

ABSTRACT

This paper main objective is to contribute to the growing literature on the relationship between social capital and the management of natural resources. Specifically, we investigated the effect of trust based social capital on the environmental awareness captured by the willingness to give a part of income to protect the environment. Results from Ordered Logit and instrumental variable estimates using data from 13 african countries indicate that social capital has a robust positive effect on the environmental awareness. Assessing the mechanism behind the effect of trust based social capital, one observes that this effect operates mainly through the increase of social cohesion. In the same vein, the results suggest that social capital and institutions are substitutes in Africa. These results add to previous evidences and demonstrate the importance of social capital in improving collective management of natural resources in Africa.

Key Words: *Social Capital, Environmental awareness, , African countries, Ordered Logit*

JEL Classification: *A13, C25, Q01*

I.Introduction

The decades-old debate over the relationship between economic development and environmental conditions has assumed renewed urgency in the wake of growing concern about global warming. (Roberts and Grimes, 1997).

According to Roberts and Grimes (1997), a central question in the debate has been whether effluents produced by industrial processes increase monotonically with economic development, or if countries reach a turning point” at which emissions begin to drop because they can afford more efficient infrastructure and more stringent pollution controls. Some studies have found such an inverted U-curve (also called environmental Kuznet curve) in the relation between level of development and certain pollutants such as particulates, sulphur dioxide, toxic chemicals and a series of water pollutants (World Bank, 1992; Selden and Song, 1995; Stokey, 1998). Also, Grossman and Krueger (1995) claimed that this turning point for several pollutants tended to occur before countries reach a gross domestic product of US\$8,000 per capita. In other words, in countries where the gross domestic product is below this threshold, environmental degradation increases with economic development. This is mainly the case with developing countries, especially African countries. For this reason, environmental protection has become a vital issue for the contemporary world.

In richer countries, environmental awareness, and the necessity to incorporate ecological considerations in land management and the ability to subscribe to tenets of sustainable agriculture have contributed to national strategies for a rational use of biophysical resources. The poorer third world countries, on the other hand, are unable to embrace these ‘lofty’ ideals and continue on the road to reduced productivity and the inability to feed themselves (Udrescu and Man, 2010). One of the conventional wisdom with regard to this issue is that the emergence of environmental awareness depends on the level of development (Broad, 1994; Duroy, 2005). For instance, low income country may exhibit a weak demand for environmental quality. Therefore, they are less likely to contribute in order to improve or to preserve the quality of the environment.

According to previous statements, there is a wide range of studies devoted to environmental preferences. In this specific context, the willingness to pay for the preservation of environment has been a controversial issue. In fact, environmental quality most often is perceived as a luxurious good that becomes of concern only when basic needs have been met (Dasgupta, 2002). In other words, the desire to protect the environment is negatively associated with the level of GDP (Duroy, 2005). However, some studies highlighted the fact that in some

specific case, poor people become environmental protectors, notably when there is a collective management of natural resources (Broad, 1994). As far as collective action is concerned, there are several studies showing that where social capital is well developed, groups with locally-developed rules and sanctions are able to make more of existing natural resources than individuals working alone or in competition (Ostrom, 1990; Westerman, Pretty and Ashby, 2005). Notwithstanding the recognized positive effect of social capital (through collective action) on the efficient management of natural resources, little is known about the role that social capital can play in improving the willingness to preserve environment. Dealing with the relationship between social capital and environmental awareness is relevant for at least two reasons:

1) The issue of environmental preservation nowadays is a common concern for both developed and developing countries. However, environment quality is still perceived as a luxurious good that becomes of concern only when basic needs have been met (Duroy, 2005). In other words, low income countries such as African countries are less likely to exhibit a strong demand and WTP for environment quality. This paper takes the opposite direction, showing that while accounting for social capital, African countries could exhibit a strong demand for environment quality.

2) Despite a wide range of papers related to environment concern and an increasing body of literature on social capital there is some gap with regards to the relationship between social capital and environmental preservation. One exception is Polyzou et al (2011) who addressed the effects of social capital on the WTP for drinkable potable water in the case of Bulgaria. However, as many studies devoted to environment, this study is based on a specific country and cannot be easily generalized. Moreover, it is difficult to find contributions related to a country or a group of countries and considering an environmental damage perspective as a whole (Israel and Levinson, 2004). While the whole perspective has the disadvantage of excessive simplification which can lead to a downward bias of environmental WTP, with a general perspective, embedding effects which are usually linked to specific environmental commodities can be avoided (Torgler and Garcia-valinas, 2005).

In this light, the main objective of this paper is to provide an empirical evidence of a positive relationship between social capital as measured by generalized trust and environmental awareness¹ in the case of thirteen African countries. Thus, the contribution of this paper is twofold. First, using five waves of the World Value Survey (1981-2007)² and mobilizing ordered

¹ By environmental awareness, we mean the willingness to preserve environment.

² This period has been chosen due to data availability.

Logit specifications, we explore the effects of social capital on environmental awareness in thirteen African countries. Secondly, unlike most studies in the social capital literature, we deal with the plausible endogeneity of social capital using an instrumental variable approach. In this line, the estimated slave exports from African countries between 1400 and 1900 are used as an instrument for social capital.³ Then after factoring in the endogeneity of social capital, results suggest that social capital is positively and significantly correlated to environmental awareness in African countries.

The rest of the paper is as follow: Section 2 provides a brief review regarding the relationship between social capital and the willingness to pay for environmental goods. Section 3 presents a simple description of the environmental awareness and social capital data. Section 4 documents the correlations that exist in the data while section 5 turns to the issue of causality. Section 6 concludes.

2. Theoretical Background

2.1. The definition and measure of Social capital: an elusive quest

Over the recent years, social capital has been successfully connected to a wide range of topics in economic development. Specifically, social capital has been connected to economic growth (Chou, 2006; Sabatini, 2009), health (Rostila, 2007), environment (Pretty, 2001; Polyzou *et al*, 2011).

Despite the huge amount of research on it, the definition of social capital has remained elusive (Durlauf and Fafchamp, 2004). According to Putnam and al (1993), social capital refers to features of social organization, such as trust, norms, and networks that can improve the efficiency of society. In the same line, Lin (2001) defines social capital as resources embedded in social networks, accessed and used by actors for actions. With regard to Durlauf and Fafchamps (2004), one can distinguish three main underlying ideas: (1) social capital generates positive externalities for members of a group; (2) these externalities are achieved through shared trust, norms, and values and their consequent effects on expectations and behaviour; (3) shared trust, norms, and values arise from informal forms of organizations based on social networks and associations. Sometime, this variety of definitions gives rise to a wide range of measures.

