Egyptian public's concern for global warming

The influence of post-materialism, religiosity, political orientation, and locus of control

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Abstract

Purpose – Despite the growing scientific evidence regarding risks caused by global warming and climate change, virtually no studies have been conducted to investigate general public's attitudes toward this phenomenon in a non-Western context. The purpose of this paper is to investigate factors influencing concern for global warming in a representative sample of 2,551 respondents in Egypt.

Design/methodology/approach – The study uses logistic and Bayesian logistic regression modeling techniques to test the influence of post-materialistic tendencies, religiosity, political orientation and locus of control on concern for global warming in Egypt.

Findings – Results contradict the post-materialist hypothesis and show that concern for global warming is driven by religiosity, political orientation and internal locus of control.

Originality/value – The findings highlight the importance of investigating the specificity of global warming and environmental concern in a non-Western context.

Keywords Climate change, Egypt, Sustainable development, Global warming, Religiosity, Locus of control, Post-materialism, Political orientation, Bayesian analysis

Paper type Research paper

1. Introduction

Global warming has been widely recognized as an international problem as it was linked directly to climate change across the globe (Shi *et al.*, 2010). Anthropogenic climate change is caused by human activities ranging from transportation and electricity consumption to the breeding of livestock (Schmidt *et al.*, 2013). Borick and Rabe (2010, p. 777) argue that there is a "growing belief that the climate is changing, and higher levels of concern regarding the impact that this phenomenon will have on the planet." Some authors have even claimed that concern for global warming has become a social norm (Takas-Santa, 2007). Public concern for global warming has risen across nations and a strong support for initiative aiming at reversing the trend has been reported by several authors (e.g. Capstick and Pidgeon, 2014). Whitmarsh (2009) argued that investigating public attitudes toward global warming and informing the public about it is considered the basic prerequisite for informed public decision-making process regarding climate change. Shiva (2008) suggests that the mitigation of the global warming problem can only occur with a change in all aspects of human life, including the way we shop, move, live and eat.

With the notable exceptions of Mostafa (2007) and Goksen *et al.* (2002), the majority of studies exploring global warming and environmental concern have largely ignored Arab and Islamic nations. Previous research focussed on countries as diverse as the USA (Dunlap *et al.*, 2000), Britain (Norris, 1997), Israel (Drori and Yuchtman-Yaar, 2002), Canada (Edgell and Nowell, 1989), Norway (Olli *et al.*, 2001), Korea (Kim, 1999) and Australia. However, because environmental concern is ultimately based on the motivations and

cognitions of individuals within a society (Kemmelmeier *et al.*, 2002), investigating global warming phenomenon in a non-Western context seems critical in explaining environmental concern. In this research we fill this research gap by assessing the effects of several important variables on concern for global warming. More specifically, we aim to extend the existing debate regarding global warming concern in two ways: first, we use a relatively large sample size representing one of the largest nations in the Arab and Islamic worlds, which makes it possible to generalize results to other nations. Second, we use Bayesian logistic modeling approach to check the robustness of our finding. To the best of our knowledge, this is the first time this technique is used to investigate concern for global warming.

Two theoretical paradigms anchor our study: the new politics' paradigm and the value-based paradigm. Inglehart's and Inglehart and Welzel's new politics' paradigm argues that citizens shift their attention from economic and personal security issues toward environmental protection and other more salient political issues as nations become more affluent. Within this paradigm, concern for global warming is classified as a new political issue (Kvaloy *et al.*, 2012). The value-based paradigm argues that basic values such as religion and locus of control can affect the concern for environmental issues. Empirical evidence supports, in general, this paradigm.

This paper is organized as follows. Next section reviews relevant literature and develops research hypotheses. Methodology and results sections follow. Finally, research implications, limitations and directions for future research will be explored.

