# Trust, Cooperation, and Implementation of Sustainability Programs: The Case of Local Agenda 21

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Abstract

This paper provides evidence of the role of trust in ensuring desirable economic outcomes. We examine the implementation of Local Agenda 21, a regional sustainability initiative that requires the coordination of diverse decision-makers, in a sample of 67 developing and industrialized countries. We use a game theoretic framework to motivate our empirical study of the number of Local Agenda 21 programs implemented across countries. We find that, once a threshold level of trust is reached, higher levels of aggregate trust are associated with more communities adopting a program that requires coordination of multiple stakeholders. We also find that more programs are adopted when the country's institutional structure may reduce the cost of coordination and when the benefits of the program, measured by environmental quality, would be expected to be greater.

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## 1 Introduction

Recent contributions to the economics literature have emphasized the role of culture in influencing economic outcomes. (See for example, Guiso, Sapienza and Zingales, 2006; Fernandez and Fogli, 2005; or Stulz and Williamson, 2003.) Because trust can facilitate economic transactions in an efficient and cost-effective manner, this has been one aspect of culture that has received particular attention. In a seminal paper, Knack and Keefer (1997) found some evidence that countries with higher levels of trust have higher levels of investment, possibly due to the reduced need for costly contracts and regulations. Following on this work, several others have examined trust and its ability to substitute for high quality institutions. See, for example, Knack and Zak (2001); Glaeser, Labson, Sheinkman and Soutter (2000); or La Porta, Lopez-de-Silanes, Schleifer, and Vishny (1997).

In this paper, we provide additional empirical evidence of the importance of trust in ensuring desirable economic outcomes. We present a stylized one-shot coordination game and develop hypotheses that we test in a sample of 67 developing and industrialized countries. In particular, we examine the implementation of Local Agenda 21, an initiative that focuses on regional sustainable development projects and requires the coordination of diverse decision-makers. We find that a country's level of trust is an important determinant of the number of communities that implement such sustainability efforts.

Our work contributes to three areas of research. First, it relates to the literature examining how social capital influences economic outcomes in general and environmental attitudes, behavior and outcomes in particular. Pretty and Ward (2001) argue that social and human capital are critical for environmental outcomes and discuss case studies that show how collective action can help improve environmental quality. Owen and Videras (2006) uncover a finding consistent with this when they examine the relationship between individual attitudes towards free-riding behavior and environmental attitudes and show that, in low-income countries, civic-minded behavior is particularly important in generating pro-environment attitudes. In contrast, Grafton and Knowles (2004) focus on environmental quality outcomes and find little evidence that national measures of social capital influence a country's environmental performance.

A closely related and growing literature explores the role of social capital in natural resources management. For example, Hodler (2006) develops a model and provides some empirical evidence that ethnic fractionalization is a cause of the resource curse because fractionalization leads to increased fighting between rival groups, less productive activity and weaker property rights. Similarly, Torvik (2002) considers how abundance of natural resources encourages unproductive rent-seeking behavior.

We contribute to the literature on culture and the environment by examining the determinants of cross-country adoption of sustainable development policies. We expect the link between social capital and policy adoption to be stronger than the link between environmental outcomes and social capital, as in Grafton and Knowles (2004), because environmental quality is the result of complex interactions between policies and technological and structural factors. In addition, social capital is particularly relevant for sustainable development policies that involve a diversity of policy goals (economic, ecological, and social) and thus require the coordination of multiple decision-makers with diverse preferences (Boulanger and Bréchet, 2005). Indeed, we find strong and robust empirical evidence that a country's level of trust is a determinant of how many communities implement Local Agenda 21, an initiative that requires local authorities to engage and consult with multiple community constituencies.

The second strand of literature to which our work contributes focuses on endogenous policy formation. Fredriksson, Neumayer, Damania, and Gates (2005) examine lead content in gasoline for 104 developing and industrialized countries. The authors find weak results for the influence of environmental advocacy groups and political participation but a strong effect of political competition. Damania, Fredriksson, and List (2003) also study the determination of lead content per gallon of gasoline in a panel of 48 developing and developed countries. Their findings indicate that trade and government honesty increase environmental stringency. Fredriksson, Mani, and Wollscheid (2006) present results from cross-country analyses of 90 developing countries using a policy assessment index from the World Bank. The authors examine how the level of centralization of decision making influences "environmental capacity" and find that federalism has a negative effect on environmental capacity but this effect is reduced as trade intensity/openness increases.

Our work departs from these studies in that we examine the determination of policies that are implemented at the municipal level and, thus, are likely driven by additional factors than those influencing federal environmental stringency. To the extent that the practice of environmental policy shifts from federal to local authorities, our analysis is a first step in understanding whether appeals to local communities to set their own policy goals are likely to be successful.

Finally, this paper provides additional empirical evidence on the role of trust in coordination games. For example, Cabon-Dhersin and Ramani (2004) show how trust influences the probability of R&D cooperation, while Van Huyck, Battalio, and Beil (1990) use experimental evidence to show that coordination failure can result from players attributing too much risk to the payoff-dominant equilibrium because of uncertainty regarding the other players' actions.

In what follows, we first provide more detail on the Local Agenda 21 program, then we develop a simple theoretical framework that guides the empirical analysis of the adoption of the Local Agenda 21 programs, present our empirical results, and conclude.

## 2 Local Agenda 21

The United Nations Conference on Environment and Development (UNCED) that took place in Rio de Janeiro in 1992 called for international cooperation to reverse the trend in global climate change. The 1992 UNCED, also known as the Earth Summit, approved four treaties: the Rio Declaration, the Forest Principles, the Biodiversity Treaty, and Agenda 21. Agenda 21 is a global plan promising countries international help to design and implement strategies to reduce emissions of greenhouse gases. Chapter 28 of Agenda 21 proposes Local Agenda 21 (LA21).

LA21 is a decentralized initiative that focuses on the role of local governments in the implementation of regional sustainability programs. The overall goal of LA21 is to engage multiple stakeholders within a community in sustainability decision making through participatory target setting and assessment. As determined by the International Council for Local Environmental Initiatives (ICLEI), LA21 municipalities must fulfill several criteria: (1) the process must include the participation of multiple constituencies in the community, (2) stakeholders need to reach a consensus regarding social,

environmental, and economic objectives, (3) the process must provide a forum for discussion and overseeing, (4) the process must include a long-term action plan, and (5) the process must establish a framework for reporting and monitoring (ICLEI, 2002).

The goals that LA21 communities have set address water resource management, transportation, air quality, energy management, and solid waste reduction, among others. Community development and the alleviation of poverty are additional goals that some communities integrate into their plans. Although local governments (cities, towns, or counties) generally lead the efforts toward the implementation of LA21, community groups, NGOs, businesses, universities, or even individuals, have also acted as the driving force (ICLEI, 2002). Independent of who acts as the leader, LA21 initiatives require participatory assessment and decision-making. This emphasis on encouraging and enabling participation by multiple stakeholders is a manifestation of the diversity of policy goals that sustainable development entails and of the interest that policymakers and social scientists express for including procedural justice as a criterion in decision making at the local, national, and international level (Paavola and Adger, 2006).