Several components have been identified as indicators of social capital (Coleman, 1990; Putnam *et al*, 1993; Sabatini, 2009; Polyzou *et al*, 2011). Firstly, social trust which has to do with

³ This choice is made according to Nunn and Wantchekon (2011) who have shown that there is a significant correlation between Slave exports and trust.

trust towards people in general (Uslaner and Conley, 2003). Secondly, institutional trust, referring to trust in institutions (Paxton, 1999). Thirdly, social networks and civic participation, relating to the involvement of individuals in formal and informal networks and also their interest for collective issues of their community (Putnam, 2000). Finally, compliance with social norms, hence the tendency of individuals to comply with formal or informal community rules aiming to the protection of the common good (van Oorschot *et al.*, 2006).

Trust is considered as one of the most important component of social capital⁴ with significant influence on norms and social network (Polyzou *et al.*, 2011). According to Fafchamps (2004), trust may be understood as an optimistic expectation or belief regarding other agents' behaviour. Trust could arise from repeated interpersonal interaction. In this case we talk about personalized trust. In some other case, trust arises from general knowledge about population agents, incentives they face and the upbringing they have received (Platteau 1994a, 1994b). The latter case talks about generalized trust. The main difference between the two is that, for each pair of newly matched agents, the former takes time and effort to establish while the latter is instantaneous, and more cheaply (Durlauf and Fafchamps, 2004). In this case, generalized trust generates large efficient gains than personalized trust.

Trust is an essential ingredient in fostering exchange and the delivery of public goods. In this case, trust helps setting up collective action. Trust is also necessary to resolve conflicts among competing interests and to reduce fears of free riding.

2.2. Possible channels of causality between social capital and environment

The literature has identified three main channels through which social capital could improve the efficiency: Information sharing, Group identity and explicit coordination. Information sharing arises during the process of socialization. Thus it is a by-product of social interaction. Because interacting with others is also consumption good, collecting information through socialization benefits from a kind of subsidy, relative to non-social forms of information collection (e.g., going to the library). In the specific case of environmental goods, social capital helps in sharing information about environmental issues and therefore increases the environmental awareness.

According to Durlauf and Fafchamps (2004), social capital could also act through group identity and the modification of preferences. This effect arises because identification with a group or network affects individual preferences and choices. As such, social trust influences individuals' environmental preferences due to their perception that other members of their community will

⁴ As from now social capital refers to trust.

act in a similar manner aiming at the protection of the common good (Pretty, 2003). Similarly, individual's desire to protect the environment is influenced by the expectation of others people intention to contribute money (Wiser, 2007). In case of public goods, trust in institutions (e.g. the state) is important due to their involvement in environmental management. Thus, the tendency of individuals to trust these institutions is connected with the perception for the efficiency of environmental management (Kim, 2005; Beierle and Cayford, 2002). In the same vein, Social capital could be complement for good institutions (Baliamoune-Lutz, 2009a, 2011) and substitute for bad ones (Pretty and Ward, 2001; Gabre Madhin, 2001). Therefore, weak institutions could give rise to the creation and strengthening of social capital, leading to the increase of individual environmental awareness.

Some beneficial effects of social capital on individual preferences also occur through coordination and leadership. As posits by Durlauf and Fafchamps (2004), in very informal groupings, leadership is likely to be essential to alter individual preferences and elicit voluntary contributions to the common good. This observation also has implications for policy. Good leaders may improve efficiency by using the levers of social capital, by fostering altruistic preferences and concern for the common good; favouring group identification; preaching good behaviour and making free-riders feel guilty; encouraging mimicry of good behavior through role models and the manipulation of group symbols and representations (e.g., religion, ideology). According to Jones, (2010); Poyzou *et al*, (2011), individual leadership and the propensity to coordinate a group can improve civic engagement and participation in collective activities. These structural elements turn to be highly correlated with the level of awareness for environmental issues and the tendency to participate in action for their resolution. Consequently, it may be assumed that citizens who are more interested in collective issues are also expected to be more willing to pay for the preservation of the environment.

Besides, social capital (trust) may be associated with high social cohesion and this may cause residents to support environmental quality and pay for it because social cohesion may reduce the possibility of free riding.⁵ Finally, social capital may act through the increase of human capital centered on participatory learning process, which in turn lead to the improvement of environmental awareness and a better management of natural resources.

However, it is not all types of social capital that are prerequisite for a long-term improvement in natural capital. Since the Putnam's distinction between bonding social capital⁶

⁵ This channel has been suggested by an anonymous referee.

⁶ Connections to people with some shared demographic characteristics such as family, relatives, and kinship

and bridging social capital⁷, there is a wide recognition of their different impacts on economic development. As far as environmental quality is concerned, bonding social capital seems to matter more, especially in the African context. Bonding social capital (closed social network) limits the scope of information sharing and therefore undermines the learning process of innovative solution to protect the environment. In contrast, closed social network may encourage compliance with local – sometimes implicit – rules and customs and reduce the need for formal monitoring. In this vein, bonding social capital may facilitate the compliance with environmental norms and improve the coherence of collective action. Contrary to that, bridging social capital increases the speed of information sharing and therefore human capital and innovation. Then bridging social capital should be useful to facilitate the development and the appropriation innovative solution necessary for the preservation environment.

3. Empirical analysis

3.1 Environmental awareness and Social Capital data

This paper makes use of data drawn from the World Value Survey. Five waves have been merged over years 1981-2007. As far as African countries are concerned, thirteen countries have been selected (list of countries in Appendix), that is a sample of 39821 individuals.

As mentioned in the theoretical framework, social capital is empirically captured by a wide range of variables, starting from generalized trust to civic participation. In this paper, social capital is measured by trust and specifically generalized trust. Two reasons are behind this choice. First, this variable is available in the survey. Second, as stated by Durlauf and Fafchamps (2004) generalized trust seems to lead to more efficient gains than interpersonal trust and is strongly correlated with other dimensions of social capital such as norms, social network and civic participation. Nevertheless, we have to mention that this measure remains controversial although it is used in several studies (see Knack and Keefer, 1997; Dearmon and Grier, 2009). For example, Balliamoune-Lutz (2011) reports two experimental studies conducted respectively by Glaeser *et al* (2000) and Anderson et al (2004) that led to opposite results. Glaeser *et al* (2000) conduct an experimental study using Harvard undergraduates and combine the results with a question survey which includes attitudinal and self-reported behavioral measures of respondents' trustworthiness and trustfulness. They identify only two attitudinal questions that predict the experiment based trust, underscoring by the way the potential weaknesses of the World Value Survey (WVS) trust variable as a measure of generalized trust. In contrast to these findings, the

⁷ Connections to people, who are not like you in some demographic sense, tend to bring people across social divisions.

results of Anderson *et al* (2004) suggest that the most common attitudinal measure of trust used in the literature which is based on the affirmative responses to the question ‘do you think most people can be trusted’ is valuable. Moreover, as pointed out by Balliamoune-Lutz (2011) and Woolcock (2001), since social capital is a consequence of trust, the latter could be a good measure of the stock of social capital and can capture positive aspects resulting from networks and cooperation. However, as there is no clear-cut view on this issue, we carry out some robustness check using alternative measure of social capital. (see Section 5 and Table 5b in appendix).