2. Literature review and hypotheses development
Past research has generally found that the higher a country is on post-materialism, the greater its members' concern for the environment. Inglehart (1995) argued that advanced industrial countries, which tend to exhibit post-materialist values, also tend to demonstrate higher environmental concern. He argued that once citizens achieve economic security, they shift their attention to environmental quality. This hypothesis is known in the literature as "the subjective values hypothesis." Inglehart argued that public support for the environment is higher in some nations because these nations have relatively post-materialistic publics. Thus, post-materialists and materialists are expected to possess distinctive attitudes toward the environment (Abramson and Inglehart, 1995). It follows that post-materialists, having achieved a certain level of economic affluence and security, are more supportive of environmental issues. This hypothesis has been empirically supported by several scholars. For example, Steger *et al.* (1989) found a positive link between post-materialistic values and several pro-environmental behaviors. In a study across 27 nations, Oreg and Katz-Gerro (2006) found a positive and significant relationship between post-materialism and environmental concern. Other studies that found a positive impact of materialism on environmental concern include Gelissen (2007) and Schultz and Zelezny (1999). This discussion suggests the following hypothesis:

> *H1.* Individuals' post-materialist values are positively related to concern for global warming.

Religiosity seems to be the least social-level variable employed by researchers investigating environmental concern (Schultz *et al.*, 2000; Yuchtman-Yaar and Alkalay, 2007). White (1967) argued that Christianity has established a dualism between humans and nature, which made it possible for human beings to dominate nature and exploit it with a sense of indifference toward natural objects. This hypothesis which

advocates a Judeo-Christian dominance of nature is referred to in the literature as the White's thesis and has been recently the subject of heated debate (e.g. Smith and Leiserowitz, 2013; Hayes and Marangudakis, 2000, 2001). Several authors have empirically found evidence to support the White's thesis. For example, Hand and Van Lier (1984) found that "End of Time" thinking or conservative eschatology is linked negatively to environmental concern. The authors concluded that compared to non-Christians, Judeo-Christians were more committed to a "mastery over nature orientation" and thus showed lower degrees of environmental concern. Shaiko (1987) investigated environmental concern among a several group of religious denominations such as Protestants, Catholics and Jews. The author found that Judeo-Christian had higher mastery of nature orientation compared to non-Judeo-Christian. Another stream of research found negative and significant relationship between biblical literalism and environmental concern. For example, Guth *et al.* (1995) used data from four national representative surveys of the general public, political-party contributors, religious activists and clergy. The authors reported a negative relation between individuals who believe that the Bible represent the literal word of God and environmental concern. Similar results were reported in Eckberg and Blocker (1993).

Islamic teachings contrast sharply with the Western view of humans domineering of nature – a pervasive ontology in Judeo-Christian religion and scientific rationalism (Schultz *et al.*, 2004). Damad (2000) argues that according to Islamic culture, God created the universe in a perfect equilibrium and humans represent just a part of this scheme. Humans are also entrusted by God to manage the earth as a steward of God: "It is He that has appointed you as regents in the earth" (Quran 35:39). As a steward of God, a Muslim must not only safeguard the environment but also cultivate it in consistency with maintaining God's balance (Kamla *et al.*, 2006; Vasi, 2010; Hope and Jones, 2014). In fact, concern for the environment is deeply rooted in Islamic culture and the first Caliph Abu Bakr ordered his commander not to "destroy palm trees, burn houses or fields of wheat, cut down fruit trees, and to kill cattle only when there is a need to eat it." (Schwarte, 2003). This discussion suggests the following hypothesis:

H2. Religiosity is positively related to concern for global warming.

Research has shown that political orientation "colors much of the way we perceive political events and choices, from candidates to policy options" (Kellstedt *et al.*, 2008, p. 115). Political orientation was first used to investigate environmental concern by Dunlap (1975). It was extensively used afterwards by ecologists, environmentalists and economists to study the interplay between political affiliation and environmental concern (Swami *et al.*, 2010; Tilikidou and Delistavrou, 2014). Political ideology and partisan identification were found to be consistent predictors of concern for the environmental degradation, including concern for global warming (Guber, 2013). Previous research has generally found that people with left-leaning orientation are more likely to be involved in pro-environmental actions (e.g. Blankenau *et al.*, 2008; Neumayer, 2004; Strandbu and Skogen, 2000; Biel and Nilsson, 2005). In a similar vein, several authors have found that left-wing individuals, such as Democrats in the USA and Labor party supporters in the UK or Australia, tend to accept climate change reality compared to right-wing individuals (e.g. Fielding *et al.*, 2012; McCright and Dunlap, 2011; Poortinga *et al.*, 2011; Unsworth and Fielding, 2014). In their seminal work, Zahran *et al.* (2006) found that left-leaning individuals are more likely to regard global warming as risky. The authors also found that such individuals are more likely to support costly public policies aiming at mitigating risk resulting from climate change. Pampel (2011) found that concern for the