Although there are case studies that examine the performance of some LA21 programs (Southey, 2001; Evans and Theobald, 2003; and Moser, 2001), the literature has not explored the reasons for adoption. Thus, our paper makes a contribution by evaluating the implementation of programs that require coordination among multiple stakeholders generally, as well as the adoption of LA21 programs specifically. Rather than using case studies, our methods rely on analysis of aggregate cross-country data and examine the country-level characteristics that are associated with more communities within a country adopting these programs. Ideally, one would also want to complement this analysis with more disaggregated data that allowed a more focused analysis of the characteristics of the specific communities within each country in which LA21 programs take place. However, such data do not exist. Although we cannot draw sharp conclusions from the aggregate analysis about the determinants of adoption by localities, our cross-country analysis provides empirical evidence that is consistent with our simple theoretical framework and can help explain how economic, structural, and social factors affect the success of sustainability initiatives.

## 3 The Theoretical Framework

An important aspect of Local Agenda 21 is the coordination and engagement of multiple stakeholders. Although coordination benefits the community at large, it is costly. In addition, coordination is risky when defection is also a rational strategy. The incentives and likelihood of coordination can be modeled using the one-shot game known as the Stag Hunt game (also known as the Assurance Game). There are two symmetric Nash equilibria in this game: all parties coordinate or all parties defect. In this situation, trust of others' commitments is necessary to achieve the Pareto-dominant equilibrium. Below, we provide a simple one-shot model in which trust is exogenous. Although the level of trust that individuals have is the result of previous interactions with others, in the context of this novel decision, agents enter the game with a pre-determined level of trust.

In this game, we first consider two identical agents.[1] For each player, the cost of committing to the program is denoted *c*. The direct benefits of the program are a public good that accrue only when the two parties coordinate. Let *b* be the direct benefits that occur when the program is implemented. If cooperation does not occur and the program is not implemented, these benefits do not accrue. In addition, individuals who cooperate to provide such a program may also receive additional benefits from cooperating. These benefits may be thought of as a "warm glow" and we denote them with a *g*. We assume that *b*, *g*, and *c* are positive, $c>b$, $c> g$, and $c<b+g$. These assumptions imply that the net benefits are positive only when there is coordination and when individuals receive a warm glow. The payoff matrix for this situation is as follows.

Figure 1

| | Coordinate | Defect |
|---|---|---|
| Coordinate | b+g-c<br>B+g-c | 0<br>g-c |
| Defect | g-c<br>0 | 0<br>0 |

[1] For illustrative purposes, we model two player games. Extending the game to allow for more players should not affect the qualitative conclusions for which we seek empirical evidence.

Let $p$ be the probability that one agent assigns to the event that the promise to invest efforts in the program by the second player will be fulfilled. This probability is exogenous to the game that we describe and is determined by the amount of trust that individuals have that others will fulfill promises. In this case, coordination is a dominant strategy only if:

$$p(b+g-c)+(1-p)(g-c)>0 \Rightarrow p>\frac{c-g}{b}. \qquad (1)$$

Thus, even from this simple game, we see that higher levels of trust, $p$, imply that higher costs, $c$, or lower benefits, $b$, would be consistent with coordination. Alternatively, higher benefits and lower costs require less trust to exist in order for the coordination to occur. The formulation in Equation 1 also suggests that, given costs and benefits, there is a threshold level of trust, below which coordination would not occur.

A natural extension of the game above is to allow for the presence of opportunists or free-riders in the population. Consider a modification to the game we describe above in which one of the players is an opportunist and does not receive a warm glow from cooperating. Specifically, let Player 1 be a free-rider that does not receive a warm glow from cooperating. Then, the payoff matrix becomes

Figure 2

| | | Player 1 (free-rider): Coordinate | Player 1 (free-rider): Defect |
|---|---|---|---|
| Player 2 | Coordinate | b-c<br>B+g-c | 0<br>g-c |
| | Defect | -c<br>0 | 0<br>0 |

Note that because $b < c$, the dominant strategy for free-riders is always to defect.

From Player 2's perspective, however, the optimal strategy depends on both trust that people will do what they say, $p$, and the likelihood that they are playing against an opportunistic player. Let $s$ be the fraction of opportunistic players in the population. Then the non-opportunist will coordinate if

$$(1-s)\left[p(b+g-c)+(1-p)(g-c)\right]+s(g-c)>0 \quad \text{or} \quad p>\frac{c-g}{(1-s)b} \qquad (2)$$

Comparing Equation 2 to Equation 1, we see that the presence of free-riders has the effect of lowering the expected benefit from coordination. Thus, for a given level of trust, *p*, if the proportion of free-riders, *s*, is too high, the dominant strategy for Player 2 is to defect as well. Conversely, if there are more free-riders, a higher level of trust is required in order for cooperation to occur.

In what follows, we discuss the estimation of empirical models that examine the determinants of the number of communities within a country that adopt a Local Agenda 21 program. The simple model above shows the importance of trust, costs and benefits of coordination, and the presence of free riders. These observations motivate the hypotheses of the empirical work. Specifically, our theoretical framework provides the following testable implications.

1. For a given expected cost-benefit ratio, a minimum level of trust is required for the program to be formed. This implies the effect of trust is non-monotonic. Following this result, we include a squared term for trust in the empirical models.
2. For a given expected cost-benefit ratio and trust, higher levels of social responsibility should be associated with more LA21 programs.
3. Country-level characteristics that influence the cost of coordination will affect the number of Local Agenda 21 programs that are implemented. In our empirical framework, we need to include variables that control for a country's capacity to implement sustainability efforts such as the number of NGOs, per capita GDP, and the extent to which the existing policy framework emphasizes local or national control.
4. If benefits of implementing Local Agenda 21 programs vary by country, the extent of implementation may also vary. We include indicators of environmental quality that control for the potential benefits of the program, on the idea that worse current environmental quality would be associated with greater future benefit of the program. Furthermore, preferences for environmental quality may vary across countries, creating

variation in the perceived benefits of LA21 programs. Therefore, we also control for environmental preferences in our empirical work.

5. The model also implies that as environmental quality deteriorates and the benefit of implementing a successful Local Agenda 21 program increases, the level of trust necessary should decline. To test this hypothesis, we include an interaction between trust and the indicators of environmental quality. We expect the coefficient of the interaction term to be negative.
6. Finally, based on the intuition of the model, we hypothesize that social responsibility and trust interact with each other so that higher levels of social responsibility require less trust in order to coordinate Local Agenda 21 implementation and vice versa. Therefore, we expect the coefficient on an interaction of trust and social responsibility to be negative.