The question asked to measure generalized trust is: Generally speaking, would you say that most people can be trusted or you can’t be too careful when dealing with people? This question gives rise to a binary variable described as follows:

Table 0.a: Measure of Social Capital, Generalized trust

	Frequencies	Percentage	Cumulative percentage
Most people can be trusted	7232	18.79	18.79
We can't be too careful	31247	81.21	100.00
Total	38479	100	

Source: Author’s calculation based on data from WVS

According to Table 0.a, in the thirteen African countries selected for this study, 81.21% of the population consider that only few people can be trusted.

In order to measure the environmental awareness, we resort to a variable which captures for the respondent’s willingness to contribute financially in order to preserve the environment. The question asked is: would you agree to give a part of your income for the preservation of the environment? This question gives rise to an ordered variable going from (1) strongly disagree to (4) strongly agree. Table 0.b provides the descriptive statistics:

Table 0.b: Environmental awareness

	frequencies	Percentage	Cumulative percentage
Strongly agree	4351	20.88	20.88
Agree	8484	40.72	61.61
Disagree	5053	24.25	85.86
Strongly disagree	2946	14.14	100.00
Total	20834	100	

Sources: Author’s calculations based on data from the WVS

While most of the responses are concentrated between “agree” and “disagree” (more than 65%), one may notice that the percentage of people who strongly agree to invest a part of their income to the environment is higher than that of those who strongly disagree. Since this variable is not fully informative, we carry out some robustness check using an alternative variable. The

question related to this variable is: Would you buy thing at a 20% higher price if it helped to protect environment. However, this variable is only available for Nigeria and South Africa and only for the wave 1999-2004. This makes it difficult to be used as the main measure of environmental awareness unless the focus of the study is only on two countries.

3.2. Basic correlations: Ordered Logit Estimates

This subsection empirically examines the effect of trust based social capital on environmental awareness while controlling for individual characteristics and country fixed effects. The baseline estimating equation is:

$$EA_{ijt} = \beta_0 + \beta_1 Trust_{ijt} + X'_{ijt}\gamma + u_i + \varepsilon_{ijt} \quad (1)$$

Where EA_{ijt} is the measure of environmental awareness for individual i in country j at time t , Trust is the generalized trust and X is a vector of control variables that are meant to capture differences in individual characteristics. Following Polyzou *et al* (2011), this vector includes individual age, sex, years of education, marital status (married), religion (different dummies for Muslim, Protestant, Catholic and Orthodox), poverty level (head count ratio), the importance of environmental problems such as water pollution (1 if the problem is guessed important and 0 otherwise), air pollution and global warming (1 if the problem is guessed important and 0 otherwise), the size of town in order to control for population density which could affect the intensity of environmental problems.

For robustness checks, we add to this baseline specification a measure of ethnic tension as an alternative measure for social capital (Fafchamps, 2000; 2003). In the same vein, to account for potential difference between bonding and bridging social capital, variables which capture the time spent respectively with parents, friends and colleagues are included in the regression. The higher the value, the lower the time spent with parents and relatives. Countries fixed effects are included in order to control for specific events that occur in a country. Countries fixed effects also control for country-specific factors that are potentially important determinants of trust, such as government regulation (see Aghion, Algan, and Cahuc, 2008a; Aghion, Algan, Cahuc, and Shleifer, 2008b). The descriptive statistics of data are given in Table 1.

[Insert Table I about here]

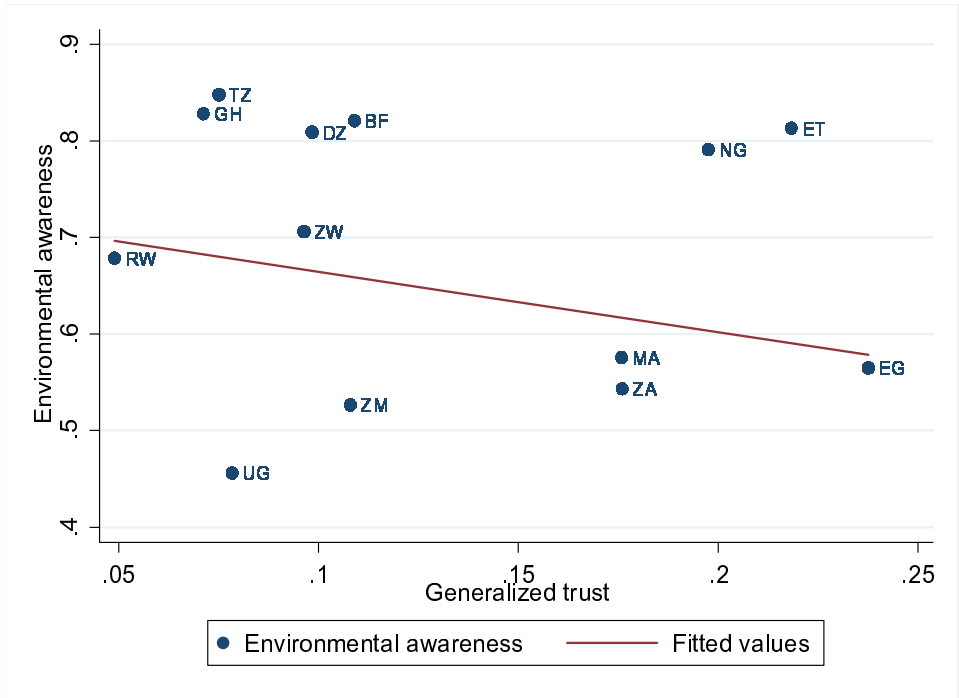
Ordered Logit estimates of equation (1) are reported in Table 2. Columns (1) and (3) report coefficients while columns (2) and (4) report marginal effects of trust on the probability to strongly agree to give a part of income to protect the environment ($\Pr[EA=4]$)⁸.

The results suggest that social capital as measured by generalized trust positively and significantly influences environmental awareness. Specifically, relatively to the lack of generalized trust, in countries where people think that most people can be trusted, the willingness to give a part of his income to protect the environment increases by 0.09 point in average. As it is shown in columns (3) this effect remains when one controls for variables that measure the importance of environment issues.

[Insert Table 2 about here]

In order to see how countries individually perform, we present a simple two way scatter plot which portrays the relationship between trust based social capital and a measure of environmental awareness.

