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 approximately 66 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 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.

1 Introduction

Recent contributions to the economics literature have emphasized the influence of culture on economic outcomes. (See for example, Guiso, Sapienza and Zingales, 2006; Fernandez and Fogli, 2005; or Stulz and Williamson, 2003.) Trust is one aspect of culture that has received particular attention. In a seminal paper, Knack and Keefer (1997) found 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 other researchers have examined trust as a substitute for formal institutions. See, for example, Knack and Zak (2001); Glaeser, Laibson, Sheinkman and Soutter (2000); or La Porta, Lopez-de-Silanes, Schleifer, and Vishny (1997).

In this paper, we provide 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 approximately 60 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 estimate count data models and find that a country's level of trust is an important determinant of the number of communities that implement such sustainability efforts. We also find that greater potential benefits of sustainability programs are correlated with more programs and that the benefits necessary to implement the programs are smaller when there is more trust.

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 outcomes in particular. Pretty and Ward (2001) discuss case studies that show how collective action can help improve environmental quality. Owen and Videras (2006) find that in low-income countries civic-minded behavior is particularly important in generating pro-environment attitudes. 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 related literature explores the role of social capital in natural resources management. Hodler (2006) provides 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. 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 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.

Our work also contributes to the literature on endogenous policy formation. Fredriksson, Neumayer, Damania, and Gates (2005) examine lead content in gasoline for 104 developing and industrialized countries. 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. 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 provide more detail on the Local Agenda 21 program, 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 to help countries 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 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).

LA21 programs 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 for 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 aggregate data and examine country-level characteristics that are associated with more communities within a country adopting these programs. Ideally, we would also want to complement this analysis with more disaggregated data that allowed an 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 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 Conceptual 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 a rationalizable 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.

We 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 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 b+g-c	0 g-c
Defect	g-c 0	0 0

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 and is determined by the amount of trust that individuals have that others will fulfill promises. In this case, coordination takes place in equilibrium if:

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

Thus, coordination occurs if levels of trust are high enough to compensate for higher costs and lower benefits. Alternatively, higher benefits and lower costs require less trust to exist in order for coordination to be the equilibrium behavior.

A natural extension of the game above is to allow for the presence of opportunists in the population. Consider a modification to the game 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:

[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.

Figure 2

Player 1 (free-rider)

Player 2		Coordinate	Defect
	Coordinate	b-c b+g-c	0 g-c
	Defect	-c 0	0 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.

This simple model motivates our methodological approach. Since our dependent variable is the number of Local Agenda 21 programs countries adopt, we estimate models for count outcomes. In addition, the conceptual framework indicates that trust, the presence of free riders, and the costs and benefits of implementing the program matter. These observations motivate the following hypotheses:

1. For a given expected cost-benefit ratio, higher levels of trust promote more coordination.
2. For a given expected cost-benefit ratio and trust, higher levels of social responsibility (fewer free riders) should be associated with more LA21 programs.

3. The model implies that higher levels of social responsibility require less trust in order to coordinate and vice versa. Therefore, we expect the coefficient on an interaction of trust and social responsibility to be negative.
4. Country-level characteristics that influence the benefits and costs of coordination will affect the number of Local Agenda 21 programs that are implemented. In our empirical framework, we include variables that control for a country's capacity to implement sustainability efforts such as per capita GDP and the extent to which the existing policy framework emphasizes local or national control. In addition, 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.
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 for successful coordination declines. To test this hypothesis, we include interaction terms between trust and the indicators of environmental quality. We expect the coefficients of the interaction terms to be negative.

4 Empirical Evidence

4.1 The Empirical Model

Our measure of sustainability policy is the number of Local Agenda 21 (LA21) programs in a country. Because these are count data, we estimate a negative binomial model. While a Poisson regression might have also been appropriate, given the divergence between the mean and the variance of the count variable, we present and discuss results from negative-binomial models that account for overdispersion in the dependent variable.[2] (See Table 1 for descriptive statistics and the Appendix for a list of countries and key variables of interest by country.)