environment among left-leaning individual does in fact complement their support for equality in distribution, concern for market externalities and support for government's environmental regulatory policies. Using a short version of the Authoritarianism-Conservatism-Traditionalism scale (Duckitt *et al.*, 2010), Devine-Wright *et al.* (2015) found that concern for global warming is significantly lower among right-wing authoritarian groups. On the other hand, Heath and Gifford (2006) found a greater rejection of claims regarding human-induced global warming among rightists who favor free-market ideologies. This discussion suggests the following hypothesis:

H3. Left political orientation is positively related to concern for global warming.

Internal locus of control refers to the fact that one's actions can bring about an outcome, whereas a lack of control over outcomes or powerlessness signifies an external locus of control (Rotter, 1966). Cleveland *et al.* (2005) claim that when people have a sense of control of some aspects of the external world, they will most likely show care about that aspect and they may strive to improve it. For example, McCarty and Shrum (2001) found that individuals who believe they can influence some socio-political outcomes were more likely to participate in recycling behavior. Previous research found that individuals with an internal locus of control are more likely to exhibit more concern for the environment as reflected by pro-environmental attitudes and behaviors (e.g. McElwee and Brittain, 2009; Fielding and Head, 2012; Kellstedt *et al.*, 2008; Jansson *et al.*, 2010; Bamberg and Moser, 2007; Hwang *et al.*, 2000). Internal locus of control has also been linked to responsible environmental attitudes (e.g. Balderjahn, 1988; Iwata, 2004). People with higher perceived internal locus of control were found to be more likely to define climate change as risky and to act based on such perceived risks (e.g. Kellstedt *et al.*, 2008). Several authors have also found that awareness of environmental consequences ascribes responsibility to themselves for taking pro-environmental action (e.g. Bamberg and Schmidt, 2003; Stern, 2000). The ascription of responsibility notion is closely related to internal locus of control (Thogersen, 1999). Ascription of responsibility has been found to be positively related to several pro-environmental behaviors such as use of renewable energy (Tanner, 1999) and recycling behavior (Guagnano *et al.*, 1995). This discussion suggests the following hypothesis:

H4. Internal locus of control is positively related to concern for global warming.

3. Method
3.1 Data
Data used in this research were taken from the World Values Survey (WVS) organization (www.worldvaluessurvey.org), which collects a large-scale project data each five to six years in countries throughout the world. Topics covered may change each wave of data collection. For this analysis, data from the WVS 2005-2009 environmental module are used. Although this version is a bit old, it is the latest version that includes questions pertaining to global warming concern. The WVS is originally written in English and translated into the national language(s) of the participating countries for conducting the survey. The samples selected are either nationally representative or weighted for non-random samples. Although the standardized questionnaires might be interpreted differently in different countries based on diverse cultural, economic or political contexts, the WVS cross-national surveys provide "useful tools for comparative research, especially when statistical methods such as multilevel models are employed to help identify variation at the different levels"

(Running, 2013, p. 385). In fact the WVS data have been recently extensively used in the field of environmental and/or global warming studies (e.g. Givens and Jorgenson, 2011; Kvaloy *et al.*, 2012; Running, 2013). Although the majority of respondents in Egypt did answer all questions in the survey, there are some missing data. Since running the logistic regression models with and without missing observations resulted in virtually the same results, we opted for analyzing only complete sets of cases. This decision was taken in order to maximize comparability among the models used.

