

# The Tradeoff between Growth and Environment: Evidence from China and the United States

## Kompromis pomiędzy wzrostem a środowiskiem: Przykład Chin i USA

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### Abstract

This paper empirically analyzes individual attitudes on the tradeoff between environment and economy, and factors that might influence such choice for two representative countries: China and the United States. Based on the World Value Survey, the Chinese are found more inclined to support environmental protection, while people from the United States choose economic growth as priority. Considering three sets of correlates of sociodemographics, environmental attitude and social context, variables such as education, political affiliation and environmental consciousness show significance in influencing personal preferences, and the effect of health, age, employment and marital status demonstrates heterogeneity across countries. Such micro-level evidence on how the public weighs the economy versus environment can provide policy guidance for the government to better respond to public opinions.

**Key words:** economic growth, environmental protection, tradeoff, individual preference, public opinion

### Streszczenie

Artykuł poddaje analizie indywidualne postawy odnoszące się do kompromisu pomiędzy środowiskiem a ekonomią, a także czynniki, które mają wpływ na kształtowanie się takich postaw, w odniesieniu do dwóch ważnych krajów: Chin i USA. Według danych World Value Survey okazuje się, że Chińczycy są bardziej skłonni wspierać ochronę środowiska, podczas gdy Amerykanie za priorytet uznają rozwój ekonomiczny. Uwzględniając trzy zbiory korelatów odnoszące się do socjodemografii, postaw wobec środowiska i kontekstu społecznego, zmienne takie jak edukacja, orientacja polityczna i świadomość ekologiczna, okazuje się, że te czynniki odgrywają istotne znaczenie w kształtowaniu indywidualnych priorytetów, a kwestie zdrowia, wieku, zatrudnienia i stanu cywilnego wypadają podobnie w różnych krajach. Dane z takiego mikro poziomu pokazują, jak ludzie indywidualnie rozstrzygają spór pomiędzy ekonomią a środowiskiem, co stanowi polityczną wskazówkę dla rządu, dzięki której można lepiej odpowiadać na nastroje społeczne.

**Słowa kluczowe:** rozwój ekonomiczny, ochrona środowiska, kompromis, indywidualne preferencje, opinia publiczna

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### Introduction

Economic growth and environmental protection are two main issues concerning social welfare. The history of developed and developing countries shows that the process of economic development is coupled with the increase in resource consumption and pollutant emission. The certain incompatibility of envi-

ronment and economy introduces a dilemma between economic progress with the sacrifice of environmental quality, and protecting the environment while tolerating a lower economic growth rate. Different priorities correspond to different public policies. Depending on the stage and plan of a country's development, the political choice plays an important role in influencing social outcomes. As individuals

are heterogeneous (Dolnicar and Grün, 2009) and each is closely correlated with economic and environmental benefits, the micro-level evidence on how the public weighs the economy versus environment and which elements affect their attitudes are crucial for the policy making and implementation.

The tradeoff between environment and economy has long been a debated topic. Starting from the report *The Limits to Growth* in 1972 which suggests a non-sustainable economy, Beckerman (1992) states that economic growth should be given more priority than environmental protection especially for developing countries. Grossman and Krueger (1995) study empirically the relationship between environmental quality and income per capita, and find that economic growth does not necessarily lead to environmental degradation. The environmental quality exhibits a reverse-U shape with respect to personal income, referred to as the Environmental Kuznets Curve (EKC). While Stern (1998), Antweiler et al. (1998) and Azomahou et al. (2006) support the EKC theory, other research papers discover different relationships as linear, N or reverse-N shapes (Gale and Mendez, 1998; Barret and Graddy, 2000; Harbaugh et al., 2002; Cole and Elliot, 2003; Perman and Stern, 2003). The majority of previous studies demonstrate the existence of conflicts between environment and economy at certain point.

Previous research relating to the tradeoff between environment and growth uses mostly a macro framework. Instead, micro evidence, especially on the public opinion towards environment-economy relationship, and its effect on environmental policy making, are relatively scarce. Existing literature with micro-level data concentrates on the determinants of environmental concerns or pro-environmental behavior. In line with Olli et al. (2001), we classify the correlates of environmental concerns or behavior into three groups: sociodemographics, environmental attitudes or knowledge, and social context. The first set of correlates includes age, gender, income, residence, education, etc., where education and income generally prove a consistent and positive relationship with environmental concerns, while the effect of age and gender are more mixed. Barr (2007) summarizes that as a crude stereotype, young, high-income earning as well as well-educated individuals tend to be more environmentally active. However, Scott (1999) and Swami et al. (2011) find that high age to be a significant predictor of household waste management behavior. Regarding the gender differences which in most cases are found uncertain (Davidson and Freudenburg, 1996; Heath and Gifford, 2006), Steel (1996) and Zelezny et al. (2000) have identified a significant relationship where women report stronger environmental attitude and behavior than men, due to higher levels of socialization to be more socially responsible. The second category of determinants represents environmental attitude, values, and in a broad scope, knowledge or recognition