In addition, our small sample size requires an approach that addresses the issue of potential outliers and influential observations. We take several steps to do so. First, we compute jackknife standard errors. Second, we replicate our models excluding countries in the 90th

[2] The Poisson regression model assumes that the mean of the distribution equals the variance. The negative binomial regression model accounts for overdispersion by adding a parameter that captures unobserved heteregoneity among observations. Both models have the same mean structure but the standard errors of the Poisson model are biased downwards. Likelihood-ratio tests suggest there is significant evidence of overdispersion in our models.

percentile of the distribution of programs. We also show that our results are robust to including several different sets of control variables.

The data for our dependent variable are compiled by the International Council for Local Environmental Initiatives and are available at the World Resources Institute's EarthTrends website. We observe the number of LA21 communities for 1996 and 2001. Availability of the measure of trust limits our sample to 41 countries in 1996. In this sample, the average number of programs is 39.9 and the standard deviation is 91.72 programs. For 2001, our sample consists of 66 countries with a sample mean of 54.3 and a standard deviation of 99.3 programs.

The predictions of our theoretical model suggest the independent variables in our estimation. An important variable explaining coordination is the aggregate level of trust. 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.[3] 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 the Appendix shows, there is considerable variation by country. Sweden and Denmark have the most trusting people at 64 percent. Tanzania, Uganda, and the Philippines have the least trusting people at 8 percent. Simple correlation coefficients between aggregate trust and number of programs show a positive and strong relationship in 1996, the coefficient is .61 and is statistically significant at the 1 percent level, while the relationship is weaker but still significant at the 1 percent level in 2001 when the correlation coefficient equals .41. This positive association is not driven by those countries with many programs and high level of trust such as Sweden and Norway. When we drop countries in the 90 percentile of the distribution of LA21 programs in 1996, the correlation coefficient between trust and the number of programs is .56 and significant at the 1 percent level. For 2001, when we drop countries in the 90th percentile of the distribution of LA21 programs, the correlation coefficient between trust and the number of programs is .23 and significant at the 8 percent level.

In addition to the impact of trust, the model also indicates that the presence of free-riders can hinder the extent of coordination. We use the answers to four questions about justifiable

[3] 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.

behavior in the WVS to calculate an index of civic behavior.[4] These questions ask if it is ever justifiable to 1) cheat on taxes, 2) 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. Although higher levels of CIVIC means that free-riding may be less frequent, this variable is just a proxy for the fraction of the population that will receive a warm glow from cooperating. The empirical model also includes an interaction term between CIVIC and TRUST. We expect the coefficient on this term to be negative since according to our conceptual framework a lower level of trust is required for cooperation where civic behavior is more prevalent.

Our model also highlights the importance of the implementation cost in the LA21 decision and we include the logarithm of per capita GDP as a proxy for a country's quality of institutions and opportunity costs of implementing sustainable development policies.[5] We expect per capita GDP will be positively correlated with the implementation of LA21 programs. Population density may also be related to implementation cost if people living in densely populated areas may be less likely to feel connected to their neighbors and less likely to coordinate behavior.[6] However, higher population density may also be related to benefits if sustainable policies are more beneficial in urban settings. Therefore, although density could increase implementation costs, its effect is a priori ambiguous. A related variable included in all estimations is the population of the country (in logs) to control for scale effects. Everything else equal, we should expect more programs as a country's population increases.

Local governments usually lead LA21 efforts and having an institutional framework that relies on local governments may reduce the cost of implementation of LA21. To control whether a country's institutional framework emphasizes local or national control, we follow Fredriksson,

[4] A similar index was first used by Knack and Keefer (1997).
[5] 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.
[6] We also used urban population as an alternative independent variable with no change in the main results.

Mani, and Wollscheid (2006) and include a dummy variable for federalism. We are again cautious in making a prediction, however, because communities in countries with a federal structure might have less need to implement these types of programs, making the effect of federalism difficult to anticipate.

Finally, our model highlights the importance of the benefits of these programs and we hypothesize that countries with more environmental degradation will invest more local efforts into sustainability because the benefits of the programs would be greater. 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.[7] Based on the results of the theoretical model, we also include interaction terms between the measures of environmental quality and trust and expect negative coefficients because the larger the potential benefits from the program the lower the level of trust required to coordinate agents is.

