omitted.

[Table Two about here]

The results reported in Table Two closely mirror those in Table One. Of most interest are the coefficients on the social institutions variables. The same three social institutions variables are significant as in Table One, although note that *GENDER* is now significant at the one percent level; previously it was significant at the five percent level. These results imply that the results reported in Table One were not unduly influenced by a small number of influential observations.

The results for the common sample of 68 countries are reported in Table Three. The same three social capital variables are significant, with the same sign, as in Tables One and Two. Hence the finding that *CIVIC* and *GENDER* (and the *SDINDEX*) are positively correlated with the ESI, but that the other measures of social capital are not, appears robust to changes in the sample. The key difference between the Table Three results and those reported in Tables One and Two is that $GDP^2$ is now significant, with a negative sign, in all specifications. *GDP*, however, is significant only in Column (ii) but is close to being statistically significant in Column (i) and especially Column (vii). Hence there is some evidence of an environmental Kuznets curve in the data. However, based on the coefficients obtained, the turning point where increases in income per capita will lead to improvements in the ESI occurs at a level of income per capita above $150,000. Hence, there are no countries anywhere near the point where increases in per capita income will be associated with improvements in the ESI.

[Table Three about here]

As a final test of the robustness of our results, we rerun the regressions reported in Table One, but add the Gini coefficient as an additional explanatory variable. Some of the social institutions measures incorporate different types of inequality (for example between the genders or between minority groups and the rest of society). It is possible, therefore, that if these variables are significant, this is merely due to the fact that both social institutions and the ESI are correlated with income inequality. We use Gini coefficient data on inequality of income or consumption (*GINI*) from the World Development Indicators. These data are not available for all countries, which reduces our sample size.[1] The results from including *GINI* are reported in Table Four and are qualitatively similar to those in Table One, with *GENDER* and *CIVIC* remaining statistically significant in explaining the ESI. The social development index (*SDINDEX*), however, is now statistically insignificant, although it is close to being significant at the ten percent level (p-value = 0.123). The Gini coefficient is statistically insignificant in all specifications.

[Table Four about here]

The four tables of results discussed above imply that some forms of social capital are more important that others for explaining environmental performance. The positive correlation between *GENDER* and *ESI* may be evidence that women tend to be more protective of the environment than are men, which means that in countries where women have a greater say in society this translates into better environmental performance. *GENDER* is measured on a 0-1

[1] This reduction in sample size is the reason why we did not include a measure of income inequality in our main regressions reported in Tables One to Three.

scale, as are all the social institutions measures. The coefficient on *GENDER* ranges from 14.654 (Table One) to 28.237 (Table Three). Hence a one standard deviation (0.12 point) increase in *GENDER* is associated with an increase in the ESI of between 1.76 and 3.39 percentage points (recall the ESI is measured on a 0-100 scale).

Turning to *CIVIC*, the positive and statistically significant coefficient on this variable implies that the ESI will be higher in countries where citizens are engaged in the political process. A one standard deviation (0.09) increase in *CIVIC* is associated with an increase in the ESI of between 1.74 and 2.01 percentage points, depending on which coefficient for *CIVIC* is considered the most reliable.

The level of democracy (*DEMOC*) is significantly positively correlated with the ESI in nearly all regressions run. Interestingly, it is only insignificant when *CIVIC* is included as the social institutions measure. Recalling that *CIVIC* proxies the extent to which citizens are engaged in the political process, it could be that this is more important for explaining environmental outcomes than is whether a country is democratic or not. However, the two variables are highly correlated, with a simple correlation coefficient of 0.667, hence multicollinearity between these two variables is a potential problem.

The variable that is the most consistently correlated with the ESI across the three tables of results is the population density variable. This variable has also been the most significant variable in other cross-country studies of environmental performance (e.g. Grafton and Knowles, 2004). The coefficient on ln*POP* typically has a value in the region of -3.50, implying a one standard deviation (1.18 point) reduction in ln*POP* is associated with an increase in the ESI of 4.13 percentage points.

## 7. Conclusions

This paper has analysed whether different dimensions of social institutions can explain cross-country differences in environmental performance, using social institutions data produced by the World Bank. Grafton and Knowles (2004) found that a measure of civic norms was significantly positively correlated with the ESI, but that measures of trust and group memberships were not. We find evidence that other forms of social capita/institutions are also correlated with environmental performance, for a much larger sample of countries. More specifically, we find that proxies for gender inclusiveness and civic engagement are important in explaining cross-country differences in the ESI. Our results also confirm the finding of several other studies that more densely populated countries tend to have worse environmental records. *CIVIC* appears more important than the level of democracy in explaining cross-country differences in the ESI.

