



The Journal of Population and Sustainability

ISSN 2398-5496

Article title: Post-materialism as a basis for achieving environmental sustainability

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Vol. 5, No. 2, 2021, pp.97-125.

PEER REVIEWED ARTICLE

Post-materialism as a basis for achieving environmental sustainability

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Abstract

A recent article in this journal, "Achieving a Post-Growth Green Economy", argued that a turn to post-material values by younger generations may be setting the stage for a more environmentally friendly, post-growth green global economy. To expand the foundations for the possible emergence of such an economy, the current article offers empirical evidence from the World Values Survey for the propositions that individual post-material values and experiences leads to (1) a reduction in consumption-oriented activities, (2) a shift to more environmentally friendly forms of life that include living at higher, more energy efficient urban densities, (3) having families with fewer children, and (4) greater political support for environmental improvement. Such behavioral shifts provide a foundation for a no-growth, or even a negative-growth, economy among the affluent nations of the world leading to declining rates of energy and materials throughput to the benefit of a healthier global biosphere.

Keywords: post-materialism; sustainability; population growth; post-growth economy.

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Introduction

A sea-change in values among middle-class youth has occurred around the world away from giving high social priority to materialist economic social goals and towards non-economic social purposes such as advancing freedom of expression and increasing social tolerance (Inglehart, 2008; Norris and Inglehart, 2019). This change appears to be accompanied by less emphasis on the pursuit of wealth and material possessions and more emphasis on seeking cultural and social experiences that take place outside the sphere of economic transactions or within the economic arena but for non-economic purposes. This article hypothesizes that such a shift in outlook and activities brings a less entropic and more environmentally friendly way of living and greater political support for sustaining a healthy natural environment. Not only have values shifted in a post-material direction away from more traditional concerns among global populations, but interest in the pursuit of post-material experiences beyond the strictly economic has expanded as well. In the following, data from the World Values Survey, Wave 6 (2010-2014) will be used to offer evidence for these claims and to show that post-materialists are (1) less oriented to expanding material consumption, (2) choose to reside in denser, more energy efficient urban settings, (3) have smaller families than others, and (4) support the environment through political actions, all to the benefit of a healthier global biosphere (World Values Survey Association, 2015).

Various authors have suggested limiting material economic activity in those countries most responsible for the violation of ecological sustainability measures such as the ecological, carbon, or materials consumption footprints. Some argue simply for a cessation of economic growth and others for actual reductions in economic activity in order to meet global sustainability goals (Booth, 2020a; Jackson, 2017, 2019; Victor, 2008). To accomplish either of these would be a profound political act and require a substantial constituency. Such a constituency is potentially found amongst individuals who express post-material values or participate in post-material experiences. These individuals are more likely than others to themselves limit their material consumption and to be strongly supportive of doing something about global environmental problems. Whatever position taken on the question of limiting growth to address harms to the environment, the historical evidence is clear that economic growth, and the technological changes and population expansion behind it, have brought about substantial harms to the environment, and this is especially the case for the U.S. and the U.K. (Booth, 1998).

The post-material silent revolution

Ronald Inglehart and his colleagues have extensively documented a 'silent revolution' in social values among younger generations occurring over the last half of the 20th Century and continuing into the early 21st Century (Inglehart, 1971, 2008; Inglehart and Abramson, 1994). In these years, the 'silent revolution' in the formation of post-material values made significant advances in the world's most affluent countries, which have gained the capability of providing economic and physical security to younger generations as they come of age (Inglehart, 1971; Inglehart and Welzel, 2005; Norris and Inglehart, 2019). Statistical evidence shows a substantial advance in the ratio of post-materialist to materialist values in a diverse collection of European countries and the U.S. (Inglehart, 2008; Inglehart and Norris, 2016). Growing up in economically secure conditions enables the formation of 'liberal' post-material values among younger generations such as freedom of expression, social tolerance of all irrespective of race or sexual predilections, a humane society based on ideas rather than money, and democracy in all of life's arenas. These values are given disproportionate support by younger individuals over such materialist goals as increased economic growth and expanded personal security (Inglehart, 2008; Inglehart and Abramson, 1999). Inglehart also provides evidence showing that younger generations continue to be more post-materialist than older generations over time despite fluctuations in post-materialism measures related to economic cycles (Inglehart, 2008). In brief, as particular generations age they retain their basic commitment to values formed in their younger years.

The realization of post-material values more commonly occurs among those from more affluent middle-class backgrounds than among those from less economically secure working-class backgrounds (Inglehart and Abramson, 1994, 1999; Inglehart and Welzel, 2005). For this reason, a class divide between middle-class post-materialists and working-class materialists who occupy the lower end of the social class spectrum is likely (Booth, 2020b).

The World Values Survey data and measuring post-materialism

The data source used in the following analysis comes from the World Values Survey, Wave 6, a global sample survey of a full array of human values under the auspices of the World Values Survey Association composed of 100-member countries (World Values Survey Association, 2015). For a full explanation of the

methodology behind the survey, go to the World Values Survey web site, <http://www.worldvaluessurvey.org>. The survey is funded by member countries and a variety of foundations and administered in person to a randomly selected set of respondents by professional staff and is confined to adults 18 and older. Wave 6 data were collected over the period from 2010 to 2014 and include 60 countries (Table A1) and a total sample of 86,274 respondents.