3.2 Measures
Concern for global warming was measured in the fifth wave of the WVS by the following question: "Please tell me how serious you consider global warming or the greenhouse effect to be for the world as a whole." Respondents were asked to select one of the following possible set: "very serious," "somewhat serious," "not very serious" and "not serious at all." Original coding scheme was reversed so that higher values correspond to higher concern for global warming. Following Running (2013), we coded the first response as 1 and we collapsed the last three responses into 0. In the WVS 2005-2009, post-materialist values were measured by asking the respondents to select the two most important goals for their society from among the following set: first, maintaining order in the nation; second, giving people more say in important government decisions; third, fighting rising prices; and fourth, protecting freedom of speech. Goals 1 and 3 were considered materialist, whereas Goals 2 and 4 were considered post-materialist. For each respondent, the number of post-materialist values was counted resulting in a post-materialist value score (POSTMAT) ranging from 0 to 2. This scale has been used extensively in previous studies (e.g. Kemmelmeier *et al.*, 2002; Oreg and Katz-Gerro, 2006; Mostafa, 2013). Tests of the scale's validity demonstrate that the scale, "though simple, is valid" (Abramson and Inglehart, 1995, p. 10). Religiosity was measured by two variables: how important God is in the individual's life and how often the respondent attends religious services. However, since the two variables were highly correlated, we used only the second one. A ten-point Likert-type scale measured the respondent's position on the left-right scale, with 1 representing the most extreme right-wing political ideology and 10 representing the most extreme left-wing political ideology. Internal locus of control was measured by a ten-point scale ranging between 1 (no control over one's fate) and 10 (full control of one's fate).

4. Results
4.1 Logistic regression modeling
In this study data were analyzed using the general GLM function in R software package (R Development Core Team, 2014). The software packages used provide several methods to estimate the logistic regression parameters, including the maximum likelihood (ML) and restricted maximum likelihood (RML) methods. Although the two methods are asymptotically equivalent (Gonzalez and Griffin, 2002), we opted for the RML method as it takes degrees of freedom into account. Although Kreft *et al.* (1995) found raw score to be equivalent to grand mean centering, all models were grand mean-centered in order to alleviate potential collinearity problem. Table I presents logistic regression results, while Figure 1 presents the logistic regression ROC curve and Figure 2 presentsthe regression model classification map. A correct classification rate of 72 percent indicates that the model is performing better than chance.

From Table II we see that post-materialist score is negative and non-significant. This result contradicts Inglehart post-materialist theory and does not confirm *H1*.

Although this result seems to contradict previous findings, some authors investigating global warming and environmental attitudes using multilevel analysis have found a negative link between post-materialist and environmental concern (Mostafa, 2013). Religiosity was positively and significantly related to concern for global warning as measured both by the frequency of performing prayer. Thus, *H2* is supported by data. This result corroborates previous research conducted in Islamic nations (Schwarte, 2003). As hypothesized, the extreme left political orientation was found to be positively and significantly related to concern for global warming, which supports *H3*. This result is in line with previous research investigating the relationship between environmental concern and political ideology (McCright and Dunlap, 2011). Internal locus of control was positively and significantly related to concern for global warming as expected. This result supports *H4*. This result is in line with previous research findings investigating the relationship between locus of control and environmental concern (Iwata, 2004).

4.2 Bayesian logistic regression
To check the robustness of our findings, we also carried out a Bayesian logistic regression model. Ntzoufras (2009) argues that the Bayesian regression model

	Estimate	SE	Z-value	Pr(> |Z|)	Exp (B)	Lower 95% CI	Upper 95% CI
Intercept	0.31477	0.23047	1.366	0.17201	1.367	0.874	2.159
POSTMAT	−0.07273	0.08450	−0.861	0.38943	0.929	0.788	1.097
PRAYER	0.53762	0.18018	2.984	0.00285***	1.712	1.196	2.428
EXTLEFT	0.69140	0.11487	6.019	0.00001***	1.997	1.599	2.509
LOCUS	0.05380	0.02010	2.677	0.00744***	1.055	1.015	1.098