Summary statistics for all the variables used in our analysis are reported in Table 1. Key variables in our analysis that are derived from the World Values Survey limit our sample substantially. The small sample requires parsimonious specifications and motivates robustness checks which we report later in the paper. Additional variables that were added in our sensitivity analysis are related to institutional capacity, environmental preferences, and trade. Specifically, we also estimated models adding a measure of civil liberties and political rights (from the Freedom House indices) and the number of international NGOs present in the country. We used 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. We also added secondary school enrollment rates in some specifications to allow for the fact that education may impact coordination by affecting preferences for the environment and the cost of coordination, and it may be correlated with trust.

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

4.2 Results

Table 2 presents results for the 1996 sample and Table 3 presents the results for 2001. The first column of each table shows the coefficient estimates on TRUST and the logarithm of population. The next columns add controls to check for the robustness of the positive impact of aggregate trust on the expected number of LA21 programs by country. The 1996 sample has 41 countries while the 2001 sample has 66 countries (missing data for some independent variables limit the sample to 60 countries in some specifications).

The effect of aggregate trust on sustainability efforts can be seen in the first row of each table. The results in Table 2 show that for the sample of 41 countries, trust has a positive and statistically significant impact of the number of LA21 programs. Using the results in column 4 of Table 2, we calculate that a 1 percent increase in TRUST increases the expected mean of the dependent variable by almost 8 percent. For the larger sample of countries in 2001, the estimated coefficients on TRUST are positive but smaller. They are insignificant in three specifications but return to significance when the models include a more complete set of controls, especially those measuring environmental quality. In addition, for the 2001 sample, trust also impacts the expected number of LA21 programs through its interaction terms with the measures of environmental quality. Although trust matters in both samples, there are some differences in the way in which it enters the specification significantly across the two samples. To get some insight into the reasons for this, we also estimated the models with 2001 data only for those countries for which we also have information in 1996. (Results are available from the authors upon request.) We find that the results are very similar in magnitude and significance to those in Table 2. This leads us to suggest that the more diverse set of countries in the 2001 sample might make including the interaction between trust and environmental quality important and may help us measure with more precision these interaction effects. [8]

The level of development and institutional features of the economy also affects sustainability efforts, with GDP per capita having a positive effect, indicating that more developed countries are more likely to have more LA21 programs. This effect is highly

[8] There are 38 countries that appear both in the 1996 sample and in the 2001 sample. For these countries we also estimated random-effects negative binomial models (Hausman tests indicated there were no evidence the random-effects models were misspecified). These models also included a year dummy for 2001. As expected, everything else equal, there were on average more programs in 2001 than in 1996. Qualitatively, these models produced the same results as the cross-section models for the 1996 sample but the coefficient estimates were lower. Nonetheless, the estimates of TRUST were statistically significant at the 5 or 10 percent level. Given that the countries in this panel are very similar to the countries in the 1996 cross-section, these results are to be expected.

significant both in a statistical and an economic sense. For example, using the results in column 4 of Table 2, we calculate that a 1 percent increase in the logarithm of GDP is estimated to increase the expected mean of programs by 108 percent. Although this seems to be a large effect, a 1 percent increase in the logarithm of GDP implies a significant change in per capita GDP.[9] In addition, to the extent that GDP is a proxy for the quality of institutions, this variable captures more than just a country's level of economic development. On average, countries with federal systems implement fewer LA21 programs. The estimates of FEDERAL are consistently negative and statistically significant in most specifications at the 10 and 5 percent levels. 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 local governments.

As expected, population is positively correlated with the number of LA21 programs. Again, using the results in column 4 of Table 2, we calculate that a 1 percent increase in the logarithm of population is estimated to increase the expected mean of the dependent variable by almost 97 percent.[10] The coefficient estimates on density are negative across all specifications and are statistically significant in the larger sample. This finding might be explained by the fact that coordination is more difficult in densely populated areas. Such a result is potentially troubling because sustainability policies are possibly more necessary in urban settings.