A post-materialism index based on respondent expressions of attitudes towards materialist and post-materialist social goals can be constructed using data from the World Values Survey-Wave 6 (WVS), administered over the period 2010-2014 (World Values Survey Association, 2015), and is referred to here as the Inglehart post-materialism index. The construction of the index is set out in Table 1 where all WVS variables used in the following are described. Data from the WVS survey shows that 69 % of respondents are materialists who each claim less than a majority of post-material social goals among the options used in the construction of the Inglehart Post-Materialism Index, and 31 % are post-materialists who each claim a majority of their social goals as post-material (World Values Survey Association, 2015). Between the WVS wave 6 (2010-2014) and wave 7 (2017-2020), for 32 countries common to each sample, the share of post-materialists increased more than 10 % from 30.5 to 33.7 % of the global sample population (World Values Survey Association, 2015, 2020). Unsurprisingly, in an outwardly materialist world, post-materialists still constitute a minority of the population, but one that has expanded in recent decades in European countries and the U.S. as already described (Norris and Inglehart, 2019).

Table 1. World Values Survey Wave 6 * Questions Wording and Coding

Variables	Questions	Coding
<p>Inglehart Post-Materialism Index</p>	<p>People sometimes talk about what the aims of this country should be for the next ten years. On this card are listed some of the goals which different people would give top priority. Would you please say which one of these (on each Card) you, yourself, consider the most important? And which would be the next most important? (PM refers to a post-materialist social goal and M to materialist).</p> <p>Card 1</p> <p>(1) A high level of economic growth (M)</p> <p>(2) Making sure this country has strong defense forces (M)</p> <p>(3) Seeing that people have more say about how things are done at their jobs and in their communities (PM)</p> <p>(4) Trying to make our cities and countryside more beautiful (PM)**</p> <p>Card 2</p> <p>(5) Maintaining order in the nation (M)</p> <p>(6) Giving people more say in important government decisions (PM)</p> <p>(7) Fighting rising prices (M)</p> <p>(8) Protecting freedom of speech (PM)</p> <p>Card 3</p> <p>(9) A stable economy (M)</p> <p>(10) Progress toward a less impersonal and more humane society (PM)</p> <p>(11) Progress toward a society in which Ideas count more than money (PM)</p> <p>(12) The fight against crime (M)</p>	<p>Index=sum of the number of first and second post-material (PM) priorities for each set</p> <p>Range: 0-5</p>

Variables	Questions	Coding
Organization Membership Index	<p>Now I am going to read off a list of voluntary organizations. For each organization, could you tell me whether you are an active member, an inactive member or not a member of that type of organization? Sport or recreational; art, music or educational; environmental; humanitarian or charitable.</p>	<p>Not-0 Inactive-1 Active-2 Index= summation of scores. Range 0-8</p>
Creative Tasks/ Independence at Work Index	<p>Are the tasks you perform at work mostly routine tasks or mostly creative tasks? Use a 1 to 10 scale with 1 mostly routine tasks and 10 mostly creative tasks.</p> <p>How much independence do you have in performing your tasks at work? Use a 1 to 10 scale with 1 no independence at all and 10 complete independence.</p>	<p>1-10 1-10 Index= sum of above Range 1-20</p>
Participation in Political Action Index	<p>I am going to read out some forms of political action that people can take. Tell me for each action how often you have done it in the last year. Signing a petition; joining a boycott; attending peaceful demonstrations; joining strikes; other acts of protest.</p>	<p>Not at all-0 Once-1 Twice-2 Three-3 More-4 Index=sum of for all actions. Range 0-20</p>
Age	<p>Can you tell me your year of birth, please? 19____ (write in last two digits)</p> <p>This means you are ____ years old (write in age in two digits).</p>	<p>Years</p>

Variables	Questions	Coding
Education	<p>What is the highest educational level that you have attained? [NOTE: if respondent indicates to be a student, code highest level s/he expects to complete]:</p> <p>1 No formal education</p> <p>2 Incomplete primary school</p> <p>3 Complete primary school</p> <p>4 Incomplete secondary school: technical/ vocational type</p> <p>5 Complete secondary school: technical/ vocational type</p> <p>6 Incomplete secondary: university-preparatory type</p> <p>7 Complete secondary: university-preparatory type</p> <p>8 Some university-level education, without degree</p> <p>9 University-level education, with degree</p>	1-9
Social Class	<p>People sometimes describe themselves as belonging to the working class, the middle class, or the upper or lower class. Would you describe yourself as belonging to the</p> <p>1 Upper class</p> <p>2 Upper middle class</p> <p>3 Lower middle class</p> <p>4 Working class</p> <p>5 Lower class</p>	1-5
Importance of Being Rich	<p>Now I will briefly describe some people. Using this card, would you please indicate for each description whether that person is very much like you, like you, somewhat like you, not like you, or not at all like you? It is important to this person to be rich; to have a lot of money and expensive things.</p>	1-6