Notes: AIC = 2924.9. ***$p < 0.001$
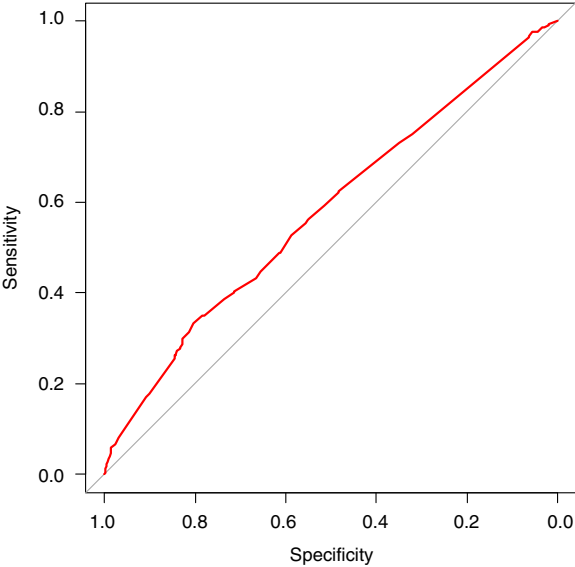
Table I.
Logistic regression results

Figure 1.
Logistic regression ROC

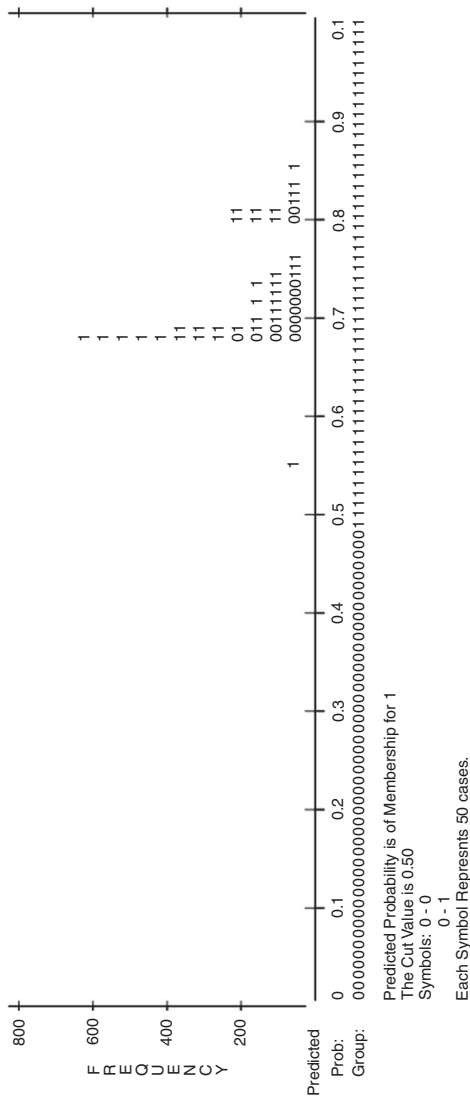**Note:** Area under curve: 0.5807

Figure 2.
Logistic regression
classification map

involving the use of MCMC method consists of three steps: the construction of prior probability distributions; the determination of a likelihood function; and sampling for the previously specified posterior probability distributions. Following Stegmueller's (2013) large-scale simulation study, we chose a low degree of belief in the prior distribution by using a low precision value taken as 0.0001. There is an extensive literature that supports the use of diffuse priors (Browne and Draper, 2006). Following Vatter et al. (2014), we used in this research the uniform prior bounded between zero and 100 as a diffuse prior for σ^2. In this study the Bayesian parameter estimation was conducted using the MCMCpack (Martin et al., 2011) and the arm (Gelman et al., 2010) packages developed for the R software environment version 3.1 (R Development Core Team, 2014). We ran all GLMMs for 50,000 iterations where the first 10,000 iterations were burned to filter occurrence of autocorrelation between successive iterations, with a thinning interval of 50. Changing number of iterations, the filter space or the thinning interval did not virtually alter the results.