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, sulfur dioxide, and energy use would indicate a worse environmental quality in those countries and greater future benefit from environmental protection. As predicted, the coefficient estimates on these variables are positive for 1996 and 2001 but are significant at the 5 percent level or better in the larger sample only. Consistent with the predictions of the model, both for 1996 and 2001 we find that the coefficients on the interaction terms between trust and the measures of environmental quality are negative and statistically significant. In other words, lower trust implies that the benefits of the program have to be larger in order for the program to be implemented.

[9] For example, in this sample of 41 countries a 1 percent increase in the logarithm of GDP implies approximately a 10 percent increase in per capita GDP from the median.

[10] A 1 percent increase in the logarithm of population implies an increase of approximately 2,600,000 people using the median of the distribution of population as the reference point.

The results in Tables 2 and 3 do not provide evidence for the prediction that social responsibility should matter for implementation of LA21. In the last column of Table 2 and Table 3, we find that civic responsibility is not statistically associated with the number of LA21 programs. In Table 3, column 8, the interaction term between TRUST and CIVIC is negative as the model predicts but significant at the 10 percent level only. The point estimates are measured with substantial imprecision. It may be difficult to disentangle the effect of trust and social responsibility and it is possible that in this specification we are confounding the interpretation of our results for TRUST and CIVIC. 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 capture the level of social responsibility, we may have difficulty identifying separate effects for TRUST and CIVIC.

In sum, we find that, consistent with the hypotheses outlined in Section 2, 1) greater trust is associated with more LA21 programs, 2) country level characteristics that may influence the cost of implementation such as 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, and 4) when there is more trust, the benefits necessary to implement the programs are smaller. We find no evidence that social responsibility on its own is associated with more programs or that more social responsibility lowers the amount of trust required to facilitate the coordination.

4.3 Sensitivity Analysis

Although the empirical results corroborate many of the predictions of our conceptual 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. First, we compute jackknife standard errors to provide confidence that our results are not driven by individual countries.[11] Table 4 reports the results from selected models for 1996 (columns 1 to 4) and 2001 (columns 5 to 8). Although the standard errors computed with the jackknife procedure are larger than those reported previously, the main inferences we can draw

[11] The jackknife technique computes coefficient estimates leaving out one country at a time.

regarding the impact of trust are similar. For 1996, the coefficient on TRUST is statistically significant at the 1 percent level, however, the interaction terms with SO2, CO2, and ENERGY are now statistically insignificant. Also, the standard error of the logarithm of GDP is measured with more uncertainty. Thus, it appears that in this small sample, inferences about income per capita and environmental quality are sensitive to individual countries. In the larger 2001 sample, however, the coefficients on sulfur dioxide emissions and its interaction with TRUST are still significant at the 1 percent while carbon dioxide emissions and the interaction with TRUST are significant at the 10 percent and 5 percent levels. It is also the case for this sample of countries that our conclusion about the effect of per capita GDP is not sensitive to individual observations.

We continue exploring how individual countries might affect our results by dropping from the sample countries in the 90th percentile of the distribution of LA21 programs. For 1996, we exclude Denmark, the United Kingdom, the Netherlands, Norway, and Sweden. For 2001, we drop Denmark, Spain, the United Kingdom, Italy, Korea, Finland, and Sweden. We present the results in Table 5 (columns 1 to 4 for the 1996 sample and columns 5 to 8 for the 2001 sample). The coefficients on TRUST are lower but still statistically significant at the 1 percent level in 1996. Using the results in column 1 of Table 5, we calculate that a 1 percent increase in TRUST increases the expected mean of the dependent variable by a 4.5 percent. For the same model and full sample in 1996, the effect was almost 8 percent. Thus, although dropping these observations reduces the magnitude of the effect, trust still matters for these countries. The magnitudes of GDP and population are also lower but economically significant (for example, using the results in column 1 of Table 5, we calculate that a 1 percent increase in the logarithm of GDP is estimated to increase the expected mean of programs by 73 percent). The models for the 2001 sample show that, even after excluding 7 countries, trust matters through its interaction with SO2, CO2, and ENERGY.