Figure 1: Relationship between Social Capital and Environmental Awareness



Source: Author’s calculations based on data from WVS

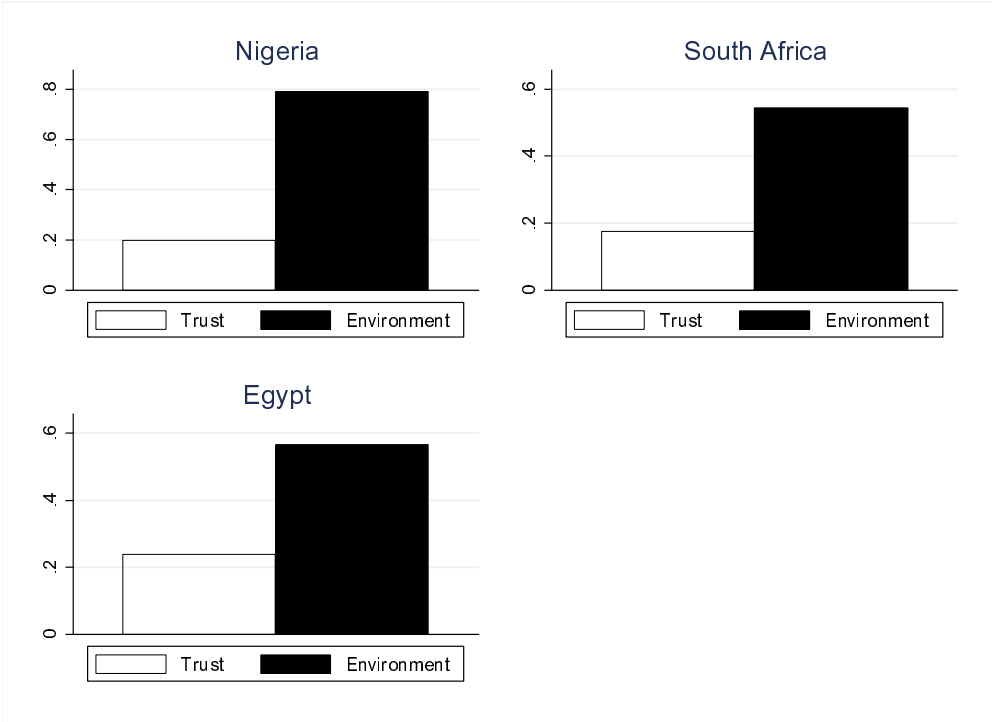
Figure 1 shows the relationship between environmental awareness in Y-axis and the generalized trust in X-axis⁹. As shown in the Figure, the situation in countries vary. Countries

⁸ The variable has been recoded so that the modality ‘strongly agree’ takes the higher value.

such as Tanzania, Ghana, Burkina Faso, Algeria and Zimbabwe present a high level of environmental awareness with a low level of generalized trust. On the contrary, South Africa, Egypt and Morocco exhibit a low level of environmental awareness with a high level of generalized trust. Countries such as Nigeria and Ethiopia perform better as the high level of generalized trust goes along with the level of environmental awareness. Finally, the figure reveals that countries such as Zambia, Uganda and Rwanda perform badly with both a low environmental awareness and a low level of generalized trust.

To sum up, Figure 1 shows that without controlling for other plausible confounding variables, very few countries exhibit simultaneously a high level of environmental awareness and a high level of trust based social capital. In order to go deeper with this analysis, we compare three major countries in terms of population density, namely Nigeria, South Africa and Egypt. This comparison also helps to see whether North Africa and Sub-saharan Africa have the same behavioural pattern.

Figure 2 : Social capital and environmental awareness, comparing Nigeria, South Africa and Egypt



Source: Author’s calculations based on data from WVS

Figure 2 displays a bar graph which makes a direct comparison between Nigeria, South Africa and Egypt. The figure shows that in terms of generalized trust, Egypt performs better,

⁹ Actually the graph depicts the relationship between the predicted probability (EA=4) and the predicted probability (Trust=1). Coefficients of country dummies are presented in Table 6 in appendix.

followed by Nigeria and South Africa. However, in terms of environmental awareness, Nigeria has the first rank followed by Egypt and South Africa. However, one cannot draw from this figure a general conclusion according to which North African countries exhibit a high level of generalized trust on average. In fact, figure 1 shows that Algeria could be an exception to this statement.

In order to refine this comparison, table 3 presents the ordered Logit estimates of the effects of social capital on environmental awareness while comparing Nigeria, South Africa and Egypt. Table 3 suggests that the relationship between trust based social capital and environmental awareness is only significant for Egypt and South Africa. Besides, this relationship is positive with a higher magnitude for Egypt.

[Insert Table 3 about here]

3.3. Assessing some transmission channels

The aim of this subsection is to test some mechanism behind the impact of trust on environmental awareness (captured by the willingness to give a part of income for environmental preservation). As suggested in the theoretical background, there are various channels including institutions, human capital, social cohesion, through which trust based social capital could impact environmental awareness. In order to test whether social capital and institutions are complements, we include in the specification (1) an interact term between trust and institutions captured by the index of corruption¹⁰ (ICRG, 2006). Social capital and institutions are substitutes if the coefficient of the interact term is positive and significant. Table 4a displays the results. According to Table 4a, the positive effect of trust on environmental awareness is partially reduced when the quality of institution improve. This suggests a substitution between bad institutions and trust based social capital.

[Insert Table 4a about here]

We resort to Karlson et al (2010) to assess the indirect effect of social capital on the environmental awareness. The indirect effect is the difference between the total effect and the direct effect. The direct effect is the one obtained while controlling for a full set of explanatory variables. The total effect is obtained when we run a simple regression of trust based social

¹⁰ Higher values correspond to low level of corruption.

capital on the measure of the environmental awareness. Table 4b displays the results. The first column shows that social cohesion (captured by the ICRG measure of internal conflict¹¹) confirms the hypothesis according to which the impact of social capital acts through the increase of social cohesion. This effect still holds when one use as an alternative measure of social capital the ICRG measure of ethnic conflict¹². Besides, the channel of human capital is also tested using the same methodology. However, the results suggest that in this specific case, human capital is not a valid channel through which social capital impact environmental awareness. This result is rather surprising. Nevertheless, it could be explained by the fact that the measure of education used here (years of education) does not fully capture the informal learning process which shapes the effect of social capital on environmental awareness.

[Insert Table 4b about here]

4. Causality Issue: Instrumental variable estimates

Although the Ordered Logit estimates reveal a positive and significant relationship between social capital and the environmental awareness, it remains unclear whether this effect is causal. In fact the environmental awareness can be correlated with unobservable heterogeneity that is also correlated with social capital. In this case, maximum likelihood estimates could be downward biased. Besides, generalized trust could have been measured with error. Thus we need a better identification strategy in order to assess the causal effect of social capital on the environmental awareness.