## 4 Empirical Evidence

### 4.1 The Empirical Model

We are interested in determining how community characteristics influence the adoption of coordinated sustainability policy. The empirical measure of sustainability policy we use is the number of communities that implement Local Agenda 21 (LA21) in a country. The data are compiled by the International Council for Local Environmental Initiatives and are available at the World Resources Institute's EarthTrends website. To normalize the number of communities for cross-country comparison, we divide the number of communities by the country's population, in millions. Because this distribution is markedly skewed, we use the logarithm of 1 plus LA21 communities per 1 million people as our dependent variable. We observe the number of LA21 communities at the country level for 1996 and 2001. Our data set contains only data for those countries that have at least one LA21 community. There are a total of 117 countries, however, availability of key explanatory variables limits our sample to 67 countries when we include a measure of trust. We are unable to interpret missing values in the data because they could represent zero LA21 communities or a country for which there is a positive number of unobserved LA21 programs. Although this may be an indication that our estimates suffer from sample selection bias, when we estimate a Heckman selection

model, we find that the coefficients on the variables of interest are qualitatively unchanged and that the inverse Mills ratio is insignificant in the estimations, indicating that our conclusions are not affected by sample selection.[2]

For a few countries (21), we have observations in both 1996 and in 2001.[3] This might make fixed or random effects specifications most appropriate; however, likelihood ratio tests indicate that the null hypothesis that the variance of the country-specific effects is zero cannot be rejected at any of the conventional levels. This result implies that OLS is appropriate to estimate the models. We return to this issue later in our discussion of robustness of the results.

As discussed above, our simple theoretical model gives several empirical predictions. Specifically, our explanatory variables should include a measure of trust, social responsibility, environmental quality, environmental preferences, and institutional structure that might be related to the cost of coordination. Because we have a small sample and many of our independent variables are highly correlated, we estimate parsimonious models.

The data for our explanatory variables are compiled from several sources. To measure trust, we use responses to a question from the World Values Survey (WVS) that asks if "most people can be trusted." We use these responses to calculate the proportion of the people in each country that answer this question affirmatively.[4] As discussed above, the model predicts that this variable will enter the estimations non-linearly so we include TRUST and its square.

We also use individual responses in the WVS to gauge the extent of social responsibility that may influence opportunistic behavior. We use the answers to four questions asked in the WVS about justifiable behavior to create an index of civic behavior.[5] Specifically, these questions ask if it is ever justifiable to 1) cheat on taxes, 2)

[2] Results of all estimations discussed in the text, but not reported in detail are available from the authors upon request.

[3] In some countries, the number of LA21 communities declines from 1996 to 2001 while in other countries it increases.

[4] We use the sampling weights provided by the WVS to calculate this proportion and all other aggregate statistics from the WVS. The WVS has been conducted during four separate time periods. We use wave 2 values as predictors of LA21 activity in 1996 and wave 4 values as predictors of LA21 communities in 2001. Wave 2 of the WVS was conducted over the time period 1990-1993 and wave 4 was conducted during 1999-2001.

[5] A similar index was first used by Knack and Keefer (1997).

ride public transportation without paying the fare, 3) take a bribe in the course of official duties, or 4) claim government benefits to which you are not entitled. For each behavior that an individual says is "never justifiable," we assign a value of one and add the responses to each question to obtain an index of civic behavior which we call CIVIC. At the individual level, the responses vary from 0 to 4, with 0 being associated with the most opportunistic behavior and 4 the least. We then average the individual responses within each country, using the sampling weights provided by the WVS, to obtain a country level measure of social responsibility.

We use three main measures of environmental quality, carbon dioxide emissions (CO2), sulfur dioxide emissions (SO2), and energy use (ENERGY) from the World Bank's World Development Indicators data base and the World Resources Institute's EarthTrends website. CO2 measures kilograms of carbon dioxide emissions per dollar of GDP. ENERGY measures average kilograms of oil-equivalent energy intensity per dollar of GDP. SO2 measures thousand metric tons of sulfur dioxide per current million $US. These variables are measured for 1996 and 2001.[6] We also experimented with water quality and access to improved water sources to measure environmental quality, however, we found these measures to be highly correlated with the other independent variables and we do not report the results of these estimations in the paper.[7] We hypothesize that countries with more environmental degradation will invest more local efforts into sustainability because the benefits of the programs would be greater. Based on the results of the theoretical model, we also include an interaction term between the measure of environmental quality and trust and expect a negative coefficient because, according to the model, the larger the potential benefits the lower is the level of trust required to coordinate agents.

Another question from the World Values Survey allows us to control for environmental preferences with the proportion of individuals within a country who strongly agree with the statement, "I would agree to an increase in taxes if the extra

[6] Due to data availability, we use 1995 and 2000 sulfur dioxide emissions to predict 1996 and 2001 LA21 programs, respectively.

[7] Including measures of water quality and access to improved water resources changes the sign of some independent variables. Furthermore, variance inflation factors (VIFs) suggest high levels of multicollinearity in these specifications.

money were used to prevent environmental pollution," as a measure of environmental preference at the country level.

To capture the features of a country's institutional structure that may influence the cost of implementing LA21, we use a number of variables. We include the number of international NGOs (per one million people) to account for the impact of lobbying by these organizations as well as an indicator of a society's capabilities to implement pro-environment policies. Following Fredriksson, Mani, and Wollscheid (2006), we include a dummy variable for federalism. While Fredriksson, Mani, and Wollscheid (2006) show that federalism has a negative effect on the environmental capacity of developing countries, we hypothesize already having an established policy framework that relies on local governments may impact the cost of implementation of LA21.

We also include the log of per capita GDP as it may proxy for a country's broad institutional environment.[8] To further control for institutional capacity, we estimate selected models adding a measure of institutional quality. We use the Freedom House indexes that measure civil liberties and political rights as experienced by a country's citizens. We compute the variable FREEDOMS as the sum of these two indexes (re-scaled so that 14 represents the most free and 2 represents the least free).[9] Because including this variable reduces the sample size but does not change the results and inferences we can gain from our empirical analysis, we discuss the findings in the context of our sensitivity analysis.

We add a few additional control variables that are likely related to environmental protection. First, we use trade openness, (exports + imports)/GDP as an explanatory variable following Damania, Fredriksson, and List (2003) who find that trade increases environmental stringency in a sample of developing and developed countries.[10] We include the percent of the population that is in urban areas. Although sustainable policies might be in some cases more necessary in highly urbanized societies, people living in urban areas may be less likely to feel connected to their neighbors and less likely to

[8] The link between GDP and institutional quality is the subject of a vast literature. See Acemoglu, Johnson and Robinson (2001) as an example of this work.
[9] The Freedom House index is available on-line, htttp://www.freedomhouse.org/research/survey2004.htm), New York: Freedom House.
[10] Fredriksson, Mani, and Wollscheid (2006) also provides a discussion of the effects of openness on environmental capacity and how openness interacts with federalism.

coordinate behavior.[11] Finally, we add secondary school enrollment rates in some specifications to allow for the fact that education may impact coordination by affecting preferences for the environment and also the cost of coordination. All specifications include a time dummy (equal to 1 for 2001) that controls for the fact that it takes time to learn about, design, and implement Local Agenda 21.