The title of this paper asks whether differences in social capital and social institutions can explain cross-country differences in environmental performance. Our empirical results suggest that the answer is yes, for some types of social institutions. Taken at face value, our empirical results suggest that countries in which women fully participate in society, and in which citizens are more engaged in the political process, perform better environmentally, as measured by the Environmental Sustainability Index.

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**Table One: Determinants of the Environmental Sustainability Index (ESI) for all available data**

| | Social Capital Measure | | | | | | |
|---|---|---|---|---|---|---|---|
| | (i) *CIVIC* | (ii) *GENDER* | (iii) *COMMUNITY* | (iv) *CRIME* | (v) *COHESION* | (vi) *INCLUSION* | (vii) *SDINDEX* |
| Social Capital Measure | 22.315** (2.39) | 14.654* (2.57) | -4.526 (-0.62) | -3.512 (-0.31) | 6.826 (1.38) | 3.244 (0.61) | 34.536* (1.95) |
| *INDUST* | -0.064 (-1.41) | -0.080 (-1.61) | -0.079 (-1.37) | -0.056 (-0.95) | -0.068 (-1.32) | -0.034 (-0.69) | -0.051 (-0.85) |
| ln*POP* | -3.514*** (-7.62) | -3.046*** (-5.60) | -3.817** (-6.75) | -3.267*** (-5.43) | -2.812*** (-4.96) | -3.097*** (-6.23) | -3.701*** (-7.10) |
| *DEMOC* | 0.260 (1.19) | 0.474* (2.32) | 0.707* (2.58) | 0.628*** (2.75) | 0.631*** (2.98) | 0.920*** (4.49) | 0.705*** (2.73) |
| *GDP* | 0.00003 (0.12) | -0.0001 (-0.50) | -0.0003 (-0.86) | 0.0001 (0.56) | 0.00004 (0.15) | -0.0001 (-0.44) | -0.0005 (-1.66) |
| $GDP^2$ | 1.34E-09 (0.18) | 1.20E-08 (1.47) | 1.68E-08* (1.96) | 6.14E-09 (0.78) | 7.34E-09 (0.88) | 9.82E-09 (1.32) | 1.48E-08** (2.12) |
| Constant | 55.022*** (13.97) | 55.380*** (16.48) | 66.185*** (17.90) | 62.976*** (6.66) | 54.860*** (11.31) | 57.553*** (16.89) | 48.870*** (5.43) |
| $R^2$ | 0.556 | 0.504 | 0.577 | 0.502 | 0.483 | 0.529 | 0.605 |
| N | 99 | 113 | 68 | 103 | 110 | 97 | 68 |

Notes: heteroscedasticity-consistent t-statistics are given in parentheses. ***, ** and * indicate significance at the 1 percent, 5 percent and 10 percent levels respectively (on the basis of a two-tailed test). N denotes the sample size. Variable abbreviations are as defined in the text.

**Table Two: Determinants of the Environmental Sustainability Index (ESI) with Outliers Omitted**

| | Social Capital Measure | | | | | | |
|---|---|---|---|---|---|---|---|
| | (i) *CIVIC* | (ii) *GENDER* | (iii) *COMMUNITY* | (iv) *CRIME* | (v) *COHESION* | (vi) *INCLUSION* | (vii) *SDINDEX* |
| Social Capital Measure | 19.339* (2.19) | 17.886*** (4.01) | -4.431 (-0.62) | -7.074 (-0.69) | 2.984 (0.71) | -2.608 (-0.60) | 26.312* (1.68) |
| *INDUST* | -0.065 (-1.44) | -0.074 (-1.66) | -0.081 (-1.43) | -0.013 (-0.27) | -0.085* (-1.70) | -0.055 (-1.12) | -0.058 (-1.00) |
| ln*POP* | -3.552*** (-9.17) | -3.415*** (9.03) | -3.644*** (-7.00) | -3.295** (7.55) | -3.370*** (-7.66) | -3.319*** (-8.34) | -3.697*** (7.37) |
| *DEMOC* | 0.306 (1.60) | 0.393* (2.45) | 0.598** (2.34) | 0.655*** (3.79) | 0.572*** (3.30) | 0.739*** (3.99) | 0.678*** (2.79) |
| *GDP* | -0.00006 (-0.28) | -0.0004 (-1.63) | -0.0003 (-0.89) | 0.00001 (0.05) | 1.66E-06 (0.01) | -0.00003 (-0.13) | -0.0005** (-2.14) |
| $GDP^2$ | 6.15E-09 (1.00) | 1.87E-08*** (3.06) | 1.76E-08** (2.11) | 9.23E-09 (1.27) | 8.63E-09 (1.10) | 1.10E-08 (1.46) | 1.84E-08*** (2.97) |
| Constant | 56.464*** (15.98) | 57.028*** (22.20) | 65.860*** (17.85) | 65.653*** (7.57) | 60.597*** (15.04) | 61.098*** (23.99) | 53.296*** (6.47) |
| $R^2$ | 0.610 | 0.612 | 0.590 | 0.534 | 0.511 | 0.535 | 0.622 |
| N | 96 | 106 | 67 | 98 | 105 | 93 | 66 |