Posterior mean of parameters and 95 percent highest probability density (HPD) were obtained. It should be noted that these HPDs have a straightforward interpretation indicating a 95 percent probability that the true value falls within that range. HPDs are interpreted the way that frequentist-based CI is sometimes incorrectly interpreted. Our results are presented in Table II. As expected, the ML and Bayesian estimates are almost identical (Stegmueller, 2013). From this table we find that apart from post-materialism, all other explanatory variables are reliable at conventional levels (a 95 percent HPD interval bounded away from zero). Figure 3 shows the trace and kernel density plots of the posterior marginal distributions for parameters from fitting the Bayesian logistic regression model. The trace graph shows that the mean of the Markov chain has stabilized and appears constant over the graph. Thus, it seems that the MCMC appear to have reached its stationary distributions. Several authors have recently suggested using the posterior density kernels to help researchers to decide whether a parameter is significant or not even in cases in which zero is included in the interval (e.g. Martin et al., 2009, p. 167).

5. Implications, limitations and future research

Inglehart (1995) argued that wealthy nations with high levels of post-materialist values tend to focus more on environmental quality. While this view has largely been accepted (Franzen, 2003), our results suggest, contrary to the affluence hypothesis, that it may be erroneous to imply that less developed nations are not concerned with environmental issues. In fact, Dunlap and Mertig (1997, p. 24) stated that "the emergence of widespread concern for environmental quality in non-industrialized nations poses an anomaly for the theory of post-materialist values that presumably spawn environmentalism." In this study we found support for the thesis arguing that there is a positive relationship

	Estimate	SE	Lower 95% CI	Upper 95% CI
Intercept	0.3038	0.2319	−0.1541	0.7675
POSTMAT	−0.0703	0.0862	−0.2391	0.0897
PRAYER	0.5443	0.1783	0.2059	0.8916
EXTLEFT	0.6922	0.1168	0.4616	0.9166
LOCUS	0.0541	0.0199	0.01389	0.0948

Note: Sample size per chain = 1,000

Table II.
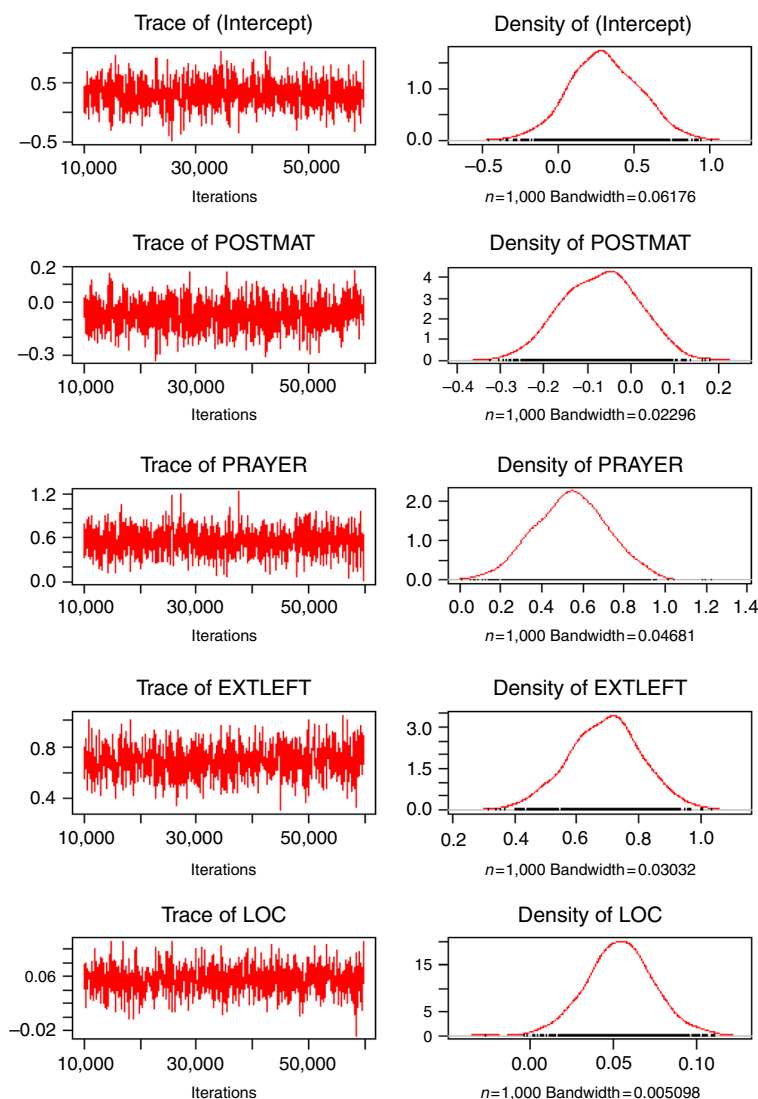Bayesian logistic regression results