concerning environmental problems. For instance, Steel (1996) finds that attitude intensity is correlated with self-reported environmental behavior and political activism in environmental issues, Barr (2007) and Gadenne et al. (2011) confirm such significant link with respect to waste reduction and energy saving behavior. Moreover, Kaiser et al. (1999) make distinction among environmental attitude, knowledge, value, and intention effect. Lastly, social context refers to not only environmental organizations, but also social influences including family, group, societal, political and cultural influences (Gadenne et al., 2011). Since environmental reforms are generally opposed by business and industry (Van Liere and Dunlap, 1980), political party involvement or political liberals are found more favorable to environmental changes (Olli et al., 2001). Besides, Olli and Wollebaek (2001) incorporate social network in studying environmental behavior, concluding that its effect is comparable to sociodemography, political attitudes and environmental knowledge. In addition to above three sets of correlates, Olli et al. (2011) and Swami et al. (2011) also analyze the effect of psychological traits such as personalities on the waste recycling behavior.

To summarize, the micro-level research proves valuable in understanding environmental consciousness and promoting environmental behavior, however, focusing solely on environmental issues and personal environmental perception may not accommodate the big picture of harmonized development of both environment and economy. Taking economic growth into consideration, environmental preferences are likely to diverge from pro-environmentalism. Rydzewski (2015) looks at multiple preferences including environment, economy, education, health, etc. A related analysis by Heath and Gifford (2006) considers effect of free market ideology on beliefs in climate change, testing the logic that capitalism is inconsistent with environmental preservation and free-market system is supposed to take care of everything. Besides the fact that their research does not directly analyze the binary choice or tradeoff, our study focuses on the preferences between environment and economy, instead of a free-market belief. Therefore, our analysis incorporates a broader scope emphasizing on economic growth, which is irrespective of the market systems and allows for cross-country comparisons. In short, this paper tries to study individual preferences towards economic growth and environmental protection (when possible conflicts may exist between them), and its implications on public policies.

Based on World Value Survey (WVS), we analyze public attitudes on the tradeoff between environment and economy, and factors that may influence such choice. With a sample of two representative countries: United States and China, the analysis can account for a comparison between typical developed and developing countries, and the heterogeneity in

income, education, health, etc. Instead of a macro study on the environment versus economy problem, this paper focuses on individual choices, which not only complements the EKC theory from a micro perspective, but also provides policy implications that accord with public opinions.

The rest of the paper is organized as follows. The next section explains the data source and variables. Section 3 presents the estimation model and results. The final section concludes.

## Data

The data is extracted from the WVS, which is a micro database based on a multi-national survey program, and widely used in sociology, political science and economics. The analysis uses the sixth-period survey data from two countries: United States and China, where the investigation was conducted in 2011 and 2012 respectively. The number of surveyed individuals is 2300 in China and 2232 in the United States.

Regarding the tradeoff between environment and economy, one question posed in the WVS questionnaire is: *Here are two statements people sometimes make when discussing the environment and economic growth, which of them comes closer to your own point of view?* Option 1 writes *Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs*, while option 2 states *Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent*. Unknown and other answers are coded in option 3. Table 1 summarizes the responses. In the U.S., the majority of people in the U.S. regard economic growth as priority (60.5%), while more respondents in China prefer environmental protection (46.5%). We use a dummy variable ENEC to represent the preferences toward environment and economy, with value 1 denoting priority in environmental protection, 0 as preferences in economy, and unknown answers dropped. The mean of ENEC is shown higher in China (0.68) than in the United States (0.38). A direct t-test of group means ( $t = 19.77$ ) confirms that the preferences for environmental protection in China is significantly stronger than that in the United States.

To account for sociodemographic factors which may influence the preferences toward environment and economy, we also include variables of Age, sex (Male=1 if the respondent is male), marital status (Married=1 if married, =0 otherwise), whether the respondent has children or not (Child=1 if the respondent has one or more children), and categorized income (Income is from lowest 1 to highest 10). Health status may also affect personal choices on environmental preference, we transform the answers of self-reported health status to variable Health with value 1, 2, 3, 4 where 1 is poor health and 4 is very good health. Concerning the education background,

it is calculated in number of years (Olli et al. 2001). Variable Education is assigned 0 if no official education received, primary school not finished=3, primary school=6, junior school not finished=7.5, junior school=9, high school not finished=10.5, high school=12, college without a diploma=15, college and beyond=16. In accordance with Olli et al. (2001), the individual employment status is included, since the environmental policies represent extending the welfare state of which employees of the public sector are a part and on which they depend (Eckersley 1989). The questionnaire distinguishes three employment statuses: government or public institution, private business or industry, private non-profit organization, and we define two dummy variables with Public=1 if working in public sectors, and Private=1 where the individual is employed in private business.