Finally, we investigate whether the results we attribute to aggregate levels of trust are robust to including additional controls. Some have argued that empirical measures of trust are really just proxies for the quality of institutions. We demonstrate that our conclusions are robust to including a measure of general institutional quality. A similar argument can be made about the relationship between aggregate trust and levels of education and we experiment with this measure as well. Finally, we also include two other controls that researchers have found to be significant predictors of environmental policies: NGOs and trade openness. Table 1 presents

descriptive statistics for these variables and Table 6 presents the results. The Freedom House indices are proxies of civil liberties and political rights as experienced by a country's citizens and should be related to overall institutional quality. We compute the variable FREEDOMS as the sum of these two indices (re-scaled so that 14 represents the most free and 2 represents the least free). The coefficient estimate on FREEDOMS is positive, as expected, but statistically insignificant. In addition, there is evidence of collinearity as the standard error of the estimate for GDP increases. Secondary school enrollment is negative but statistically insignificant. The results for TRUST in the 1996 sample still hold, suggesting that quality of institutions and levels of education are not omitted variables influencing the impact of TRUST in our original regressions. (In results not reported in this table, we also find that the interaction terms between trust and indicators of environmental quality are still statistically significant in the 2001 sample). The number of international non-governmental organizations is negatively correlated with the expected number of LA21 programs but the result is only statistically significant at the 10 percent level in the 1996 sample (columns 3 and 7). Trade openness is also statistically insignificant (columns 4 and 8). While Damania, Fredriksson, and List (2003) found that trade increased the stringency of lead content per gallon of gasoline in a panel of 48 developing and developed countries, our measure of environmental policy refers to local sustainability efforts rather than country-wide policies.

In summary, we find robust evidence that there is a positive relationship between levels of trust and sustainability efforts at the country level. For the sample of countries in 1996, trust influences LA21 programs directly while for the 2001 sample trust matters through its interaction with measures of environmental quality. These main results are robust to including additional controls, excluding potential outliers, and computing jackknife standard errors.

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 motivate the empirical approach to estimating the adoption of Local Agenda 21 programs. As predicted by the model, trust is critical to the implementation of the programs. The effect is economically meaningful. For a sample of 41 countries in 1996, a 10 percent increase in aggregate levels of trust implies almost a 80 percent increase in the expected number of programs and even when we

exclude potential outliers, a 10 percent increase in trust implies a 45 percent increase the expected number of LA21 programs. For a sample of 63 countries in 2001, the effect of trust is apparent when we control for the potential benefits of the programs: although when the benefits are greater more municipalities undertake these sustainability efforts, negative interaction terms suggest that higher levels of trust are necessary as the benefits decrease. We also find that the level of GDP is positively related to the number of Local Agenda 21 programs, probably because higher income levels lower the cost of implementation. These conclusions are robust to changes in specification and sample size.

These results have implications for the design of policies and programs intended to improve environmental quality. 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

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Table 1: Summary Statistics

	Description	Countries, 1996	Mean Std. Dev., 1996	Countries, 2001	Mean Std. Dev., 2001
LA21	Local Agenda 21 municipalities	41	39.90 (91.72)	65	54.31 (99.26)
TRUST	Percent of population who says most people can be trusted	41	33 (14)	65	27 (14)
Log(GDP)	Log of GDP per capita (constant 1995 US$)	41	8.90 (1.35)	65	8.37 (1.56)
Log(POP)	Log of Population	41	16.72 (1.82)	65	16.70 (1.71)
FEDERAL	= 1 if country is federal	41	.31 (.47)	65	.2 (.40)
DENSITY	Population per square mile	41	140.56 (203.85)	63	254.58 (861.22)
CIVIC	Index of civic responsibility (= 0 if all 4 free-riding behaviors are justifiable)	40	2.44 (.57)	48	2.44 (.64)
CO2	CO2 emissions (kg per 1995 US$ of GDP)	41	1.37 (1.38)	65	1.34 (1.28)
ENERGY	Energy use per GDP (kg of oil equivalent per constant 1995 PPP $)	41	.30 (.17)	62	.28 (.17)
SO2	Emissions of sulfur dioxide (thousand metric tons per million current US$)	40	.006 (.007)	64	.004 (.005)
FREEDOMS	Sum of Freedom House indexes, 14 = the most free and 2 = the least free	31	11.06 (3.68)	49	9.12 (4.10)
EDUCATION	% secondary school enrollment	26	82.51 (13.79)	45	78.07 (18.24)
NGOs	International non-governmental organizations per 1 million population	38	3.67 (8.37)	63	4.42 (10.23)
TRADE	(Exports + Imports) as % of GDP	41	75.28 (38.58)	64	86.54 (49.51)