For this purpose, we use slave exports between 1400 and 1900 as an instrument for social capital¹³. This choice is made following Nunn and Wantchekon (2011) who have shown that slave trade is a historical origin of mistrust within Africa. Specifically, they show that individuals whose ancestors were heavily raided during the slave trade today exhibit less trust in neighbors, relatives, and their local government.

The IV estimates are reported in Table 5a. The first column reports the estimates with the main measure of environmental awareness (willingness to give a part of his income to protect the environment). The second reports results obtained using the alternative measure of

¹¹ The highest rating is given to those countries where there is no armed or civil opposition for the government and the government does not indulge in arbitrary violence, direct or indirect, against its own people.

¹² The highest rating is given to countries with low or no ethnic tension.

¹³ Slave exports are weighted by the size of labour force in each country in order to get a time-varying instrument.

environmental awareness (a willingness to buy a good 20% higher in order to protect the environment). The first stage estimates are reported in column (3). It shows that the coefficient associated to slave exports is significant. In the same vein, the F-statistic (44.74) is sufficiently higher compared to the Stock *et al* (2002) rule of thumb of 10 and shows that our instrument is not weak.

The IV estimates confirm the positive effect of social capital on the environmental awareness. The point estimates range from 0.15 in ordered Logit to 0.28 in the instrumental variable regression. This was expected as far as the measurement error which affects the variable of trust leads to a downward biased maximum likelihood estimates.

Overall the instrumental variable estimates confirm the positive relationship between generalized trust and the environmental awareness.

4. Robustness check: Alternative measure of social capital

This subsection seeks to know whether the effect of social capital on the environmental awareness still holds if one uses alternative measures of social capital. Table 5b presents the results. We start by using ethnic tension as an alternative measure of social capital. The rationale behind this choice is that the higher is ethnic tension¹⁴ the lower is the level of generalized trust (Fafchamps, 2000; 2003). Columns (2) and columns (3) show the main results using alternative measures of environmental awareness. The main observation is that the effect of social capital on environmental awareness remains.¹⁵ In order to take into account the potential effect of bridging and bonding social capital¹⁶, we add to the specification three variables. The time spent with parent captures the bounding social capital while the time spent with friends and colleagues capture the bridging social capital. The results presented in column (4) show that the time spent with parents is associated with the decrease of environmental awareness. The same conclusion holds for the time spent with colleagues. In contrast, there is no significant correlation between the time spent with friends and the environmental awareness.

[Insert table 5b about here]

5. Conclusion

This paper contributes to the increasing literature devoted to the relationship between social capital and the environment. In particular, we examine the effect of trust based social

¹⁴ The measure of ethnic tension is drawn from the ICRG 2006 database.

¹⁵ Note that trust and ethnic tension are negatively correlated.

¹⁶ As suggested by Pretty and Ward (2001) it is not all types of social capital that matter for environment preservation.

capital on the environmental awareness measured by the willingness to give a part of income to protect the environment. Results from Ordered Logit and instrumental variable estimates using data from 13 african countries indicate that social capital has a robust positive effect on the environmental awareness. Assessing the mechanism behind the effect of trust based social capital, one observes that this effect operates mainly through the increase of social cohesion. In the same vein, the results suggest that social capital and institutions are substitutes in Africa. This conclusion is consistent with the findings of Fafchamps and Minten (2002) who reports in the case of Madagascar that social capital may be substitute to weak institutions. While comparing Nigeria, South Africa and Egypt, the results suggest that the relationship between trust based social capital and environmental awareness is only significant for Egypt and South Africa. Besides, this relationship is positive with a higher magnitude for Egypt.

These results add to previous evidences and demonstrate the importance of social capital in improving the collective management of natural resources in Africa. Therefore, sound policies should promote community-based environmental management, by providing the support that help groups to form and mature. However, the implementation of these policies raises further questions. For instance, there is a need of more investigation on mechanisms through which trust based social capital influences the support for environmental quality. Indeed the knowledge of these mechanisms will shape the structure of groups and the way they are operating in the field of natural resource management. Another important issue is how to manage the state-community relationships when social capital in the form of local associations will spread to very large numbers of people? Does the improvement on institutions quality enhance an efficient management of these associations or lead to a sort of crowding-out in the field of the environment preservation?

References

- Aghion, P, Y, Algan, and Pierre Cahuc. (2008), “Can Policy Interact with Culture? Minimum Wage and the Quality of Labor Relations”, mimeo, Harvard University.
- Aghion, Philippe, Yann Algan, Pierre Cahuc, and Andrei Shleifer. (2008) “Regulation and Distrust”, mimeo, Harvard University.
- Anderson, L.R, Mellor, J.M., and Milyo, J. (2004) “Social capital and contributions in a public goods experiment”, *American Economic Review* 94 (2), 373–376.
- Baliamoune-Lutz, M. (2009a) “ Human well-being effects of institutions and social capital”, *Contemporary Economic Policy* 27 (1), 54–66.

- Baliamoune-Lutz, M. (2011) “Trust based Social Capital, Institutions and Development”, *Journal of Socio-Economics*, Vol 40, 335-346
- Beugelsdijk, S., and van Schaik, T., (2005) “Social capital and growth in European regions: an empirical test”, *European Journal of Political Economy* 21, 301–324.
- Beierle, T.C., Cayford, J., (2002), “ Democracy in Practice. Public Participation in Environmental Decisions. Resources for the Future”, *Washington, DC*.
- Broad, R. (1994), “The Poor and the Environment: Friends or Foes?”, *World Development*, Vol 22, N°6, pp811-822.
- Chou, Y.K. (2006), “ Three simple models of social capital and economic growth”, *Journal of Socio-Economics* vol 35, 889–912.
- Coleman, J., (1990), “*The Foundations of Social Theory*”. Cambridge: Harvard University Press.
- Dasgupta, P. (2002), “Economic Development, Environmental Degradation, And the Persistence of Deprivation in Poor Countries”, *Inaugural lecture of the World Bank Lecture series, Bank’s Environmentally Sustainable Development Month, April 2002*
- Dearmon, J., and Grier, K. (2009) “Trust and development”, *Journal of Economic Behavior & Organization* 71 (2), 210–220.
- Durlauf, S.N and M. Fafchamps. (2004), “Social Capital”, *CSAE Working Paper N°14-2004*
- Duroy, Q.M. (2005), “The Determinants of Environmental Awareness and Behaviour”, *Rensselaer Working Papers N°0501-2005*
- Fafchamps, M. (2000) “Ethnicity and credit in African manufacturing”, *Journal of Development Economics* 61, 205–235.
- Fafchamps, M. (2003) “Ethnicity and networks in African trade”, *Contributions to Economic Analysis & Policy* 2 (1), Article 14.
- Fafchamps, M and Minten, B. (2001) “Property rights in a flea market economy”, *Economic Development and Cultural Change* 49 (2), 229–269.
- Fafchamps, M., (2004), “*Market Institutions in Sub-Saharan Africa*”, Cambridge: MIT Press.
- Gabre-Madhin, E.Z. (2001) “Market Institutions, Transaction Costs, and Social Capital in the Ethiopian Grain Market”, Research paper No. 124. International Food Policy Research Institute, Washington, DC.
- Glaeser, E.L., Laibson, D.L., Scheinkman, J.A and Soutter, C.L. (2000) “Measuring trust”, *Quarterly Journal of Economics* 115 (3), 811–846.
- Granovetter, M. (2005) “The impact of social structure on economic outcomes”, *Journal of Economic Perspectives* 19 (1), 33–50.