Summary statistics for all the variables used in our analysis are reported in Table 1. An important point to note is that key variables in our analysis that are derived from the World Values Survey limit our sample substantially. The small sample size will influence our estimation strategy because it requires parsimonious specifications as well as encourages robustness checks which we report later in the paper. Nonetheless, it is interesting that, on average, only about 30 percent of individuals in each country indicate that they believe that most people can be trusted. As the table in Appendix A shows, there is considerable variation in this statistic by country, with Sweden and Denmark having the most trusting people at 64 percent (in 2001) and Tanzania, Uganda, and the Philippines having the least trusting at 8 percent (in 2001).

### 4.2 Results

In Table 2, we present results that estimate the determinants of LA21 communities in a base specification that includes control variables and a key variable of interest, TRUST. Before discussing the results for the testing of the key hypotheses we derive from the theoretical model, we first address the findings for the control variables and the variables representing institutional structure. Income per capita has a positive and highly significant effect on sustainability efforts, indicating that more developed countries are more likely to have more LA21 communities.[12] Consistent with the findings of previous literature, the number of NGOs is positive and significant across all specifications. The percentage of the population living in urban areas is generally negative but significant only in columns 1 and 2 in Table 2. As we noted earlier, if people living in urban areas are less likely to know and cooperate with their neighbors, it

[11] We also used population density as an alternative independent variable with no change in the main results.

[12] We also tried squaring the log of GDP per capita but did not find significant results for this second-order term.

may be the case adding TRUST to the specifications causes URBAN to become insignificant. On average, countries with federal systems implement fewer LA21 programs. The estimates of FEDERAL are consistently negative and statistically significant at least at the 5 percent level. This result suggests that when local governments are weaker, LA21 coordination is more likely to be implemented, perhaps as a substitute for actions taken by a local government.[13] The results for TRADE are inconclusive. The estimates are positive but significant in only a two of the four models. Secondary schooling enrollment rate (EDUCATION) is positively related to LA21 communities (column 2 of Table 2), however, the coefficient is significant at the 10 percent level only. Although not reported in the tables, this variable is not consistently significant in additional specifications, possibly due to its strong correlation with the other independent variables (in particular GDP), so we do not include it in remaining estimations. As expected, the coefficient of the time trend is consistently positive and statistically significant at the 1 percent level in all five models reported in Table 2.

Environmental preferences as measured by the willingness to pay taxes to protect the environment (TAX) enter the specification in column 3 of Table 2 positively and significantly as predicted by the theoretical model, however, once we control for TRUST (column 4), this variable loses its significance. Because the use of this variable limits our sample size considerably and it does not consistently enter the estimations with a significant coefficient, we do not use it in subsequent estimations.

Columns 4 and 5 in Table 2 show the effects of trust. In both specifications, TRUST and its square are used to capture the non-linear effect implied by the model. In column 4, we also report a specification in which TAX is used to demonstrate that the effects of TRUST do not depend on the exclusion of this variable or the change in the sample that is caused by the use of TAX. In both columns 4 and 5, we find a U-shaped relationship between the dependent variable and aggregate trust, consistent with the idea that the effect of trust is non-monotonic. The point estimates in column 5 imply that at least 26 percent of the population must trust others for trust to have a positive effect on

[13] Although this result may be puzzling as one might expect that stronger local governments could reduce the cost of LA21 coordination, none of the results we report depend on the inclusion of FEDERAL.

sustainability efforts. In this sample, the average marginal effect of TRUST is positive (1.06 with a standard deviation of 3.87).[14]

While the results in Table 2 establish the importance of trust for the implementation of LA21 programs, in Table 3 we report results that examine several other hypotheses suggested by our theoretical framework. In particular, we show the results when we add indicators of environmental quality.[15] Recall that the model predicts that a greater benefit from coordination would increase the likelihood of implementation, holding all other things constant. Higher levels of carbon dioxide and sulfur dioxide emissions and energy use would indicate a worse environmental quality in those countries and perhaps greater future benefit from environmental protection. In Table 3, column 1 uses CO2, column 2 uses ENERGY, and column 3 uses SO2 as the measures of environmental quality. As predicted, CO2 enters with a positive coefficient, but its impact declines as trust increases. In other words, lower trust implies that the benefits of the program have to be larger in order for the program to be implemented. In fact, the marginal effect of CO2 is positive for countries that have below average levels of TRUST. The coefficients on ENERGY and ENERGY*TRUST as well as the coefficients on SO2 and its interaction with TRUST are also similar in sign and significance to those of CO2, providing further evidence that greater benefits of sustainability programs are associated with a greater likelihood of implementation of LA21 programs, however, when there is more trust, those benefits do not need to be as large.[16]

In the last column of Table 3, we present evidence for another prediction of the model—that, *ceteris paribus*, lower levels of opportunism are associated with a greater chance of implementation of LA21 programs. To proxy for the extent of free riding there is in a country, we use the variable CIVIC. Higher levels of CIVIC means that free-riding may be less frequent, although clearly this variable is just a proxy for the fraction of the population that will not receive a warm glow from cooperating. That said, we

[14] This is the average of the individual marginal effects.
[15] Ideally, these specifications would also include TRUST*TRUST as our earlier results found some evidence for this nonlinearity. However, when we include the square of TRUST as well as interactions of TRUST with the environmental quality measure, the specification suffers from multicollinearity and we cannot obtain reliable estimates.
[16] In column 1 of Table 3, the coefficient on GDP loses its significance in the estimation, though it remains positive. We attribute this loss of significance to the high degree of correlation between CO2 and GDP.

would expect that higher levels of CIVIC would be associated with the implementation of more LA21 programs, but that the interaction of CIVIC and TRUST should be negative. In other words, at higher levels of TRUST, CIVIC is less important. The results in column 4 of Table 3 corroborate this prediction. We note that at the sample averages, the marginal effect of CIVIC is negative, which is contrary to the prediction of the model. However, the coefficient on CIVIC is estimated very imprecisely and an increase in the coefficient equal to one standard error yields a positive marginal effect.

To summarize the results reported in this section, we find that, consistent with the hypotheses outlined in Section 2, 1) greater trust is associated with more LA21 programs and that trust is related to the number of programs in a non-linear way, 2) country level characteristics that may influence the cost of implementation such as number of NGOs, per capita GDP, and the strength of local governments affect the number of LA21 programs, 3) greater potential benefits of LA21 programs as measured by environmental quality are correlated with more programs, 4) when there is more trust, the benefits necessary to implement the programs are smaller, and 5) more social responsibility lowers the amount of trust required to facilitate the coordination. The only hypothesis that we have outlined in Section 2 for which we find only weak evidence is the idea that social responsibility on its own should be associated with more programs. We are unable to make a strong claim about the effect of social responsibility because its effect is estimated imprecisely.