Variables	Questions	Coding
Importance of Work	For each of the following, indicate how important it is in your life. Work.	1-4
Importance of Leisure	For each of the following, indicate how important it is in your life. Leisure.	1-4
City Size	(Code size of town): 1 Under 2,000 2 2,000 – 5,000 3 5 – 10,000 4 10 – 20,000 5 20 – 50,000 6 50 – 100,000 7 100 – 500,000 8 500,000 and more	1-8
Family Size (No. of Children)	Have you had any children? (Code 0 if no, and respective number if yes): 0 No children 1 One child 2 Two children 3 Three children 4 Four children 5 Five children 6 Six children 7 Seven children 8 Eight or more children	0-8
Environment Importance	Now I will briefly describe some people. Using this card, would you please indicate for each description whether that person is very much like you, like you, somewhat like you, a little like you, not like you, or not at all like you? (1-6 scale). Looking after the environment is important to this person; to care for nature and save life resources.	1-6
Give to an Ecological Organization	During the past two years have you given money to an ecological organization?	

Variables	Questions	Coding
Attend an Environmental Demonstration	During the past two years have you participated in a demonstration for some environmental cause?	0-1
Life satisfaction	All things considered, how satisfied are you with your life as a whole these days?	1-10
Job Loss Fear	To what degree are you worried about the following situations? Losing my job or not finding a job.	1-4

**Source: (World Values Survey Association, 2015). Wave 6 Countries Surveyed: Algeria, Argentina, Armenia, Australia, Azerbaijan, Bahrain, Belarus, Brazil, Columbia, Cyprus, Chile, China, Ecuador, Egypt, Estonia, Georgia, Germany, Ghana, Hong Kong, India, Iraq, Japan, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Lebanon, Libya, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Nigeria, Pakistan, Palestine, Peru, Philippines, Poland, Qatar, Romania, Russia, Rwanda, Singapore, Slovenia, South Korea, South Africa, Spain, Sweden, Taiwan, Thailand, Trinidad, Tunisia, Turkey, Ukraine, United States, Uruguay, Uzbekistan, Yemen, Zimbabwe.*

***This social option is excluded from the final 12-item index as a social priority because it fails in practice to adequately separate materialists from post-materialists (Chang and Chen, 2013; Inglehart and Abramson, 1999)*

The formation of post-material values has also resulted in the advance of post-material experiences such as joining voluntary groups, pursuing creativity and independence in the world of work, and engaging in political actions, experiences that go beyond a strict focus on accumulating financial wealth and material possessions (Booth, 2018a, 2020b). Henceforth in this article, the terms ‘post-materialism’ and ‘post-materialist’ will encompass both Inglehart post-material values and post-material experiences. If we are materialists, our life’s focus is on gaining control over both tangible and material-like intangible objects and transforming them to mirror our deepest wishes (Booth, 2018a). Our experience of such control and its resulting manipulations of the material stuff of life is sensual and virtual, a product of our perception-driven, conscious thought process. Our desire to physically manipulate and alter objects as we find them in nature can ultimately result in huge transformations of the material world. Witness the remaking of the global environment following, first, the agricultural revolution and, second, the industrial revolution (Harari, 2015).

Some object ownership is inevitably a part of all our lives – we each need our own private supply of food, clothing, living space, and such – but post-materialists

look increasingly for experiences and actions not necessarily contingent on ownership of objects in their field of perception. For post-materialists, the essential quest in life is for experiences of the world apart from any requirements for ownership and private control. A post-materialist is not just someone with a certain value orientation, but a person who lives in a certain way and participates in certain kinds of activities. A post-materialist can afford to pursue extensive activities beyond the purely economic. Three activities of this kind postulated here are these: (1) voluntary group membership, (2) creative and independent work such as that undertaken by artists, and (3) political action beyond voting in support of some cause. Each measures a dimension of post-material, action-oriented experience where private possessions or wealth are secondary and, in some cases, inessential to the activity (Booth, 2018a). The World Values Survey (WVS) can be utilized to construct measures of these activities and estimate the extent of participation in them (World Values Survey Association, 2015). An index of voluntary group membership can be formulated from WVS inquiries about respondent participation in (a) sport or recreational, (b) art, music, or educational, (c) environmental, or (d) humanitarian or charitable organizations with inactive membership assigned a value of 1 and active membership a value of 2 for each of the four organizational categories which are then added up for each survey respondent (Table 1). These organizations were chosen on the assumption that participation in each type generally requires only a modest amount of material possessions or financial wealth. The particular kind of groups selected here are those that normally provide a public benefit of some kind and would consequently be of interest to individuals with post-material values seeking self-expressive activities. People choose to belong to other kinds of organizations including labor unions, political organizations, and professional groups, but these generally have a 'utilitarian' focus and provide private benefits of some kind to members. Membership in utilitarian groups was virtually flat globally between 1980 and 2000 in post-industrial societies, but by contrast public benefit groups experienced substantial growth (Welzel, Inglehart, and Deutsch, 2005).