- Grossman, Gene M. and Alan B. Krueger. (1995), “Economic growth and the environment,” *Quarterly Journal of Economics*, Vol. 110, pp 353-377.
- Israel, D and Levinson, A. (2004), “Willingness to Pay for Environmental Quality: Testable Empirical Implications for the Growth and Environment Literature”, *Contribution to Economic Analysis and Policy*, (3)1 art.2
- Jones, N. (2010), “ Investigating the influence of social costs and benefits of environmental policies through social capital theory”. *Policy Sciences*, doi:10.1007/s11077-009-9107-1.
- Kim, J.Y., (2005). “Bowling together” isn’t a cure-all: the relationship between social capital and political trust in South Korea”, *International Political Science Review* 26, 193–213.
- Knack, S., Keefer, P. (1997) “Does social capital have an economic payoff? A cross country investigation”, *Quarterly Journal of Economics* 12 (4), 1251–1288.
- Lin, N., (2001), “*Social Capital*”, Cambridge: Cambridge University Press.
- Nunn, N. and Wantchekon, L. (2011), “The Slave Trade and the Origin of Mistrust in Africa”, *American Economic Review*, 101, 3221-3252, December 2011.
- Ostrom, E. (1990), “*Governing the commons: the evolution of institutions for collective action*”, New York: Cambridge University Press
- Paxton, P. (1999), “Is social capital declining in the United States? A multiple indicator assessment”, *American Journal of Sociology* 105, 88–127.
- Platteau, J.-P., (1994a), “Behind the Market Stage Where Real Societies Exist: Part I -The Role of Public and Private Order Institutions”, *Journal of Development Studies*, 30,3, 533-577.
- Platteau, J.-P., (1994b), “Behind the Market Stage Where Real Societies Exist: Part II - The Role of Moral Norms”, *Journal of Development Studies*, 30, 3, 533-577.
- Polyzou, E., Jones, N., Evangelinos, K.I and Halvadakis, C.P (2011), “Willingness to Pay for Drinking Water Quality Improvement and the Influence of Social Capital”, *Journal of Socio-Economic*, Vol 40, 74-80
- Pretty, G and Ward, H. (2001), “Social Capital and the Environment”, *World Development*, Vol 29, N°2, pp209-227.
- Pretty, J. (2003), “ Social capital and the collective management of resources”, *Science* 302, 1912–1914.
- Pretty, J. (2007), “ Sustainable agriculture and food systems”, In: Pretty, J., Ball, A.S., Beuton, T., Guivant, J.S., Lee, D.R., Orr, D., Pfeffer, M.J., Ward, H. (Eds.), *The Sage Handbook of Environment and Society*. Sage Publications, London, pp. 456–470.
- Putnam, R. (2000), “*Bowling Alone*”, New York: Simon and Schuster.

- Putnam, R., R. Leonardi and R. Nanetti, (1993), *“Making Democracy Work: Civic Traditions in Modern Italy”*, Princeton: Princeton University Press.
- Roberts, T.J and Grimes, P.E. (1997), “ Carbon Intensity and Economic Development 1962-9 1: A Brief Exploration of the Environmental Kuznets Curve”, *World Development*, Vol 25, N°2, pp 191-198
- Rostila, M., (2007), “ Social capital and health in European welfare regimes: a multilevel approach”, *Journal of European Social Policy* 17, 223–239.
- Sabatini, F.(2009). “Social capital as social networks: a new framework for measurement and an empirical analysis of its determinants and consequences”, *Journal of Socio-Economics* 39, 429 -442.
- Selden,T. M. and Song, A. (1995), “Neoclassical growth, the J curve for abatement and the inverted U curve for pollution,” *Journal of Environmental Economics and Management*, Vol. 29 . pp. 167-168.
- Stokey N.L. (1998), “ Are there limits to growth?”, *International Economic Review*, 39, pp1-31
- Torgler, B. and Garcia-Valinas, M.A. (2005), “Willingness to Pay for Preventing Environmental Damages”, *CREMA Working Paper*, N°22, 2005
- Uslaner, E.M., Conley, R.S., (2003), “ Civic engagement and particularized trust: the ties that bind people to the ethnic communities”, *American Political Research* 31, 331–360
- van Oorschot, W., Arts, W., Gelissen, J., (2006), “ Social capital in Europe. Measurement and social and regional distribution of a multifaceted phenomenon”, *Acta Sociologica* 49, 149–176.
- Westerman, O., Ashby, J and Pretty,J. (2005), “Gender and Social Capital: The Importance of Gender Differences for the Maturity and Effectiveness of Natural Resource Management Groups”, *World Development*, Vol 33, N°11, pp 1783-1799
- World Bank (1992), *“World Development Report 1992”*, New York: Oxford University Press, 1992.
- Woolcock, M., (2001) “The Place of Social Capital in Understanding Social and Economic Outcomes”. *Canadian Journal of Policy Research* 2 (1), 11–17.

Appendix

Table 1: Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	Source
Environment awareness main indicator	14588	2.715862	.9291502	1	4	WVS
Environment awareness alternative indicator	3548	2.305806	.9461391	1	4	WVS
Generalized trust	25801	.1683268	.3741635	0	1	WVS
Ethnic tensions	25725	3.616758	1.267569	1	6	ICRG2006
Time spent with parents	9022	1.503769	.785311	1	4	WVS
Time spent with friends	9043	1.580338	.8530871	1	4	WVS
Time spent with colleagues	8139	2.338862	1.297644	1	4	WVS
Corruption index	25725	2.009779	.6262634	.25	3	ICRG2006
Internal conflict	25725	7.589803	1.86727	2.666667	10.5	ICRG2006
Age	24377	32.35927	11.64162	15	64	WVS
Age2	24377	1182.644	870.5333	225	4096	WVS
Sex	25159	.5104336	.4999011	0	1	WVS
Years of education	26697	13.61689	4.198457	7	34	WVS
Years of education squared	26697	203.046	138.4228	49	1156	WVS
Marital status-married	26669	.4717087	.4992083	0	1	WVS
Muslim	26697	.2274038	.4191633	0	1	WVS
Protestant	26697	.0394426	.1946493	0	1	WVS
Catholik	26697	.1416264	.3486731	0	1	WVS
Orthodox	26697	.0394426	.1946493	0	1	WVS
Importance of water and sanitation pollution	9659	.8142665	.3889116	0	1	WVS
Importance of air pollution	9631	.7379296	.4397836	0	1	WVS
Importance of global warming	8807	.8420575	.3647078	0	1	WVS
Size of Town	14629	5.746463	2.174419	1	8	WVS
Poverty	21784	49.48189	24.62381	13.97	96.57	WVS
Slave export % labour force	26697	.0164823	.0368568	0	.1614673	Nunn 2007