Notes: Belgium, Mongolia and Uruguay are excluded from Column (i), Belgium, Mauritania, Mongolia, Sudan, Trinidad and Tobago, Uruguay and Uzbekistan from Column (ii), Uruguay from Column (iii), Finland, Mongolia, Sudan, Trinidad and Tobago and Uruguay from Column (iv), Finland, Mauritania, Mongolia, Sudan and Uruguay from Column (v), Finland, Mauritania, Sudan and Uruguay from Column (vi) and Mozambique and Uruguay from Column (vii). See also notes to Table One.

**Table Three: Determinants of the Environmental Sustainability Index (ESI) for Common Sample of Countries**

| | Social Capital Measure | | | | | | |
|---|---|---|---|---|---|---|---|
| | (i) *CIVIC* | (ii) *GENDER* | (iii) *COMMUNITY* | (iv) *CRIME* | (v) *COHESION* | (vi) *INCLUSION* | (vii) *SDINDEX* |
| Social Capital Measure | 20.646* (1.77) | 28.237*** (3.94) | -4.526 (-0.62) | 1.109 (0.06) | 3.099 (0.57) | 5.643 (0.92) | 34.536* (1.95) |
| *INDUST* | -0.061 (-0.99) | -0.037 (-0.70) | -0.079 (-1.37) | -0.081 (-1.37) | -0.074 (-1.22) | -0.075 (-1.31) | -0.051 (-0.85) |
| ln*POP* | -3.916*** (-7.58) | -3.726*** (-7.31) | -3.817*** (-6.75) | -3.892*** (-6.42) | -3.795*** (-7.02) | -3.726*** (-7.01) | -3.701** (-7.10) |
| *DEMOC* | 0.660** (2.41) | 0.616** (2.46) | 0.707** (2.58) | 0.701** (2.38) | 0.717** (2.49) | 0.673 (2.60) | 0.705*** (2.73) |
| *GDP* | -0.0004 (-1.47) | -0.0008*** (-2.98) | -0.0003 (-0.86) | -0.0002 (-0.72) | -0.0002 (-0.80) | -0.0003 (-0.92) | -0.0005 (-1.66) |
| $GDP^2$ | 1.16E-08* (1.68) | 2.73E-08*** (4.17) | 1.68E-08* (1.96) | 1.42E-08** (2.05) | 1.56E-08* (1.99) | 1.33E-08* (1.88) | 1.48E-08** (2.12) |
| Constant | 56.932*** (10.41) | 53.516*** (12.12) | 66.185*** (17.90) | 64.303*** (4.25) | 63.089*** (12.40) | 63.590*** (16.63) | 48.870*** (5.43) |
| $R^2$ | 0.594 | 0.653 | 0.577 | 0.575 | 0.576 | 0.582 | 0.605 |
| N | 68 | 68 | 68 | 68 | 68 | 68 | 68 |

Notes: See notes to Table One.

**Table Four: Determinants of the Environmental Sustainability Index (ESI) with Gini Coefficient as an Explanatory Variable**