The extent of creative and independent tasks at work can be measured by summing up two WVS survey responses, each measured on a 1-10 scale, first, that asks whether work tasks are mostly routine or mostly creative and, second, whether independence is exercised in performing work tasks (Table 1). Seeking work that possesses such characteristics doesn't necessary require one to be

materially wealthy, as in the case of so-called 'starving artists' (Alper and Wassall, 2006; Lloyd, 2002). Work does necessitate participation in a product market for the self-employed or a labor market and is inevitably subject to market transactions unlike membership in voluntary organizations or participation in political action, but product or labor market income can often be traded off for creative and independent tasks (Alper and Wassall, 2006).

Participation in political action can be measured with the sum of the number of times (up to a maximum of four each) that a respondent signed a petition, joined a boycott, attended a peaceful demonstration, joined a strike, or participated in some other act of protest (Table 1). Participation in such activities normally doesn't require much in the way of material possessions and financial wealth. Actions of this kind are the product of either formal or informal mass organization by activists and can frequently be described as 'elite-challenging'. Such actions experienced an upswing in the last two decades of the 20th Century in post-industrial societies (Inglehart and Welzel, 2005; Welzel et al., 2005).

The three experience activities should measure phenomenon significant in daily life if these phenomena are to be of any importance. The World Values Survey – Wave 6 (WVS) data reveal that voluntary organizations indeed matter for respondents, 33.5 % of whom belonged to at least one athletic, arts, environmental, or humanitarian organization. For membership scoring purposes, inactive membership in each type of organization is given a value of 1, and active membership a value of two. Of those who participate in on or more of the four types of voluntary organizations, the mean participation score is 2.81 out of a maximum possible of 8, the latter number being achieved only with active membership in all four types of organizations. The mean sample score for creative and independent tasks is 10.5 out of a possible 20 with approximately 23 % of the sample realizing a score of 15 or more, suggesting that creativity and independence in work occurs for a substantial portion of the respondent working population. Finally, the rate of respondent participation in political action is 20.4 % of the total sample population and the mean participation rate is 3.0 actions for those who are politically active. The three experience activities are thus a significant part of individual lives on a global scale, and importance of post-material experiences around the world is established for a substantial minority of the sample population (Booth, 2018a).

The statistical approach

To repeat, the purpose of the statistical analysis to follow will be to provide evidence that (1) post-materialists are less oriented than materialists to expanding material consumption; (2) choose more so than others to reside in denser, more energy efficient urban settings; (3) have smaller families than others; and (4) support the environment through political actions, all to the benefit of a healthier global biosphere. The basic statistical approach is to use regression analysis to show that post-materialism measures are statistical predictors of (1) – (4) in a global setting. Using such a large survey with such a diverse geographic coverage for this task has its benefits and dangers. The benefit is that the statistical results apply globally. The drawback is that any useful regression analysis for such a large sample will necessarily leave out a huge number of possible explanatory variables and will end up explaining a relatively small portion of variation in the data. Nonetheless, with such an analysis significant statistical relations can be discovered that are highly useful in explaining human behavior. To account for country-level differences, a hierarchical mixed-effects regression technique is used that creates a random effects constant for each country that controls for country differences unaccounted for by included variables in regressions equations (Stata Corporation, 2015). Note that actual sample sizes will be reduced in equations limited to the actively employed portion of the sample and generally because of missing data where respondents fail to answer questions.

Statistical analysis of post-materialism

The following WVS regressions (Table 2) confirm that (1) Inglehart Post-Materialism is predicted negatively by age and positively by education, (2) the three post-material experiences – Voluntary Organization Membership, Creative and Independent Work, and Political Action – are in turn positively predicted by Inglehart Post-Materialism, and (3) Social Class (higher to lower) negatively predicts both Post-Materialism and post-material experiences:

Table 2: Mixed-Effects Post-Materialism and Post-Material Experience Regressions (Coefficients and Standard Errors)

Independent Variables	Inglehart Post-Materialist Index	Voluntary Organization Membership	Creative/Independent Work	Political Action
Inglehart Post-Materialism Index		.1130988*** .0049122	.2113903*** .0149283	.1552952*** .0054388
Age	-.0041246*** .0002624			
Education	.0409622*** .0019717			
Social Class (Higher to lower)	-.0223641*** .0043434	-.1960595*** .0056974	-1.023931*** .0176207	-.0861862*** .0063107
Regression Wald Chi-square Statistic	1114.64***	1794.66***	3661.46***	1041.82***

Statistical Significance: *<=5%; **<=1%; ***<=.1%. Sample N=77,294; 77,336; 63,584; 77,972.

Younger individuals tend to be more post-materialist than their older peers and education positively predicts the post-materialism index as Inglehart’s theory postulates. Education is both a liberalizing force and an indicator of an economically secure upbringing (Inglehart and Welzel, 2005 p. 37). Post-material values matter in choosing to engage in post-material experiences as inferred by the post-materialism index positively predicting each of the post-material experiences. This analysis makes clear that social class (measured higher to lower) also matters for both post-material values and experiences and has a negative impact on respondent post-materialism, meaning that members of the working class are more heavily materialist in their outlook than the middle and upper classes and are also less likely to participate in post-material experiences.