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: Negative Binomial Results, 1996

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LA21	LA21	LA21	LA21	LA21	LA21	LA21	LA21
TRUST	.108***	.077***	.074***	.074***	.103***	.106***	.133***	.055
	(.013)	(.013)	(.014)	(.014)	(.013)	(.016)	(.024)	(.037)
LogPOP	.440**	.523***	.650***	.677***	.689***	.617***	.622***	.681***
	(.200)	(.145)	(.174)	(.175)	(.179)	(.188)	(.168)	(.181)
LogGDP		.753***	.731***	.730***	.225	.464**	.501**	.753***
		(.189)	(.196)	(.195)	(.271)	(.195)	(.249)	(.194)
FEDERAL			-.856	-.922*	-.980**	-1.003**	-.775*	-1.143**
			(.543)	(.519)	(.403)	(.401)	(.470)	(.529)
DENSITY				-.001	-.001	-.001	-.002*	-.001
				(.001)	(.001)	(.001)	(.001)	(.001)
CO2					.146			
					(.425)			
CO2*TRUST					-.024***			
					(.008)			
SO2						191.34*		
						(111.784)		
SO2*TRUST						-1.33***		
						(3.386)		
ENERGY							3.087	
							(3.708)	
ENERGY* TRUST							-.215**	
							(.109)	
CIVIC								.078
								(.684)
CIVIC*TRUST								.006
								(.016)
Constant	-8.35**	-15.65***	-17.24***	-17.57***	-13.48***	-14.51***	-15.42***	-17.92***
	(3.570)	(3.538)	(3.722)	(3.732)	(5.095)	(4.813)	(4.561)	(3.812)
Observations	41	41	41	41	41	40	41	40

Robust standard errors in parentheses;* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Negative Binomial Results, 2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LA21	LA21	LA21	LA21	LA21	LA21	LA21	LA21
TRUST	.053***	.011	.010	.008	.044***	.052***	.064**	.106*
	(.010)	(.010)	(.009)	(.010)	(.015)	(.014)	(.027)	(.059)
LogPOP	.198*	.301***	.357***	.393***	.509***	.498***	.370***	.381***
	(.120)	(.090)	(.090)	(.096)	(.097)	(.090)	(.094)	(.124)
LogGDP		.679***	.720***	.755***	.632***	.809***	.838***	.777***
		(.119)	(.114)	(.111)	(.115)	(.102)	(.120)	(.141)
FEDERAL			-.593	-.660*	-.719*	-.616	-.751*	-.895**
			(.401)	(.390)	(.386)	(.396)	(.398)	(.361)
DENSITY				-.001***	-.001***	-.001***	-.001***	-.001***
				(.000)	(.000)	(.000)	(.000)	(.000)
CO2					.857**			
					(.375)			
CO2*TRUST					-.038***			
					(.014)			
SO2						445.710***		
						(12.442)		
SO2*TRUST						-16.795***		
						(4.659)		
ENERGY							6.056**	
							(2.759)	
ENERGY* TRUST							-.239**	
							(.109)	
CIVIC								.898
								(.554)
CIVIC*TRUST								-.038*
								(.021)
Constant	-1.04	-7.64***	-8.79***	-9.54***	-11.35***	-13.15***	-11.30***	-11.78***
	(2.093)	(2.193)	(2.162)	(2.211)	(2.013)	(2.165)	(2.334)	(3.135)
Observations	66	65	65	63	63	62	60	47