Table 2: Ordered Logit estimates-Fixed effect

Variables	(1)	(2)	(3)	(4)
	Environment	Marginal effect	Environment	Marginal effect
Generalized trust	0.151***	0.0237***	0.178*	0.0323*
	(0.0501)	(0.00815)	(0.101)	(0.0190)
Age	-0.0245***	-0.00371***	-0.00227	-0.000398
	(0.00882)	(0.00134)	(0.0179)	(0.00314)
Age2	0.000294**	4.46e-05**	7.08e-05	1.24e-05
	(0.000116)	(1.76e-05)	(0.000241)	(4.23e-05)
Sex	0.0730**	0.0111**	-0.0623	-0.0109
	(0.0319)	(0.00483)	(0.0581)	(0.0102)
Years of education	0.0758***	0.0115***	0.0794***	0.0139***
	(0.0174)	(0.00264)	(0.0288)	(0.00505)
Years of education squared	-0.00177***	-0.000268***	-0.00207**	-0.000363**
	(0.000520)	(7.88e-05)	(0.000837)	(0.000147)
Marital status-married	0.0829**	0.0126**	0.0118	0.00207
	(0.0373)	(0.00568)	(0.0692)	(0.0121)
Muslim	0.164***	0.0256***	0.141	0.0249
	(0.0593)	(0.00951)	(0.0966)	(0.0173)
Protestant	0.0539	0.00829	0.0104	0.00183
	(0.0929)	(0.0145)	(0.105)	(0.0184)
Catholik	0.0570	0.00875	-0.0190	-0.00332
	(0.0451)	(0.00701)	(0.0883)	(0.0154)
Importance of water and sanitation pollution			0.0772	0.0133
			(0.103)	(0.0175)
Importance of air pollution			0.412***	0.0678***
			(0.0970)	(0.0150)
Importance of global warming			0.206**	0.0346**
			(0.0894)	(0.0144)
Size of Town			0.0208	0.00365
			(0.0180)	(0.00315)
Poverty			0.00926***	0.00162***
			(0.00207)	(0.000361)
Log likelihood	-16904.792		-5153.8847	
Prob>Chi2	[0.000]		[0.000]	
Observations	13,699	13,699	4,348	4,348

Note: Standards errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Marginal effects are computed at EA (environmental awareness)=4 “i strongly agree to give a part of my income if it could help to protect the environment”

Table3: Ordered Logit estimate comparing Nigeria, Egypt and South Africa

VARIABLES	Nigeria		Egypt		South Africa	
	Marginal effects		Marginal effects		Marginal effects	
	Pr[EA=4]=0.48		Pr[EA=4]=0.19		Pr[EA=4]=0.13	
Generalized trust	0.375	0.0936	0.526***	0.0914***	0.133*	0.0157*
	(0.245)	(0.0606)	(0.139)	(0.0270)	(0.0770)	(0.00937)
Age	-0.135	-0.0336	-0.0461	-0.00721	-0.0271**	-0.00308**
	(0.0870)	(0.0217)	(0.0299)	(0.00470)	(0.0136)	(0.00155)
Age2	0.00138	0.000344	0.000580	9.06e-05	0.000292*	3.32e-05*
	(0.00124)	(0.000310)	(0.000381)	(5.97e-05)	(0.000174)	(1.98e-05)
Sex	0.469**	0.116**	0.00913	0.00143	0.0803	0.00912
	(0.229)	(0.0563)	(0.0952)	(0.0149)	(0.0555)	(0.00632)
Years of education	-0.964	-0.241	0.100**	0.0156**	0.0565	0.00642
	(0.803)	(0.201)	(0.0497)	(0.00771)	(0.0352)	(0.00401)
Years of education squared	0.0400	0.00999	-0.00193	-0.000302	-0.000391	-4.44e-05
	(0.0352)	(0.00878)	(0.00136)	(0.000212)	(0.00109)	(0.000124)
Marital status-married	0.362	0.0901	0.0224	0.00348	0.0923	0.0106
	(0.254)	(0.0629)	(0.121)	(0.0188)	(0.0642)	(0.00737)
Muslim	0.144	0.0360	-0.0654	-0.0104	0.332**	0.0423**
	(0.280)	(0.0699)	(0.149)	(0.0241)	(0.148)	(0.0209)
Protestant	-0.0547	-0.0136			0.134	0.0160
	(0.299)	(0.0745)			(0.547)	(0.0685)
Catholik	-0.235	-0.0585			0.267***	0.0328***
	(0.336)	(0.0829)			(0.0947)	(0.0125)
Log likelihood	-375.888		-2129.406		-5660.3561	
Prob>Chi2	[0.11]		[0.002]		[0.000]	
Observations	323	323	1,587	1,587	4,393	4,393

Note: Standards errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Marginal effects are computed at EA (environmental awareness)=4 “i strongly agree to give a part of my income if it could help to protect the environment”.

Table 4a: Testing transmission channels: substitution between social capital and institutions

Dependent variable	(1) Environment	(2) Marginal effects
Generalized trust	0.428** (0.181)	0.0761** (0.0348)
Trust*corruption	-0.180** (0.0905)	-0.0293** (0.0148)
Corruption Index	-0.00960 (0.0283)	-0.00157 (0.00460)
Age	-0.0328*** (0.00899)	-0.00535*** (0.00147)
Age2	0.000361*** (0.000118)	5.88e-05*** (1.93e-05)
Sex	0.132*** (0.0330)	0.0215*** (0.00536)
Years of education	0.00815 (0.0189)	0.00133 (0.00308)
Years of education squared	0.000289 (0.000565)	4.71e-05 (9.21e-05)
Marital status-married	0.0992*** (0.0379)	0.0162*** (0.00621)
Muslim	0.215*** (0.0437)	0.0362*** (0.00766)
Protestant	0.770*** (0.0575)	0.149*** (0.0127)
Catholik	0.257*** (0.0473)	0.0442*** (0.00853)
Log likelihood	-16448.201	
Prob>Chi2	[0.000]	
Observations	12,785	12,785

Note: Standards errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Marginal effects are computed at EA (environmental awareness)=4 “i strongly agree to give a part of my income if it could help to protect the environment”.