The emergence of post-materialism is especially interesting because it is intrinsically ‘anti-capitalist’ in its value-orientation and its conversion to a focus on actions and activities beyond the realm of marketed material possessions. The post-materialist movement according to Inglehart and Welzel is ‘elite-

challenging', and it supports an expansion of democracy in all of life's arenas including the workplace, something that would be antithetical to the bureaucratic form of control exercised within the modern capitalist corporation (Welzel et al., 2005). Carried to its logical conclusion, a switch to post-material values and experiences means a dampening of demand growth for consumer goods without which modern capitalism loses an essential driver for its expanding global influence. Were post-materialism to become globally prevalent and a threshold income reached universally beyond which demand for further material possessions takes a back seat to post-material experiences, then global growth in consumer demand could well shrink towards zero. Historically, the central opposing force to unfettered capitalism has been the materialist-oriented labor movement driven by the tendency of large corporations in the pursuit of profits to place downward pressure on wages and upward pressure on labor effort. Materialist members of the working class and middle-class post-materialists both have interests counter to the unhindered operation of capitalist enterprises, but these interests differ. Workers primarily desire increased incomes and economic security through higher wages and benefits that as a cost of production eat into business profits, and post-materialists are more oriented to obtaining increases in freedom of expression, expanded say over the organization of the work process, and the enlargement of life prospects beyond market transactions. This division is important and will be revisited later in this article. For now, it is worth noting that while their interests differ, both post-materialists and the working-class individuals in the pursuit of their particular interests oppose key outcomes delivered by capitalist businesses.

Post-materialism as a low-entropy form of life

The future spreading of a 'post-material silent revolution' around the world, I will now argue, provides an economic and political foundation for an environmentally friendly 'green economy' with less energy and materials throughput and associated waste emissions, an outcome that may well be essential to prevent the existential threat of climate change and other environmental stresses to the global biosphere. To repeat, the 'silent revolution' will assist in bringing about such an economy for the following reasons: (1) first and foremost, post-materialists likely consume relatively less over their life-time than materialists with similar economic opportunities, reducing the negative effects of such consumption on the environment; (2) post-material forms of living and experiences tend to be

less entropic and harmful to the environment than materialist ways of life; (3) post-materialists have smaller families dampening global fertility and eventually population growth and associated environmental harms; (4) and post-materialists are more supportive of environmental protection than others in both their attitudes and political actions, increasing the likelihood of government action favorable to the environment.

Those who adopt a post-material way of life are more prone than others to lack an interest in accumulating material possessions beyond a basic threshold level. As already described, post-material experiences tend to be pursued for their own sake, and material possessions are wanted for their supporting role in meeting the basic threshold material requirements of modern life. This infers that beyond some point post-materialists will be uninterested in voluntarily expanding either their consumer purchases or their purchasing power. In such circumstances, added economic growth is no longer desired, especially if it means more working hours and less time for post-material experiences. Simply put, the spread of post-materialism carries with it an attendant dampening of growth in consumer demand that in turn will diminish the growth of aggregate economic demand and output measured by Gross Domestic Product (GDP). In brief, more post-materialism, less economic growth, lower energy and materials throughput and reduced waste emissions, and the closer a country comes to the reality of an environment-conserving 'green economy'.

The evidence for reduced consumption by post-materialist is circumstantial given the unavailability of actual data on consumption for those who profess post-material values, and such evidence is available from the World Values Survey (WVS). That survey asks three different questions that shed light on an individual's commitment to earning and spending on consumer goods (see Table 1): (1) How important is it to the respondent 'to be rich' and have a lot of money and expensive things (1-6 scale), (2) How important is 'work' in the respondent's life (1-4 scale), and (3) How important is 'leisure' in the respondent's life (1-4) scale. Statistical analysis of the WVS data in Table 3 on these questions finds that the Inglehart Post-Materialism Index is a significant negative predictor of the Importance of Being Rich and the Importance of Work and a positive predictor of the Importance of Leisure controlling for Age and Education:

Table 3: Mixed Effects Regressions: Consumption Orientation Indicators (Coefficients and Standard Errors)

Independent Variables	Importance of Being Rich	Importance of Work*	Importance of Leisure**
Inglehart Post-Materialism Index	-.0422719*** .0044899	-.0563488*** .0063815	.0986588*** .0057835
Age	-.0110707*** .0003288	-.0179869*** .0004678	-.009527*** .0004105
Education	.0133356*** .0023682	-.0046225 .0032364	.0728458*** .0028822
Regression Wald Chi-square Statistic	1416.76***	1565.39***	1393.20***

Statistical Significance: * $\leq 5\%$; ** $\leq 1\%$; *** $\leq .1\%$. Sample N=77,776; 76,627; 78,258. *Multi-Level Ordered Logit Regression. **Ordered Logit Regression; the Mixed-Effects model random constant is not statistically significant.