**4.3 Sensitivity Analysis**

Although the empirical results presented above are interesting and corroborate the predictions of our simple theoretical framework, we are concerned that the results are derived from a small sample. We estimate a number of alternative models to verify that the results are robust to changes in specification and sample size. As noted above, when we estimate panel data models, (both fixed-effects and random-effects models), likelihood ratio tests indicate that the null hypothesis that the variance of the country-specific effects is zero cannot be rejected at any of the conventional levels. This result implies OLS regression is valid. It might still be possible that countries and their respective municipalities that appear twice in the sample affect the estimates. To explore

this issue, we average the observations by country and estimate difference in means (or between-effects) models. Table 4 presents the results of the models from Tables 2 and 3 that contain the main results of the paper.

Our previous results are corroborated with this estimation technique. In column 2 of Table 4, we see that the effect of TRUST is nonlinear; and, in columns 3 and 4, we see that environmental quality and its interaction with TRUST retain the signs and significance levels of our earlier estimates. The results in column 5 regarding the impact of social responsibility are actually stronger than those reported in Table 3, with CIVIC now entering with a positive and significant coefficient, and the interaction of CIVIC and TRUST retaining the same sign with increased significance.

We compute jackknife standard errors (adjusted for within-cluster correlation) to provide confidence that the results we report are not driven by the small sample. Although the standard errors computed with the jackknife procedure are larger than those reported previously, the inferences we can draw regarding the impact of trust are the same as before. However, the results for the effect of environmental quality and the effect of social responsibility are weaker. While we obtain similar conclusions when we use ENERGY and SO2 as the measures of environmental quality in the jackknife estimation, the results for CO2 and its interaction with TRUST now become insignificant. We also find more unstable results for the model that includes CIVIC (column 5 of Table 5).

We estimate all model specifications excluding those countries in the sample with the largest number of Local Agenda 21 municipalities per capita. When we drop the two countries with the largest number of LA21 programs, Luxembourg and Iceland, from the estimation sample, we obtain very similar results regarding the effects of the variables of interest. When we exclude additional countries based on having large numbers of LA21 communities (Luxembourg, Iceland, Denmark, and Sweden), our results hold except that we do not find a nonlinear relationship for trust. This finding suggests that the countries at the top of the LA21 distribution are needed to identify the non-linear effect. For this reduced sample, the indicators of environmental quality and their interaction terms with TRUST are still significant and, interestingly, the estimates for CIVIC and the interaction term between CIVIC and TRUST are strongly statistically significant.

Finally, Table 6 presents results when we add a measure computed from the Freedom House indexes. These indexes are proxies of civil liberties and political rights as experienced by a country's citizens. As explained above, we compute the variable FREEDOMS as the sum of these two indexes (re-scaled so that 14 represents the most free and 2 represents the least free). Our goal is to investigate whether the results we attribute to aggregate levels of trust are robust to including additional controls for the quality of formal institutions. The coefficient estimate of FREEDOMS is positive, as expected, but is not consistently significant. In addition, there is evidence of collinearity as the standard error of the estimate GDP increases in some specifications. The results for TRUST and the interaction terms between trust and indicators of environmental quality still hold, suggesting that quality of institutions is not an omitted variable influencing the impact of TRUST in our original regressions.

In summary, we find robust evidence that there is a U-shaped relationship between levels of trust and sustainability efforts at the country level. When we measure potential benefits with energy use and sulfur dioxide emissions, we find consistent evidence that larger benefits increase the number of municipalities committing to LA21 and that higher levels of trust are necessary when potential benefits are lower. The results are weaker when we use carbon dioxide emissions as an indicator of environmental quality perhaps because the benefits of curbing emissions of greenhouse gasses are global rather than local. As explained above, the results for models including CIVIC are not robust. Although the coefficients have the signs that we expected from the model, the point estimates are measured with substantial imprecision. It is possible that we may be confounding the interpretation of our results for TRUST and CIVIC because the measures we use are too crude. Glaeser, Laibson, Sheinkman and Soutter (2000) provide experimental evidence that survey questions about trust of others actually reflect the respondents own trustworthiness. At the aggregate level, more trustworthy people would still have a positive effect on the implementation of Local Agenda 21 programs, however, if our aggregate measures of TRUST are also capturing in some way the level of social responsibility, we may have difficulty identifying separate effects for TRUST and CIVIC.

## 5 Conclusion

In this paper, we have examined the determinants of the implementation of policies toward sustainable development. We have provided a simple theoretical framework to help clarify our empirical approach to estimating the adoption of Local Agenda 21 programs. As predicted by the model, we find trust to be critical to the implementation of the programs. Furthermore, we find evidence that trust is related to implementation of these coordinated efforts in a non-linear way, suggesting that, everything else equal, a minimum level of trust must exist before coordination can occur. We also find evidence that country characteristics that are likely to lower the cost of implementation such as the number of NGOs or the level of GDP are positively related to the number of Local Agenda 21 programs within a country. Our results also indicate that when the potential benefits of the program are likely to be greater more municipalities undertake these sustainability efforts. A weaker empirical finding suggests greater levels of social responsibility provide a greater likelihood of Local Agenda 21 implementation.

These results have important implications for the design of policies and programs intended to improve environmental quality. In particular, the findings suggest that culture can affect the success of sustainability programs when policy adoption requires the coordination of multiple stakeholders. In countries in which trust is low, voluntary cooperation may be less likely to occur, suggesting that programs that depend on it will be ineffective. When low trust is an impediment, programs should be designed to reduce the cost of coordination and implementation. Our findings also provide evidence that an emphasis on participatory decision-making might be particularly important when the actual or perceived benefits from sustainability efforts are low.

## 6 References


Acemoglu, Daron, Simon Johnson, and James Robinson, 2001, "The colonial origins of comparative development: an empirical investigation," *American Economic Review* 91(5): 1369-1401.

Boulanger, Paul-Marie, and Thierry Bréchet, 2005, "Models for policy-making in sustainable development: The state of the art and perspectives for research," *Ecological Economics*, 55: 337-350.

Cabon-Dhersin, Marie-Laure and shyama V. Ramani, 2004, "Does trust matter for R&D cooperation? A game theoretic examination," *Theory and Decision* 57: 143-180.

Damania, Richard, Fredriksson, Per G., and John A. List, 2003, "Trade liberalization, corruption, and environmental policy formation: Theory and evidence," *Journal of Environmental Economics and Management*, 46: 490-512.

Evans, Bob, and Kate Theobald, 2003, "Policy and practice LASALA: Evaluating Local Agenda 21 in Europe," *Journal of Environmental Planning and Management*, 46(5): 781-794.

Fernandez, Raquel, and Alessandra Fogli, 2005, "Culture: an empirical investigation of beliefs, work, and fertility," NBER Working Paper No 11268.

Fredriksson, Per G., Neumayer, Eric, Damania, Richard, and Scott Gates, 2005, "Environmentalism, democracy, and pollution control," *Journal of Environmental Economics and Management*, 49:343-365.

Fredriksson, Per G., Mani, Muthukumara, and Jim R. Wollscheid, 2006, "Environmental federalism: A panacea or Pandora's box for developing countries?" World Bank Policy Research Working Paper 3847.