Concerning environmental attitude, the survey asks *whether the person looking after the environment, caring for nature and saving life resources is like you*, the answers are categorized in Envimp with integer values 1 to 6 of increasing concerns. Note that regarding environmental preservation an important issue does not necessarily indicate that he or she would prefer environment over economy, it is possible that economic development is an even more important concern. Lastly, we include dummies of environmental organization (Envorg) and political party affiliation (Party) in the social context, where participation in an organization can be viewed as a personal commitment to behaviors (Cook and Berenberg, 1981). To summarize, the descriptive statistics of all variables are displayed in Table 2.

## Estimation results

We set the empirical model as the following:

$$ENE C_i = \alpha + \beta_1 Male_i + \beta_2 Age_i + \beta_3 Married_i + \beta_4 Child_i + \beta_5 Health_i + \beta_6 Education_i + \beta_7 Income_i + \beta_8 Public_i + \beta_9 Private_i + \beta_{10} Envimp_i + \beta_{11} Envorg_i + \beta_{12} Party_i + \varepsilon$$

where  $i$  indicates individuals,  $\alpha, \beta, \varepsilon$  are the constant, coefficients to be estimated and error term. Since the dependent variable ENEC, i.e. the tradeoff between environment and economy, is binary, we apply the Probit estimation. In addition, following Ferrer-i-Carbonell and Frijters (2004), Maddison and Rehdanz (2011), Ferreira et al. (2013), Cuñado and Pérez de Gracia (2013) who study similar matters with both linear probability model and OLS estimation, we also report the OLS results in Table 3. The sign, coefficient and significance of both OLS and Probit estimation are consistent.

Consistent with Olli et al. (2001), education background significantly encourages individuals to prefer environmental benefit instead of economic growth, because more highly educated people are more aware of and able to understand environmental information (Eckersley 1989). Political party also

Table 1. Preferences toward environment and economy in WVS survey

Priority	China		U.S.	
	count	proportion	count	proportion
Environment	1299	46.5%	830	37.2%
Economy	622	27%	1350	60.5%
Unknown	379	16.5%	52	2.3%

Table 2. Descriptive statistics

Variable	China		U.S.	
	mean	s.d.	mean	s.d.
ENEC	0.676	0.468	0.381	0.486
Male	0.490	0.500	0.486	0.500
Age	43.918	14.947	48.906	16.906
Married	0.816	0.387	0.582	0.493
Child	0.430	0.495	0.148	0.355
Health	2.843	0.857	3.063	0.749
Education	9.447	4.276	13.824	2.499
Income	4.416	1.853	5.165	1.914
Public	0.197	0.397	0.174	0.379
Private	0.237	0.425	0.399	0.490
Envimp	4.174	1.151	4.045	1.280
Envorg	0.027	0.161	0.176	0.381
Party	0.082	0.275	0.453	0.498

Table 3. Estimation results on the tradeoff between environment and economy

	China		U.S.	
	OLS	Probit	OLS	Probit
Male	0.0002 (0.01)	-0.0001 (-0.00)	0.020 (1.01)	0.020 (0.90)
Age	0.003*** (2.72)	0.003*** (2.72)	-0.003*** (-5.24)	-0.004*** (-5.16)
Married	-0.059* (-1.82)	-0.061** (-1.90)	-0.031 (-1.49)	-0.034 (-1.41)
Child	-0.018 (-0.74)	-0.018 (-0.75)	0.016 (0.58)	0.018 (0.58)
Health	0.031** (2.19)	0.032** (2.20)	0.004 (0.27)	0.004 (0.27)
Education	0.019*** (5.67)	0.020*** (5.66)	0.012*** (2.79)	0.014*** (2.91)
Income	-0.004 (-0.62)	-0.004 (-0.56)	-0.001 (-0.16)	-0.001 (-0.22)
Public	-0.030 (-0.92)	-0.032 (-0.94)	0.037 (1.30)	0.043 (1.28)
Private	-0.077*** (-2.74)	-0.082*** (-2.84)	0.067*** (3.03)	0.077*** (2.99)
Envimp	0.022** (2.14)	0.023** (2.21)	0.131*** (16.36)	0.150*** (15.14)
Envorg	0.004 (0.05)	0.005 (0.07)	0.137*** (4.98)	0.148*** (4.62)
Party	-0.122*** (-2.93)	-0.131*** (-2.96)	-0.078*** (-3.66)	-0.092*** (-3.75)
C	0.306*** (3.55)	-	-0.177** (-2.24)	-
R-squared/ Pseudo R2	0.037	0.030	0.175	0.143