In other words, post-materialists express a positive desire for leisure but a negative desire for being rich and engaging in work, the latter two being positive indicators of a materialist consumption orientation, and leisure being important to the pursuit of post-material experiences as a substitute for seeking more income to fund expanded material consumption.

Having attained a basic threshold of economic security and material possessions, post-materialists not only limit their overall demand for material possessions, but as a matter of taste seek a comparatively low-entropy form of life, placing less demand on energy and materials flows to the benefit of the environment. Post-materialists are more prone than others to reside in larger, denser cities that are more energy efficient and thus less entropic than the spread-out suburban areas so attractive to their older peers after World War II (Booth, 2018b). Energy efficiency increases with urban density for such reasons as reduced human travel distances, less use of energy inefficient private motor vehicles and more use of energy efficient public transit, and lower per person consumption of private dwelling space and associated heating and cooling energy requirements (New York City, 2007; Newman and Kenworthy, 1999, 2015). In the U.S., a return to downtown living has been driven in part by Millennials choosing to live in high-density urban

neighborhoods as opposed to spread out low-density suburbs (Birch, 2005, 2009). Even in already densely populated countries such as Germany, center-city, dense neighborhoods recently experienced a relative surge in population growth driven by younger generations (Brombach, Jessen, Siedentop, and Zakrzewski, 2017). Complementary to higher-density living by younger generations in the USA, the rate of car ownership and the miles of driving undertaken by Millennials is less than their older peers (Polzin, Chu, and Godrey, 2014). Higher urban densities support more of the publicly shared experience opportunities afforded by parks, libraries, public squares, museums, art galleries, entertainment and sports venues, spaces for group meetings and public demonstrations, street cafes, and more that provide opportunities for a post-material mode of living (Markusen, 2006; Markusen and Gadwa, 2010; Markusen and Schrock, 2006).

Data in the latest World Values Survey (WVS) confirms that Inglehart post-materialists and those who engage in two of three post-material experiences – creative and independent work and political action – tend to reside in larger cities around the world controlling for individual respondent Age, Education, and Social Class (Table 4):

Table 4: Mixed Effects Post-Materialism and Post-Material Experience Regressions and City Size (Coefficients and Standard Errors)

Independent Variables	Materialism/ Post-Materialist Index	Voluntary Organization Membership	Creative/ Independent Work	Political Action
City Size	.0069311** .0022541	-.0044558 .0031385	.0849591*** .0093077	.0161175*** .0034227
Inglehart Materialism/Post-Materialism Index		.1172729*** .0057623	.1843335*** .0173879	.1485208*** .006293
Age	-.0039707*** .0002966			
Education	.0373454*** .0022587			
Social Class (Higher to lower)	-.0263753*** .0048888	-.2044908*** .0065603	-1.011185*** .0200966	-.0762095*** .0071657

Regression Wald Chi-square Statistic	794.30***	1459.35***	2938.87***	739.95***
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*Statistical Significance: * \leq 5%; ** \leq 1%; *** \leq .1%. Sample N=58,691; 58,899; 48,417; 59,230.*

This is an especially important inclination because, larger cities feature greater residential density, and, as already described, denser cities are more energy efficient, less entropic places to live (Newman and Kenworthy, 1999, 2015; Tsai, 2005). City Size is a statistically significant predictor in the Post-materialism, Creative/Independent Work, and the Political Action equations. The only exception occurs in the Voluntary Organization Membership equation where City Size lacks statistical significance. Organization Membership is apparently invariant with respect to city size.

Simply put, the choices made by post-materialists about where and how to live lead them to a less entropic and environmentally destructive form of life, and this is on top of their inclination to lower aggregate rates of material consumption.

A third choice that post-materialist make favorable to a slow-growth green economy is to have fewer children, placing downward pressure on human fertility and ultimately population growth. Global economic growth as measured by GDP contains two components: (1) growth in GDP per capita, and (2) growth in global population (Booth, 2020a; Jackson, 2019). The turn to post-materialism and its focus on purposes and activities outside the economic arena serves to dampen growth in GDP per capita as already suggested. Choosing to live in higher density settings, in and of itself, limits the accumulation of material possessions – less space, less stuff. Less population growth will mean less growth in GDP as well. The rate of human fertility that drives global population growth is, thankfully, declining at a fairly rapid rate, although it still has some distance to go to reach the magic 2.1 (children born per women) that will lead to long run population stability. Globally, world fertility peaked at 5.06 in 1964 and declined to 2.43 in 2017. The fertility rates for lower-middle, upper-middle, and high-income countries are respectively 2.3, 1.9, and 1.6, suggesting that population stability, and in some countries even population decline, is on the horizon (World Bank, 2019a). The global population annual growth rate peaked in 1969 at 2.11 % and declined to 1.11 % in 2018 (World Bank, 2019b).