Glaeser, Edward, David Laibson, Jose A. Scheinkman, and Christine Soutter, 2000, "Measuring Trust," *Quarterly Journal of Economics* 115(3): 811-46.

Grafton, R. Quentin and Stephen Knowles, 2004, "Social capital and national environmental performance: a cross-sectional analysis," *Journal of Environment and Development* 13(4): 336-270.

Guiso, Luigi, Paola Sapienza and Luigi Zingales, 2006, "Does culture affect economic outcomes?" *Journal of Economic Perspectives* 20(2): 23-48.

Hodler, Roland, 2006, "The curse of natural resources in fractionalized countries," *European Economic Review* 50: 1367-1386.

Huyck, John B., Raymond C. Battalio, and Richard O. Beil, 1990, "Tacit Coordination Games, Strategic Uncertainty, and Coordination Failure," *American Economic Review* 80(1): 234-248.

International Council for Local Environmental Initiatives (ICLEI), 2002, "Second Local Agenda 21 Survey," Background Paper No. 15, Department of Economic and Social Affairs, United Nations.

Knack, S. and Keefer, P. ,1997, "Does social capital have an economic payoff? A cross-country investigation," *Quarterly Journal of Economics* 112(4), 1251-1288.

Knack, Stephen, and Paul Zak, 2001, "Trust and Growth," *Economic Journal* 111(470): 295-321.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R. Vishny, 1997, "Trust in Large Organizations," *American Economic Review* 87: 333-338.

Moser, Peter, 2001, "Glorification, Disillusionment or the Way into the Future? The significance of Local Agenda 21 processes for the needs of local sustainability", *Local Environment*, 6(4): 453-467.

Owen, Ann L. and Julio Videras, 2006, "Civic cooperation, proenvironment attitudes, and behavioral intentions," *Ecological Economics* 58: 814-829.

Paavola, Jouni, and W. Neil Adger, 2006, "Fair adaptation to climate change," *Ecological Economics*, 56: 594-609.

Pretty, Jules and Hugh Ward, 2001, "Social capital and the environment," *World Development* 29(2): 209-227.

Stulz, Rene M. and Williamson, Rohan, 2003, "Culture, openness, and finance," *Journal of Financial Economics* 70(3): 313-49.

Southey, Sean (2001): "Accelerating sustainability; from agenda to action," *Local Environment*, 6(4): 483-489.

Torvik, Ragnar, 2002, "Natural resources, rent seeking and welfare," *Journal of Development Economics* 67: 455-470.

Table 1: Summary Statistics

| | Description | Observations | Countries | Mean | Std. Dev. |
|---|---|---|---|---|---|
| Log(1+LA21) | Log of 1 plus Local Agenda 21 municipalities per 1 million population | 163 | 117 | .82 | 1.08 |
| Log(GDP) | Log of GDP per capita (constant 1995 US$) | 163 | 117 | 7.97 | 1.69 |
| NGOs | International non-governmental organizations per 1 million population | 163 | 117 | 3.01 | 7.24 |
| TRADE | % of GDP | 163 | 117 | 76.81 | 41.45 |
| FEDERAL | = 1 if country if federal | 163 | 117 | .18 | .39 |
| URBAN | Urban population (% of total) | 163 | 117 | 58.30 | 22.64 |
| EDUCATION | % secondary school enrollment | 96 | 76 | 71.93 | 23.73 |
| FREEDOMS | Sum of Freedom House indexes, 14 = the most free and 2 = the least free | 144 | 104 | 8.75 | 4.13 |
| TAX | % of population who strongly agrees to increase in taxes if used to prevent pollution | 75 | 54 | .14 | .09 |
| TRUST | % population who says most people can be trusted | 88 | 67 | .30 | .15 |
| CIVIC | Index of civic responsibility ( = 0 if all 4 free-riding behaviors are justifiable) | 62 | 48 | 2.44 | .54 |
| CO2 | CO2 emissions (kg per 1995 US$ of GDP) | 88 | 67 | 1.21 | 1.25 |
| ENERGY | Energy use per GDP (kg of oil equivalent per constant 1995 PPP $) | 88 | 67 | .28 | .17 |
| SO2 | Emissions of sulfur dioxide (thousand metric tons per million current US$) | 88 | 60 | .0046 | .0051 |

Sources: Data on LA21 municipalities come from two separate surveys conducted by The International Council for Local Environmental Initiatives. The data are available at the World Resources Institute's EarthTrends website. Data on NGOs and SO2 emissions are also available at the World Resources Institute's EarthTrends website. Data on GDP, urban population, education, CO2 emissions, and energy use come from The World Bank Development Indicators. The Freedom House indexes are available on-line at http://www.freedomhouse.org/research/survey2004.htm), New York: Freedom House. Data on TAX, trust, and civic responsibility come from the World Values Survey (WVS), waves 2 and 4. TAX, TRUST, and CIVIC are calculated using sampling weights provided by the WVS.

Table 2: OLS Models

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| LogGDP | 0.3765*** | 0.3648*** | 0.4534*** | 0.2502** | 0.2800*** |
| | (0.0814) | (0.1371) | (0.1202) | (0.1014) | (0.0775) |
| NGOs | 0.0565*** | 0.0538*** | 0.0589*** | 0.0584*** | 0.0623*** |
| | (0.0129) | (0.0100) | (0.0083) | (0.0070) | (0.0066) |
| TRADE | 0.0014 | 0.0009 | 0.0041* | 0.0053*** | 0.0060*** |
| | (0.0016) | (0.0018) | (0.0021) | (0.0018) | (0.0016) |
| FEDERAL | -0.4387*** | -0.6358** | -0.5845*** | -0.4140** | -0.2528 |
| | (0.1549) | (0.2541) | (0.2162) | (0.2022) | (0.1718) |
| URBAN | -0.0076* | -0.0168** | -0.0083 | -0.0001 | -0.0042 |
| | (0.0043) | (0.0073) | (0.0089) | (0.0066) | (0.0060) |
| 2001 | 0.3621*** | 0.3876* | 0.5987*** | 0.5633*** | 0.3577** |
| | (0.1241) | (0.2062) | (0.1554) | (0.1495) | (0.1585) |
| EDUCATION | | 0.0106* | | | |
| | | (0.0055) | | | |
| TAX | | | 3.2860** | 1.0674 | |
| | | | (1.4724) | (1.1155) | |
| TRUST | | | | -4.4429** | -6.7856*** |
| | | | | (2.1172) | (1.8018) |
| TRUST*TRUST | | | | 10.1764*** | 13.0159*** |
| | | | | (3.1380) | (2.7089) |
| Constant | -2.1638*** | -2.1350*** | -3.4735*** | -1.8573** | -1.3665** |
| | (0.3701) | (0.6683) | (0.7716) | (0.8857) | (0.6170) |
| Observations | 163 | 96 | 75 | 75 | 88 |
| R-squared | 0.56 | 0.54 | 0.67 | 0.77 | 0.74 |