Robust standard errors in parentheses;* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Negative-Binomial, Jackknife Standard Errors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1996	1996	1996	1996	2001	2001	2001	2001
	LA21	LA21	LA21	LA21	LA21	LA21	LA21	LA21
TRUST	.074***	.103***	.106***	.133***	.008	.044**	.052***	.064*
	(.023)	(.022)	(.027)	(.040)	(.011)	(.017)	(.017)	(.035)
LogPOP	.730**	.225	.464*	.501	.755***	.632***	.809***	.838***
	(.330)	(.367)	(.260)	(.393)	(.130)	(.140)	(.121)	(.149)
LogGDP	-.922	-.980*	-1.003*	-.775	-.660	-.719	-.616	-.751
	(.609)	(.498)	(.534)	(.554)	(.487)	(.475)	(.500)	(.514)
FEDERAL	.677***	.689***	.617**	.622***	.393***	.509***	.498***	.370***
	(.220)	(.215)	(.236)	(.207)	(.118)	(.117)	(.102)	(.112)
DENSITY	-.001	-.001	-.001	-.002	-.001	-.001	-.001**	-.001
	(.002)	(.001)	(.001)	(.001)	(.001)	(.001)	(.000)	(.001)
CO2		.146				.857*		
		(.724)				(.442)		
CO2*TRUST		-.024				-.038**		
		(.020)				(.017)		
SO2			191.341				445.710***	
			(214.719)				(155.304)	
SO2*TRUST			-10.326				-16.795***	
			(7.275)				(6.190)	
ENERGY				3.087				6.056
				(5.477)				(3.709)
ENERGY* TRUST				-.215				-.239
				(.159)				(.143)
Constant	-17.57***	-13.48**	-14.51**	-15.42**	-9.54***	-11.35***	-13.15***	-11.30***
	(4.470)	(6.162)	(5.825)	(6.073)	(2.681)	(2.388)	(2.440)	(2.842)
Observations	41	41	40	41	63	63	62	60

Jackknifed standard errors in parentheses;* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Negative Binomial Models
Samples exclude countries in the 90th percentile of the distribution of Local Agenda 21

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1996	1996	1996	1996	2001	2001	2001	2001
	LA21	LA21	LA21	LA21	LA21	LA21	LA21	LA21
TRUST	.044***	.064***	.067***	.063**	-.005	.026	.037**	.038*
	(.015)	(.016)	(.019)	(.029)	(.011)	(.018)	(.017)	(.023)
LogPOP	.546***	.122	.318*	.312*	.548***	.481***	.584***	.616***
	(.150)	(.251)	(.163)	(.171)	(.095)	(.108)	(.090)	(.113)
LogGDP	-.451	-.579*	-.648*	-.365	-.449	-.529	-.453	-.566
	(.419)	(.340)	(.345)	(.388)	(.328)	(.360)	(.357)	(.360)
FEDERAL	.537***	.543***	.507***	.451***	.279***	.344***	.347***	.264***
	(.127)	(.133)	(.147)	(.120)	(.079)	(.087)	(.077)	(.085)
DENSITY	-.001	-.001*	-.001*	-.002**	-.001***	-.001***	-.001***	-.001***
	(.001)	(.001)	(.001)	(.001)	(.000)	(.000)	(.000)	(.000)
CO2		-.192				.599		
		(.377)				(.392)		
CO2*TRUST		-.010				-.025*		
		(.008)				(.015)		
SO2			97.051				357.928***	
			(94.526)				(117.034)	
SO2*TRUST			-6.420**				-12.805***	
			(3.035)				(4.621)	
ENERGY				-1.996				4.642*
				(3.760)				(2.440)
ENERGY* TRUST				-.032				-.179*
				(.118)				(.095)
Constant	-13.13***	-9.37**	-1.67***	-9.30***	-5.96***	-7.25***	-8.74***	-7.37***
	(2.827)	(4.118)	(3.907)	(3.295)	(1.843)	(1.806)	(1.814)	(2.101)
Observations	36	36	35	36	56	56	55	53