There is an abundant literature on human fertility explaining the reasons for its decline, and increased individual family affluence, education, and access to health care are among the most important causes, each of which was in turn rendered possible in the past by economic growth per capita (Rogers and Stephenson, 2018). While historically the turn to post-materialism is certainly a modest contributor to the aggregate decline in fertility, the simple point to be made here is that post-materialists indeed contribute to fertility decline and will likely continue to do so in the future by possessing lower fertility rates than their materialist peers according to data in the WVS data analysis in Table 5:

Table 5: Mixed Effects Family Size Regression (Coefficients and Standard Errors)

Independent Variables	Family Size
Inglehart Post-Materialism Index	-.018067** .0053613
Voluntary Organization Membership	-.0254281*** .0039189
Creative/Independent Work	-.0054564*** .0014113
Political Action	-.0033483 .0034205
Human Development Index (HDI)	-3.497555*** .5977993
Age	.0537231*** .000383
Social Class (Higher to lower)	.0767966*** .0064439
Regression Chi-square Statistic	20639.95***

*Statistical Significance: *≤5%; **≤1%; ***≤.1%. Sample N= 61,069*

Post-Materialism and two measures of post-material experience – Voluntary Organization Membership and Creative and Independent Work – are statistically significant ‘negative’ predictors of Family Size controlling for respondent Age. Inglehart post-materialists and those who participate in two out of three post-material experiences thus have smaller families with fewer children than others. A comprehensive and widely used measure of economic and social development

across countries is the Human Development Index (HDI) compiled by the United Nations Development Program (United Nations Human Development Program, 2018). The index measures human capabilities across countries, and includes in its construction indices of life expectancy, education, and gross national income per capita (measured on a purchasing power basis). The index in each sample country for 2013 is reported in appendix, Table A1. The human development index is a country-level negative predictor of family size as one would expect given that human fertility typically declines with each of the three measures of human development. Finally, Social Class is a negative predictor of family size suggesting a positive connection between fertility and economic insecurity at the individual level.

The expansion of post-materialism on a global basis thus contributes to lower global fertility rates and ultimately to the dampening of global population growth. A slowing of population growth worldwide by itself will lead to slower economic growth, lower throughput rates than otherwise for energy and materials, and less harm to the global biosphere. Again, post-materialism is a good deal for the environment. Note also that development is especially important in reducing family size. Countries with a larger human development index have smaller families and consequently lower fertility. Both post-materialism and human development matter for reductions in human fertility that lead to lower population growth and perhaps eventual population reductions. Given that the life-time environmental impact of another person in the developed world is many multiples of someone in a comparatively poor country, reduction of family size among post-materialists in affluent societies is especially important. Note also that post-materialists tend to have smaller families while working-class materialists farther down the social class pecking order tend to have larger families implying that a reduction in social inequality could in turn decrease human fertility.

The essential takeaway message of the 'post-material silent revolution' is this: younger generations in economically and physically secure countries around the world express values and pursue activities outside the arena of material possessions more so than their older peers. The best experiences of their life don't require continuous additions to material affluence, and for them a low- or even no-growth economy would be just fine as long as opportunities to earn a minimum threshold income are available. Post-materialists also seem fine with

smaller families, less population growth, and a subsequent diminished need for continuing economic expansion. Through generational replacement, post-material values more prevalent among younger individuals will become more extensive in the global population as a whole over time. In short, the growth orientation of capitalism possesses little appeal to post-materialists, especially if it is destructive of the global biosphere and harmful to cultural and natural assets that support access to post-material experiences.

In addition to being oriented to a less entropic form of living, post-materialists exhibit support for the environment in terms of both their attitudes and actions in the world. A long line of research demonstrates that the possession of Inglehart post-material values around the world predicts individual support for the environment, and, more specifically, for addressing the problem of climate change (Booth, 2017). Such support extends as well to those individuals who engage in post-material experience activities as suggested by the WVS statistical analysis to follow in Table 6:

Table 6: Mixed Effects Environmental Support Regressions

Dependent Variable	Environmental Importance (Coefficients, Standard Errors)	Give to an Ecological Organization (Logit Odds Ratios, Standard Errors)	Attend Environmental Protests (Logit Odds Ratios, Standard Errors)
Inglehart Materialism/Post-Materialism Index	.0204977*** .0043438	1.128183*** .012342	1.191855*** .0175816
Voluntary Organization Membership	.0331226*** .003129	1.255632*** .0081557	1.300911*** .0107939
Creative/Independent Work	.0118229*** .0011487	1.035225*** .0031052	1.014692*** .0039225
Political Action	.0268521*** .0027929	1.137106*** .0064427	1.211818*** .0076544
Social Class (Higher to lower)	-.0207358*** .005247	.7795145*** .010265	.8503685*** .0145291

Regression Wald Chi-square Statistic	500.26***	3066.21***	2681.81***
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Statistical Significance: * \leq 5%; ** \leq 1%; *** \leq .1%. Sample N= 62,430, 62,468, 61,898.

Note: the marginal effect of the independent on the dependent variable is equal to 1-coefficient in the case of odds ratios.