Table 4b: Testing transmission channels: Indirect effect of social capital through social cohesion

Dependent variable	(1)	(2)	(3)
	Environment	AEnvironment	Environment
Total effect	0.0810* (0.0480)	-0.347*** (0.0195)	0.0807* (0.0484)
Direct effect	0.0892* (0.0481)	-0.528*** (0.0234)	0.0823* (0.0484)
Indirect effect	-0.00818*** (0.00284)	0.182*** (0.0125)	-0.00155 (0.00233)
Transmission channels	Social cohesion	Social cohesion	Education
Observations	12,785	13,124	13,699

Note: Standards errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Column (2) presents the results with the alternative measure of the environment awareness “i strongly agree to buy a good 20% higher if it could help to protect the environment”.

Table 5a: Instrumental variable estimates

	(1)	(2)	(3)
Dependent variable	Environment	A Environment	First step equation
Generalized trust	0.281***	6.373***	
	(0.0934)	(0.176)	
Slave export % labour force			-3.472***
			(0.519)
Age	-0.0126***	-0.0331***	-0.0396***
	(0.00357)	(0.00254)	(0.00958)
Age2	0.000149***	0.000308***	0.000542***
	(4.59e-05)	(2.11e-05)	(0.000123)
Sex	0.0382*	-0.0508***	0.00840
	(0.0218)	(0.00399)	(0.0359)
Years of education	0.0354***	0.0375*	-0.00983
	(0.00627)	(0.0209)	(0.0197)
Years of education squared	-0.000747***	-0.00146***	0.000120
	(0.000172)	(0.000448)	(0.000601)
Marital status-married	0.0497***	0.206***	0.0464
	(0.0176)	(0.0224)	(0.0431)
Muslim	0.0516	0.437***	0.312***
	(0.0354)	(0.0318)	(0.0415)
Protestant	0.0242	-1.390***	0.523***
	(0.0238)	(0.0513)	(0.0871)
Catholik	0.0290	-0.426***	-0.101*
	(0.0392)	(0.0847)	(0.0561)
Constant	2.893***	1.807***	-0.965***
	(.095)	(.2850)	(0.225)
F-test of instrument			44.74
Observations	12,417	3,371	23,631

Note: Standards errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. A Environment refers to the alternative measure of the environment awareness “i strongly agree to buy a good 20% higher if it could help to protect the environment”.

Table 5b: Robustness check with alternative measure of environment & social capital

VARIABLES	(1) A Environment	(2) Environment	(3) A environment	(4) Environment
Generalized trust	6.373*** (0.176)			0.140* (0.0828)
Ethnic Tension (proxy of trust)		-0.779** (0.319)	-0.209*** (0.0201)	
Time spent with parents				-0.0598* (0.0337)
Time spent with friends				0.0371 (0.0354)
Time spent with colleagues				-0.158*** (0.0230)
Age	-0.0331*** (0.00254)	-0.0168*** (0.00545)	-0.0124*** (0.00430)	-0.0579*** (0.0161)
Age2	0.000308*** (2.11e-05)	0.000166** (7.44e-05)	0.000134* (6.88e-05)	0.000690*** (0.000210)
Sex	-0.0508*** (0.00399)	0.000596 (0.0240)	0.00487* (0.00295)	0.168*** (0.0579)
Years of education	0.0375* (0.0209)	0.0683*** (0.0168)	0.0168*** (0.00158)	-0.0360 (0.0313)
Years of education squared	-0.00146*** (0.000448)	-0.00151*** (0.000540)	-0.000173*** (1.74e-05)	0.000768 (0.000954)
Marital status-married	0.206*** (0.0224)	0.226*** (0.0662)	0.175*** (0.0290)	0.122* (0.0641)
Muslim	0.437*** (0.0318)	1.122** (0.566)	-0.0474*** (0.00407)	0.784*** (0.101)
Protestant	-1.390*** (0.0513)	-0.221* (0.123)	-0.0264*** (0.00378)	1.121*** (0.304)
Catholik	-0.426*** (0.0847)	0.283** (0.124)	0.0344*** (0.00519)	0.278*** (0.0750)
Constant	1.807*** (0.285)	4.931*** (0.870)	3.077*** (0.149)	
Observations	3,371	13,124	3,513	4,386

Note: Standards errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. A Environment refers to the alternative measure of the environment awareness “i strongly agree to buy a good 20% higher if it could help to protect the environment”.

Table 6: Coefficients of country dummies

Variables	(1)	(2)
	Environment	Marginal effect
Dummy-Egypt	-1.196*** (0.105)	-0.135*** (0.00839)
Dummy-Ethiopia	-0.171 (0.118)	-0.0248 (0.0163)
Dummy-Ghana	0.0982 (0.102)	0.0153 (0.0162)
Dummy-Morocco	-1.077*** (0.137)	-0.116*** (0.00983)
Dummy-Nigeria	0.404** (0.158)	0.0688** (0.0298)
Dummy-Rwanda	-0.632*** (0.102)	-0.0802*** (0.0106)
Dummy-Tanzania	0.669*** (0.115)	0.120*** (0.0238)
Dummy-Uganda	-1.448*** (0.105)	-0.145*** (0.00656)
Dummy-South Africa	-1.172*** (0.0959)	-0.156*** (0.0113)
Dummy-Zambia	-1.205*** (0.107)	-0.130*** (0.00783)
Dummy-Zimbabwe	-0.626*** (0.107)	-0.0791*** (0.0111)

Table 7: Different waves of survey by country

Country	Code	Waves	Number of waves	Observations	Mean(trust)	Mean(pr(trust=1))
Algeria	DZ	1999-2004	1	1282	.0978628	.0982891
Burkina Faso	BF	2005-2007	1	1534	.1066398	.1090317
Egypt	EG	1999-2004,2005-2007	2	3000,3051	.2395245	.2376278
Ethiopia	ET	2005-2007	1	1500	.2180657	.2184455
Ghana	GH	2005-2007	1	1534	.0736589	.0712326
Morocco	MA	1999-2004,2005-2007	2	2264, 1200	.1762622	.1759063
Nigeria	NG	1989-1993,1994-1999,1999-2004	3	1001,1996,2022	.1977728	.1976152
South Africa	ZA	1981-1984,1989-1993,1994-1999,1999-2004,2005-2007	5	1596, 2736, 2935, 3000, 2988	.190689	.1760935
Rwanda	RW	2005-2007	1	1507	.0486039	.0489563
Tanzania	TZ	1999-2004	1	1171	.0744417	.0750378
Uganda	UG	1999-2004	1	1002	.0782241	.0784191
Zambia	ZM	2005-2007	1	1500	.1075368	.1080564
Zimbabwe	ZW	1999-2004	1	3000	.0982143	.0963959
Total				39,821		