Robust standard errors in parentheses;* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: Negative Binomial Results – Additional Regressors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1996	1996	1996	1996	2001	2001	2001	2001
	LA21	LA21	LA21	LA21	LA21	LA21	LA21	LA21
TRUST	.066***	.093***	.078***	.074***	.003	.024	.005	.008
	(.019)	(.024)	(.015)	(.014)	(.010)	(.015)	(.010)	(.010)
LogPOP	.435	.702***	.558***	.602*	.328***	.510***	.376***	.422***
	(.298)	(.249)	(.197)	(.352)	(.111)	(.126)	(.116)	(.133)
LogGDP	.199	.590	.697***	.703***	.646***	.729***	.772***	.773***
	(.317)	(.463)	(.205)	(.204)	(.142)	(.167)	(.108)	(.107)
FEDERAL	-1.238**	-1.631**	-.895*	-.918*	-.779*	-.958	-.694*	-.702*
	(.523)	(.735)	(.525)	(.518)	(.466)	(.646)	(.390)	(.402)
DENSITY	-.002*	-.001	-.001	-.001	-.001***	-.002***	-.001***	-.002*
	(.001)	(.001)	(.001)	(.002)	(.000)	(.001)	(.000)	(.001)
FREEDOMS	.126				.061			
	(.114)				(.057)			
EDUCATION		-.005				-.009		
		(.032)				(.012)		
NGO			-.063*				-.003	
			(.037)				(.011)	
TRADE				-.004				-.001
				(.011)				(.004)
Constant	-9.36	-16.85***	-15.22***	-15.85**	-7.82***	-1.62***	-9.27***	-9.96***
	(7.119)	(4.442)	(4.140)	(7.520)	(2.534)	(2.577)	(2.524)	(2.911)
Observations	31	26	38	41	48	43	61	62

Robust standard errors in parentheses;* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix

Country	Trust (%) (1996)	Local Agenda 21 (1996)	Trust (%) (2001)	Local Agenda 21 (2001)
Argentina	22	0	15	1
Austria	28	2	31	64
Belgium	31	5	29	106
Bulgaria	29	0	25	22
Belarus	25	0	38	0
Brazil	07	8		
Canada	51	7	38	14
Switzerland	27	2		
Chile	22	1	22	15
China	60	14	53	25
Czech Republic	28	0	23	42
Denmark	56	147	64	216
Spain	32	29	35	359
Estonia	28	1	22	29
Finland	60	88	57	303
France	21	15	21	69
United Kingdom	42	285	29	425
Hungary	24	12	21	9
India	34	20	39	14
Ireland	47	22	35	29
Iceland	42	0	39	37
Italy	33	22	32	429
Japan	38	26	40	110
Republic of Korea	34	9	27	172
Lithuania	31	0	23	14
Latvia	19	1	17	5
Mexico	19	1	21	2
Malta	23	0	20	0
Nigeria	22	0	25	5
Netherlands	50	143	59	100
Norway	61	415		
Poland	29	3	18	70
Portugal	21	10	10	27
Romania	16	0	10	0
Russia	35	5	23	29
Slovakia	22	3	15	30
Slovenia	16	1	21	3
Sweden	60	307	64	289
Turkey	10	3	13	50
United States	50	19	36	87
South Africa	27	10	12	20
Albania			23	7
Algeria			11	3
Bangladesh			23	2
Egypt			37	7

Greece			21	39
Croatia			18	20
Indonesia			46	8
Iran			50	2
Israel			23	3
Jordan			27	4
Kyrgyz Republic			17	0
Luxembourg			25	69
Morocco			23	5
Moldova			14	0
Macedonia			13	0
Pakistan			28	1
Peru			11	17
Philippines			08	28
Puerto Rico			22	0
Saudi Arabia			51	4
Singapore			17	1
Tanzania			08	13
Uganda			08	5
Ukraine			26	9
Venezuela			16	3
Viet Nam			39	20
Zimbabwe			12	39