The essential conclusions that follow from Table 6 are these: (1) Four separate measures of post-materialism (Inglehart post-material values, voluntary organization membership, creative and independent work, and political action) positively and significantly predict each of three different measures of individual support for the environment (the importance of doing something for the environment, contributing to ecological organizations, and attending an environmental demonstration); (2) Social Class (higher to lower) negatively predicts support for the environment at significant levels. The dependent variables, Give to An Ecological Organization and Attend Environmental Protests, are both binary variables and require a logistical regression for estimation. For the independent variables in the regression equations, if the odds ratio is greater than one and statistically significant then the variable has a positive effect on the dependent variable and if it is less than one and significant it possesses a negative effect. To illustrate the meaning of the odds-ratio consider the coefficients in the Attend Environmental Protests. The odds ratio for Inglehart Post-Materialism equals 1.19 meaning that a 1 unit increase in the Index will increase the probability of a typical individual attending protests by 19 %. If we compare a materialist with an index equal to 0 and a post-materialist with an index equal to 5, then the odds are that such a post-materialist will attend environmental protests will be $(5 \times 19 =) 94$ % greater than the materialist. Clearly, post-materialism matters for engaging in environmental actions. Similar calculations can be undertaken with the other independent variable with similar results.

These findings interestingly, and perhaps unsurprisingly, reveal a social class gap in support for the environment between middle-class post-materialists and working-class materialists. Moving down the social class ladder by a single class results in a $(100-85.0 =) 15$ % reduction in the odds of attending environmental protests, for example. Working class individuals at the lower end of the social class pecking order struggle to sustain a decent standard of living, a struggle that

is aggravated by increasing economic inequality in the most affluent countries around the world and by economic disruptions such as the 2008 global economic meltdown (Alvaredo, Chancel, Piketty, Saez, and Zucman, 2017; Saez, 2009; Stiglitz, 2010; Wisman, 2013). For this reason, members of the global working class, many of whom suffer from economic insecurity, are more strongly oriented than others to materialist goals and consequently place a lower priority on support for the environment.

Conclusion

The long-term trend towards post-materialism around the world fueled by generational replacement is a good thing for the environment worldwide as it takes the pressure off the growing demand for material possessions, fosters more energy efficient and less entropic forms of living, reduces fertility and population growth, and increases political support for protecting the global biosphere. This trend supports the emergence of a green economy with reduced rates of energy and materials throughput as a foundation for increasing the health of the global biosphere.

Reducing energy and materials throughput rates alone will not be enough to bring about the climatic stability necessary to a healthy world environment (Jackson, 2017). This will require a decarbonization of the global energy system and a worldwide 'Green New Deal' (Booth, 2020a; Sachs, 2019). Such decarbonization has the special virtue of creating well-paid working-class jobs by replacing capital-intensive fossil fuel energy with labor-intensive clean energy (Wei, Patadia, and Kammen, 2010). Doing so will not only satisfy the political demands for environmental improvement from politically active post-materialists but will help bring working-class materialists on board the environmental protection bandwagon by improving their immediate economic prospects and in the longer term moving them upwards in the social class structure to the point where post-materialism will become an attractive option for youths coming of age in working-class families that have attained a middle-class material status (Booth, 2020a). The social class divide between middle-class post-materialism and working-class materialism may well be surmountable by way of a Green New Deal that brings in its wake a healthier global biosphere.

Appendix

Table A1. Human Development Index (HDI Distribution Across 59 WVS Sample Countries, 2013)*

Country	Human Development Index	Cumulative %
Rwanda	.503	1.80
Yemen	.507	2.97
Zimbabwe	.516	4.74
Nigeria	.519	6.80
Pakistan	.538	8.22
Ghana	.577	10.04
India	.607	11.90
Morocco	.645	13.31
Kyrgyzstan	.658	15.08
Iraq	.666	16.49
South Africa	.675	20.64
Palestine	.679	21.81
Egypt	.680	23.61
Philippines	.685	25.02
Uzbekistan	.690	26.78
Libya	.707	29.29
Tunisia	.723	30.70
Jordon	.727	32.12
Thailand	.728	33.53
China	.729	36.23
Ecuador	.734	37.64
Columbia	.735	39.42
Peru	.736	40.85
Armenia	.742	42.14
Algeria and Ukraine	.745	45.31
Brazil	.748	47.06
Lebanon	.751	48.47
Azerbaijan	.752	49.65

Mexico	.756	52.00
Georgia	.757	53.42
Turkey	.771	55.30
Trinidad	.779	56.48
Malaysia	.785	58.01
Kazakhstan	.788	59.77
Kuwait	.795	61.30
Uruguay	.797	62.48
Romania	.800	64.25
Belarus and Russia	.804	68.99
Bahrain	.807	70.40
Argentina	.820	71.62
Chile	.828	72.79
Poland	.850	73.93
Cyprus	.853	75.10
Qatar	.854	76.35
Estonia	.862	78.15
Spain	.875	79.55
Slovenia	.885	80.81
South Korea	.893	82.22
Japan	.899	85.09
New Zealand	.907	86.08
Sweden	.912	87.50
Hong Kong	.915	88.68
United States	.916	91.30
Netherlands and Singapore	.923	95.86
Germany	.928	98.26
Australia	.931	100.00

*Taiwan data is unavailable.

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