Cluster-adjusted robust standard errors in parentheses;* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: OLS Models

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| LogGDP | 0.1287 | 0.2317* | 0.2305** | 0.2097** |
| | (0.0895) | (0.1245) | (0.1053) | (0.0881) |
| NGOs | 0.0634*** | 0.0656*** | 0.0622*** | 0.0931*** |
| | (0.0102) | (0.0084) | (0.0093) | (0.0305) |
| TRADE | 0.0041** | 0.0041* | 0.0048** | 0.0006 |
| | (0.0020) | (0.0021) | (0.0021) | (0.0028) |
| FEDERAL | -0.4675*** | -0.4285** | -0.3978** | -0.5298*** |
| | (0.1584) | (0.1676) | (0.1700) | (0.1700) |
| URBAN | -0.0038 | 0.0004 | 0.2888* | -0.0010 |
| | (0.0059) | (0.0080) | (0.1508) | (0.0057) |
| 2001 | 0.2957* | 0.3374* | -0.0051 | 0.4308** |
| | (0.1634) | (0.1756) | (0.0076) | (0.1796) |
| TRUST | 4.7334*** | 5.8219*** | 4.3816*** | 8.6488*** |
| | (0.8962) | (1.2297) | (1.0610) | (2.9524) |
| CO2 | 0.4869*** | | | |
| | (0.1798) | | | |
| TRUST*CO2 | -2.0433*** | | | |
| | (0.6289) | | | |
| ENERGY | | 3.3394*** | | |
| | | (1.0863) | | |
| TRUST*ENERGY | | -13.3968*** | | |
| | | (4.6020) | | |
| SO2 | | | 151.575*** | |
| | | | (47.984) | |
| TRUST*SO2 | | | -608.298*** | |
| | | | (176.133) | |
| CIVIC | | | | 0.4246 |
| | | | | (0.3316) |
| TRUST*CIVIC | | | | -2.3051* |
| | | | | (1.2608) |
| Constant | -1.7099*** | -3.2122*** | -2.5267*** | -3.0930*** |
| | (0.5386) | (0.7183) | (0.5917) | (1.1149) |
| Observations | 88 | 87 | 88 | 72 |
| R-squared | 0.75 | 0.72 | .71 | 0.70 |

Cluster-adjusted robust standard errors in parentheses;* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Between-effects Models (OLS regression on country means)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| LogGDP | 0.3222*** | 0.2680*** | 0.1203 | 0.2554** | 0.1924 | 0.1873* |
| | (0.0603) | (0.0758) | (0.0873) | (0.1040) | (0.1257) | (0.0962) |
| NGOs | 0.0586*** | 0.0607*** | 0.0604*** | 0.0620*** | 0.0643*** | 0.0790*** |
| | (0.0087) | (0.0086) | (0.0083) | (0.0095) | (0.0110) | (0.0203) |
| TRADE | 0.0020 | 0.0069*** | 0.0047** | 0.0046** | 0.0046* | 0.0015 |
| | (0.0015) | (0.0018) | (0.0018) | (0.0019) | (0.0023) | (0.0029) |
| FEDERAL | -0.4282*** | -0.2855* | -0.5085*** | -0.4613** | -0.5202** | -0.5611*** |
| | (0.1484) | (0.1621) | (0.1493) | (0.1762) | (0.2245) | (0.1832) |
| URBAN | -0.0070* | -0.0065 | -0.0034 | -0.0021 | -0.4152 | 0.0001 |
| | (0.0041) | (0.0056) | (0.0057) | (0.0069) | (0.3992) | (0.0068) |
| 2001 | 0.1127 | 0.1859 | 0.0936 | 0.2075 | -0.0052 | 0.3479 |
| | (0.1629) | (0.1998) | (0.1922) | (0.2185) | (0.0080) | (0.2167) |
| TRUST | | -6.4900*** | 4.2084*** | 4.7254*** | 4.0538*** | 11.3353*** |
| | | (2.0138) | (0.7265) | (1.2638) | (1.1385) | (3.6321) |
| TRUST*TRUST | | 12.0609*** | | | | |
| | | (2.9413) | | | | |
| CO2 | | | 0.5107*** | | | |
| | | | (0.1491) | | | |
| TRUST*CO2 | | | -2.1884*** | | | |
| | | | (0.4739) | | | |
| ENERGY | | | | 2.9984*** | | |
| | | | | (1.0327) | | |
| TRUST*ENERGY | | | | -11.9456*** | | |
| | | | | (4.0827) | | |
| SO2 | | | | | 171.026** | |
| | | | | | (69.844) | |
| TRUST*SO2 | | | | | -673.828** | |
| | | | | | (273.171) | |
| CIVIC | | | | | | 0.6678* |
| | | | | | | (0.3635) |
| TRUST*CIVIC | | | | | | -3.4318** |
| | | | | | | (1.3356) |
| Constant | -1.6783*** | -1.0548* | -1.3895** | -2.8853*** | -1.5715 | -3.5149*** |
| | (0.3573) | (0.5617) | (0.5610) | (0.7292) | (0.9388) | (1.2547) |
| Observations | 163 | 88 | 88 | 87 | 88 | 72 |
| Countries | 117 | 67 | 67 | 66 | 60 | 58 |
| R-squared | 0.63 | 0.82 | 0.84 | 0.80 | 0.76 | 0.76 |

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: OLS Models, Jackknife Standard Errors

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| LogGDP | 0.3765*** | 0.2800*** | 0.1287 | 0.2317 | 0.2305* | 0.2097 |
| | (0.0879) | (0.0863) | (0.1054) | (0.1430) | (0.1202) | (0.2531) |
| NGOs | 0.0565** | 0.0623*** | 0.0634** | 0.0656*** | 0.0622** | 0.0931 |
| | (0.0229) | (0.0134) | (0.0308) | (0.0213) | (0.0272) | (0.2629) |
| TRADE | 0.0014 | 0.0060*** | 0.0041 | 0.0041 | 0.0048 | 0.0006 |
| | (0.0019) | (0.0020) | (0.0034) | (0.0029) | (0.0032) | (0.0058) |
| FEDERAL | -0.4387*** | -0.2528 | -0.4675*** | -0.4285** | -0.3978** | -0.5298*** |
| | (0.1643) | (0.1852) | (0.1736) | (0.1896) | (0.1841) | (0.1958) |
| URBAN | -0.0076* | -0.0042 | -0.0038 | 0.0004 | 0.2888* | -0.0010 |
| | (0.0045) | (0.0065) | (0.0067) | (0.0091) | (0.1515) | (0.0113) |
| 2001 | 0.3621** | 0.3577** | 0.2957* | 0.3374* | -0.0051 | 0.4308** |
| | (0.1383) | (0.1593) | (0.1656) | (0.1793) | (0.0084) | (0.1899) |
| TRUST | | -6.7856*** | 4.7334*** | 5.8219*** | 4.3816*** | 8.6488* |
| | | (1.9801) | (1.2661) | (1.6404) | (1.2251) | (4.4837) |
| TRUST*TRUST | | 13.0159*** | | | | |
| | | (3.0304) | | | | |
| CO2 | | | 0.4869 | | | |
| | | | (0.3691) | | | |
| TRUST*CO2 | | | -2.0433 | | | |
| | | | (1.3855) | | | |
| ENERGY | | | | 3.3394* | | |
| | | | | (1.6740) | | |
| TRUST*ENERGY | | | | -13.3968** | | |
| | | | | (6.4954) | | |
| SO2 | | | | | 151.58** | |
| | | | | | (66.64) | |
| TRUST*SO2 | | | | | -608.29** | |
| | | | | | (236.10) | |
| CIVIC | | | | | | 0.4246 |
| | | | | | | (0.4355) |
| TRUST*CIVIC | | | | | | -2.3051 |
| | | | | | | (1.7064) |
| Constant | -2.1638*** | -1.3665* | -1.7099** | -3.2122*** | -2.527*** | -3.0930 |
| | (0.3892) | (0.6872) | (0.6582) | (0.8539) | (0.715) | (2.3897) |
| Observations | 163 | 88 | 88 | 87 | 88 | 72 |
| R-squared | 0.56 | 0.74 | 0.75 | 0.72 | 0.71 | 0.70 |