Figure 3.
Trace and density
plots of variables
used in the study

between religiosity and concern for the environment. This might be interpreted by Kaplan's (2010) ethical values hypothesis. The author argues that religions have played a major role in shaping human ethical and cultural value systems across the world. Tucker (2003) states that different religions have a unique ability to establish moral frameworks that can help to protect the Earth. The positive link we found between religiosity and concern for global warming seems to indicate that religious participation fosters altruistic and pro-environmental behaviors. Thus, religious service leaders or "influentials" should work with opinion leaders or "legitimizers" in order to promote pro-environmental behaviors by making biospheric values more salient. The fact that political left-orientation is positively linked to concern for global warming in Egypt

is an interesting one and it might be explained by the fact that political ideologies are nowadays increasingly dispersed through globalization. Some authors have recently argued that globalization plays an important role in shaping not only the state structure but also the civil society and political ideologies through the creation of a "world society" or a "world polity" (Longhofer and Schofer, 2010). Thus, political leaders may play an important role in shaping public opinions regarding issues such as global warming concern. Zaller (1992) argues that public attitudes regarding major issues are shaped based on the relative intensity of the different competing political communications. Thus, when public opinion leaders are united the publics' response to the message becomes non-ideological. On the other hand, when there is a disagreement among the elite along partisan and/or ideological lines, then the publics' response will be ideological as well. The public opinions response toward the "An Inconvenient Truth" is a case in point. We also found a positive link between internal locus of control and concern for global warming. This is in line with Hines *et al.* (1987) meta-analytic study analyzing 15 published articles dealing with environmental concern. Thus, our finding suggests that campaigns to promote global warming awareness may convey the message that individual's actions can make a difference.

Like any other study, this study is not without limitations. First, we have only considered one type of environmental concern, i.e., global warming. Future research may replicate this study on a series of other environmental concerns such as air or water pollution. Second, we investigated the influence of a limited number of variables regarding global warming concern. However, since global warming concern is a complex combination of several economic, ecological, social and cultural factors, it seems reasonable that future research should examine the influence of constructs such as sense of efficacy, guilt and trust. For example, although locus of control refers to individual's belief that his or her actions can bring a desired outcome, self-efficacy refers to the perception of whether the individual has the skills and ability needed to undertake actions (Bandura, 1977). Thus future research may investigate the impact of self-efficacy on global warming concern. Previous research found that guilt does positively influence pro-social behavior (e.g. Elgaaied, 2012). Thus, future research might extend this concept by applying it to environmental concern. Another area of possible future research is investigating the relationship between trust and concern for global warming. In fact, previous research has found that trust elicits more concern for public goods (e.g. Meyer and Liebe, 2010). Thus, it seems that there might be a positive link between trust and willingness to sacrifice to protect the environment. Future research should investigate this interesting area.

In this research we investigated concern for global warming using only data from Egypt. It would be interesting to extend this kind of research to such countries, notably to Africa and other non-Western countries, in order to see if our results hold. Although Egypt is an African country, it is not possible to test Israel's (2004) remarkable finding regarding African countries' strong support for environmental protection. There is also a need to explore other nations dominant religions, such as Hinduism and Buddhism, in shaping attitudes toward global warming. We also did not address the possible association among study variables. For example, religiosity is often associated with external locus of control, fatalism and right-wing political tendencies. Future research may test empirically whether such association does exist. Finally, we used a cross-sectional rather than a longitudinal approach. This implies that much more emphasis has been placed on observing respondents' behaviors than in observing changes in behavior. There would seem to be hence a need for much more longitudinal research to focus on observing changes in concern for global warming over time.

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