\*p<0.1,\*\*p<0.05,\*\*\*p<0.01. T-values in parentheses.

shows a strong relationship in both countries, that being affiliated with a political group negatively affect the individual's tendency toward pro-environmentalism. Despite the fact that the concern level on the environment alone (Envimp) is different from balancing between environment and economy, a higher environmental concern does significantly affect individuals' tendency in the tradeoff. The person who cares about environmental quality is more likely to choose environment over economy. Such positive correlation exists in both countries. Some sociodemographic elements may play different roles in different countries. For instance, though Age shows significance in both countries, the sign of

impacts is opposite. Younger people are more probable to favor economic development (Scott 1999; Swami et al. 2011) in China which may correspond to their career or income condition; while in the United States, the tendency towards economy is increasing in the age. Most literature applying U.S. data discovers a negative relationship between age and environmental behavior as in our study. Regarding environmental protection a substantial change and a threatening to the existing social order, younger people, less committed or integrated to the dominant social order, are expected to support environmental reform (Jones and Dunlap, 1992). Similarly, employment in private business significantly

affects individual's preference toward economic growth in China and toward environmental preservation in the United States. The opposite sign may reflect different comparative status between private business and public sectors in the two countries, where the private industry survives in the shadow of state-owned companies, resulting in more economic concern of private sectors in China.

Self-reported health and marital status is slightly significant only in China. Being a member in the environmental organization, no matter due to self-identification or because of peer monitoring and cultural influence, strongly drives individual's choice toward green-environment priority as expected (Olli et al., 2001). Only 3% of respondents belong to an environmental organization, the effect is insignificant in China. Other variables as gender (Schultz et al., 1995; Davidson and Freudenburg, 1996; Heath and Gifford, 2006), the income level, whether the respondent has children, and employment in public sectors (Olli et al., 2001) do not correlate with their choice between environment and economy in any of the countries.

## Conclusion

This paper empirically analyzes individual attitudes on the tradeoff between environment and economy, and factors that might influence such choice for two representative countries: China and the United States. Based on the World Value Survey, the Chinese are found more inclined to support environmental protection as a whole; while people from United States choose economic growth as a higher priority. The logic behind may correspond to different development stage of each country<sup>1</sup>, where the environmental degradation is not a main issue of concern in the United States, but a serious conflict in China. Though the economy has made remarkable progress in China, such growth sacrifices natural resources, biodiversity, water, air quality, etc., which in turn undermines the improvement of social welfare. The micro-level evidence suggests that the majority of citizens would rather prefer a green environment even it may negatively influence the economy or employment. The public opinions, as a crucial basis for governments' policy making, should be seriously taken into account especially involving environmental and economic public policies.

In addition, this paper focuses on individual choices instead of a macro study on the environment versus economy dilemma, which tends to complement the EKC theory from a micro perspective. As a result, the income level does not show significance in the estimation, not supporting any linear or U-shaped relationship between income and environmental qual-

ity as in EKC. However, education, political affiliation and environmental consciousness do play a significant role in influencing the tendency toward either economic progress or a green environment. The effect of health, age, employment and marital status demonstrates heterogeneity across countries. Therefore, depending on different social situations, countries can be able to harmonize corresponding environmental and economic policies to better respond to public concerns.

Due to data restriction, this study does not include effects of urban or rural residence (Olli et al., 2001), environmental knowledge (Arkestejin and Oerlemans, 2005; Heath and Gifford, 2006; Gadenne et al., 2011), and particular party affiliations where support for environmental reform can vary among political groups (Lowe and Rüdig, 1986; Olli et al., 2001; Hamilton, 2011). Our study does not make distinction between party groups (not able to do so for the United States sample and not necessary to do so for China), but view political party affiliation as a social influence from individual commitment, peer effect or societal influence (Gadenne et al., 2011), which results in a strong relationship for both countries. Lastly, we should note, environmental protection and economic development are not always conflicting, in many cases environmental problems are addressed through technological innovation. This does not compromise the results in this paper, where priorities in the political agenda can always exist, and evidence of public opinions are essentially needed in the policy making process.

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<sup>1</sup> The individual level regressions of two countries are hardly able to take into account the influence of economic development, the business cycle and other country-level

factors. Micro-level data drawn from a sufficient number of countries may address such issue, which can be a venue for future research.

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