Cluster-adjusted robust standard errors in parentheses;* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: Selected OLS Models (adding FREEDOMS)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| LogGDP | 0.3234*** | 0.2538** | 0.1180 | 0.2058 | 0.2019 | 0.0436 |
| | (0.0982) | (0.1082) | (0.1000) | (0.1549) | (0.1262) | (0.1128) |
| NGOs | 0.0547*** | 0.0622*** | 0.0640*** | 0.0658*** | 0.0621*** | 0.0936*** |
| | (0.0119) | (0.0070) | (0.0114) | (0.0094) | (0.0100) | (0.0317) |
| TRADE | 0.0008 | 0.0048*** | 0.0030 | 0.0028 | 0.0037 | 0.0001 |
| | (0.0017) | (0.0018) | (0.0024) | (0.0024) | (0.0025) | (0.0034) |
| FEDERAL | -0.4842*** | -0.3171 | -0.5030** | -0.4810** | -0.4582** | -0.6112*** |
| | (0.1743) | (0.2083) | (0.1930) | (0.2002) | (0.2095) | (0.1896) |
| URBAN | -0.0083 | -0.0069 | -0.0052 | -0.0011 | 0.2582 | 0.0029 |
| | (0.0050) | (0.0068) | (0.0061) | (0.0089) | (0.1774) | (0.0065) |
| 2001 | 0.3683*** | 0.3298* | 0.2714 | 0.3229* | -0.0063 | 0.4040* |
| | (0.1299) | (0.1773) | (0.1825) | (0.1918) | (0.0083) | (0.2059) |
| FREEDOMS | 0.0418** | 0.0423 | 0.0201 | 0.0317 | 0.0312 | 0.0602** |
| | (0.0173) | (0.0297) | (0.0251) | (0.0258) | (0.0283) | (0.0259) |
| TRUST | | -7.0295*** | 4.5687*** | 5.6775*** | 4.2108*** | 8.5593*** |
| | | (1.9147) | (0.9058) | (1.3789) | (1.1041) | (2.9769) |
| TRUST*TRUST | | 13.1634*** | | | | |
| | | (2.8356) | | | | |
| CO2 | | | 0.4168* | | | |
| | | | (0.2127) | | | |
| TRUST*CO2 | | | -1.8878*** | | | |
| | | | (0.6427) | | | |
| ENERGY | | | | 3.2425*** | | |
| | | | | (1.1033) | | |
| TRUST*ENERGY | | | | -12.9959** | | |
| | | | | (5.0453) | | |
| SO2 | | | | | 140.255*** | |
| | | | | | (47.358) | |
| TRUST*SO2 | | | | | -577.69*** | |
| | | | | | (190.40) | |
| CIVIC | | | | | | 0.3018 |
| | | | | | | (0.3175) |
| TRUST*CIVIC | | | | | | -2.2122* |
| | | | | | | (1.2492) |
| Constant | -2.0210*** | -1.2179* | -1.5647** | -3.0695*** | -2.3509*** | -2.1685** |
| | (0.4161) | (0.6263) | (0.5974) | (0.8055) | (0.6905) | (1.0746) |
| Observations | 144 | 74 | 74 | 73 | 74 | 63 |
| R-squared | 0.58 | 0.76 | 0.76 | 0.73 | 0.73 | 0.71 |

Appendix A: List of Countries (2001)

| Country | LA21 per million people | Aggregate TRUST |
|---|---|---|
| Albania | 2.23 | .23 |
| Argentina | .028 | .15 |
| Austria | 7.97 | .31 |
| Belgium | 10.30 | .29 |
| Bangladesh | .015 | .23 |
| Bulgaria | 2.74 | .25 |
| Canada | .450 | .38 |
| Chile | .974 | .22 |
| China | .019 | .53 |
| Czech Rep | 4.11 | .23 |
| Denmark | 40.31 | .64 |
| Algeria | .097 | .11 |
| Egypt | .107 | .37 |
| Spain | 8.81 | .35 |
| Estonia | 21.26 | .22 |
| Finland | 58.40 | .57 |
| France | 1.17 | .21 |
| United Kingdom | 7.20 | .29 |
| Greece | 3.68 | .20 |
| Croatia | 4.48 | .18 |
| Hungary | .883 | .21 |
| Indonesia | .038 | .46 |
| India | .014 | .39 |
| Ireland | 7.50 | .35 |
| Iran, Islamic Rep | .031 | .50 |
| Iceland | 131.21 | .39 |
| Israel | .466 | .23 |
| Italy | 7.43 | .32 |
| Jordan | .795 | .27 |
| Japan | .866 | .40 |
| Korea, Rep | 3.63 | .27 |
| Lithuania | 4.02 | .24 |
| Luxembourg | 156.82 | .25 |
| Latvia | 2.12 | .17 |
| Morocco | .171 | .23 |
| Mexico | .020 | .21 |
| Nigeria | .038 | .25 |
| Netherlands | 6.23 | .59 |
| Pakistan | .007 | .28 |
| Peru | .645 | .11 |
| Philippines | .358 | .08 |
| Poland | 1.81 | .18 |
| Portugal | 2.66 | .10 |
| Russian Federation | .200 | .23 |
| Saudi Arabia | .188 | .51 |
| Slovakia | 5.58 | .15 |
| Slovenia | 1.52 | .21 |
| Sweden | 32.49 | .64 |
| Turkey | .729 | .13 |
| Tanzania | .377 | .08 |
| Uganda | .209 | .08 |
| Ukraine | .183 | .26 |
| United States | .305 | .36 |
| Venezuela | .122 | .16 |
| Viet Nam | .252 | .39 |
| South Africa | .446 | .12 |
| Zimbabwe | 3.04 | .12 |