| | Social Capital Measure | | | | | | |
|---|---|---|---|---|---|---|---|
| | (i) *CIVIC* | (ii) *GENDER* | (iii) *COMMUNITY* | (iv) *CRIME* | (v) *COHESION* | (vi) *INCLUSION* | (vii) *SDINDEX* |
| Social Capital Measure | 22.467** (2.01) | 15.144** (2.58) | 0.685 (0.09) | -2.093 (-0.18) | 2.277 (0.51) | 1.161 (0.20) | 27.559 (1.56) |
| *INDUST* | -0.026 (-0.51) | -0.026 (-0.56) | -0.058 (-0.90) | -0.011 (-0.23) | -0.018 (-0.35) | 0.004 (0.09) | -0.035 (-0.56) |
| ln*POP* | -3.526*** (-5.83) | -2.783*** (-4.33) | -4.570*** (-6.52) | -3.324*** (-5.05) | -2.925*** (-4.41) | -3.521*** (5.63) | -4.302*** (-6.94) |
| *DEMOC* | 0.264 (1.04) | 0.420* (1.75) | 0.817*** (2.76) | 0.563** (2.32) | 0.563** (2.32) | 0.894*** (4.02) | 0.795*** (2.76) |
| *GDP* | -4.94E-06 (-0.02) | -0.00008 (-0.28) | -0.0002 (-0.57) | 0.0002 (0.86) | 0.0002 (0.61) | -0.00007 (-0.26) | -0.0004 (-1.34) |
| $GDP^2$ | 3.64E-09 (0.51) | 1.27E-08 (1.61) | 1.30E-08 (1.44) | 5.18E-09 (0.69) | 6.17E-09 (0.78) | 1.02E-08 (1.39) | 1.38E-08* (1.87) |
| *GINI* | 0.041 (0.50) | 0.093 (1.15) | -0.085 (-0.90) | 0.042 (0.43) | 0.066 (0.76) | -0.005 (-0.06) | -0.055 (-0.57) |
| Constant | 52.208*** (7.58) | 48.690*** (8.77) | 70.415*** (12.25) | 59.230*** (4.75) | 53.773*** (8.69) | 59.086*** (10.49) | 55.827*** (5.71) |
| $R^2$ | 0.574 | 0.538 | 0.609 | 0.545 | 0.512 | 0.558 | 0.627 |
| N | 87 | 96 | 63 | 92 | 94 | 87 | 63 |

See notes to Table One. *GINI* is the Gini coefficient.

**Appendix: Data Definitions and Sources**

*CIVIC* A composite index measuring the extent to which social practices encourage a more active and critical interaction with political authorities. For this cluster, 31 items have been taken from 8 independent sources, yielding sufficient data to rate 181 separate countries: the average number of items per country rated is 7.7. (Source: Foa, 2008).

*COHESION* A composite index measuring the extent of social conflicts among ethnic, religious, or other social identity groups. For this cluster, 21 items have been taken from 9 independent sources, yielding sufficient data to rate 159 separate countries: the average number of items per country rated is 11.2. (Source: Foa, 2008).

*COMMUNITY* A composite index measuring the level of engagement in local associations and networks. For this cluster, 41 items have been taken from 5 independent sources, yielding sufficient data to rate 87 separate countries: the average number of items per country rated is 17.3. (Source: Foa, 2008).

*CRIME* A composite index measuring the level of general social trust. Included in this subindex are data on citizens' trust in their society, neighbors, and community, together with data on crime victimization and estimates of homicide and other forms of general interpersonal aggression. For this cluster, 41 items have been taken from 11 independent sources, yielding sufficient data to rate 158 separate countries: the average number of items per country rated is 12.9.

| | |
|---|---|
| *DEMOC* | A measure of institutionalized democracy, understood as three essential, interdependent elements. One is the presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders. Second is the existence of institutionalized constraints on the exercise of power by the executive. Third is the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation. Other aspects of plural democracy, such as the rule of law, systems of checks and balances, freedom of the press, and so on are means to, or specific manifestations of, these general principles. The *DEMOC* indicator is an additive eleven-point scale, ranging from 0-10 (Source: Polity IV, 2004). |
| *ESI* | Environmental Sustainability Index for 2005. The ESI is a composite index of environmental measures compiled by the Centre for International Earth Science Information Network (CIESIN) at Colombia University in collaboration with the World Economic Forum. (Source www.yale.edu/esi/). |
| GENDER | A composite index measuring the level of discrimination against women. For this cluster, 24 items have been taken from 6 independent sources, yielding sufficient data to rate 185 separate countries: the average number of items per country is 12.5. (Source: Foa, 2008). |

| | |
|---|---|
| GINI | The Gini coefficient for income or consumption, measured for 2005, or the nearest available year. (Source, World Development Indicators, 2007). |
| *GDP* | The GDP per capita at purchasing power parity (PPP) in 2005, in constant 2000 US dollars (Source: World Development Indicators, 2007). |
| *INCLUSION* | A composite index measuring discrimination against vulnerable groups such as indigenous peoples, migrants, refuges or lower caste groups. For this cluster, 29 separate items have been taken from 5 independent sources, yielding sufficient data to rate 135 separate countries: the average number of items per country is 10.5. (Source: Foa, 2008). |
| *INDUST* | Industry in value added, as a percentage of GDP. Includes value added in mining, manufacturing, construction, electricity, water and gas (Source: World Development Indicators, 2007). |
| *lnPOP* | Natural logarithm of population density in 2005. Population density is midyear population divided by land area in square kilometres (Source: World Development Indicators, 2007). |