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Postmaterial Experience Economics, Population, and Environmental Sustainability

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Key Words

Postmaterialism, Experience Economics, Sustainability, Population

Abstract

Postmaterial values with their reduced emphasis on accumulating material possessions lead to greater political support for limits on environmental pollution and to a less entropic way of life that increases environmental sustainability. Similarly, reducing human fertility to replacement levels can stabilize population and increase environmental sustainability in the future by reducing the pressure of population growth on environmental resources. In recent history, increases in per capita economic well being has been a primary driver of expansion in postmaterialism and reduce human fertility worldwide. The irony of this phenomena is that economic development potentially destructive to the environment leads to

more postmaterialism and reduced fertility, both of which benefit environmental sustainability. In this article, the underpinnings of these conclusions will be set out as well as possible ways around the dilemma they bring.

The driving motivation in the modern life of the global economy most observers would agree is to accumulate material possessions. From possessions come life's essential accomplishments and enjoyments. Many profess a belief in God as the final source of meaning, but what we do in practice to give our life significance is go to the cathedral of the mall or amazon.com. An emerging alternative view, one that can be called 'postmaterialist', claims instead that many human satisfactions come from the experiences of creative expression and interactions with human others in the enjoyment of life's cultural and natural wonders independent of private possession. Economic theorizing focuses heavily on the notion that accumulating material possessions is a necessary and sufficient path to a positive life experience. While material possessions may be necessary for the good life, they need not be sufficient nor even necessary beyond a threshold amount, opening up the possibility for human engagement in activities where material possession is secondary and not especially important.

The purpose of this article is to set out a theory of postmaterial economic experience that takes as a point of departure Ronald Inglehart's highly regarded theory of postmaterial values and to explain the potential relationships between postmaterialism, human population, and environmental sustainability. Postmaterial values, and their reduced emphasis on accumulating material possessions, lead to greater political support for limits on environmental pollution and to a less entropic way of life that increases environmental sustainability. Similarly, reducing human fertility to replacement levels can stabilize population and increase environmental sustainability in the future by reducing the pressure of population growth on environmental resources. In recent history, an increase in per capita economic well-being has fostered an expansion in postmaterialism on one hand, and reduce human fertility worldwide on the other. The irony of this phenomena is that economic development potentially destructive to the environment leads to more postmaterialism and reduced fertility, both of which benefit environmental sustainability. In the pages to follow, the underpinnings of these conclusions will be set out as well as possible ways around the dilemma they bring.

Inglehart's Theory of Postmaterial Values

The theory of postmaterial experience economics presented here is inspired by the work of Ronald Inglehart, a University of Michigan political science professor, who formulated the original conception of postmaterialism in terms of attitudes towards collective social goals with an eye to its use in empirical research (Abramson & Inglehart, 1995; Inglehart & Abramson, 1994, 1999; Welzel & Inglehart, 2008). If you attach high priorities to such purposes as (1) protecting freedom of speech, (2) giving people more say in important government decisions, (3) seeing that people have more say about how things are done at their jobs and in their communities, (4) trying to make our cities and countryside more beautiful, (5) progress toward a less impersonal and more humane society, and (6) progress toward a society in which ideas count more than money, then you are a postmaterialist. Suppose instead you attach high priorities to such goals as (7) maintaining order in the nation, (8) fighting rising prices, (9) a high level of economic growth, (10) a commitment to strong defense forces, (11) a stable economy, and (12) the fight against crime. In this case you are a materialist. If your highest priorities are all materialist, that's what you are; if your highest priorities all go the other direction you are a postmaterialist; if you have a mix of highest priorities you fall on a spectrum between materialism and postmaterialism (Abramson & Inglehart, 1995; Inglehart, 2008).

Survey research on postmaterialism finds that if you are currently a young adult, you probably grew up in a period of economic prosperity, and if you are older you more likely faced economic deprivations in your pre-adult years. Because our basic values are formed by the time we reach adulthood, whether or not we face economic scarcity or social upheavals in our youth matters. As we age, our orientations fluctuate to some extent with economic and social conditions, but our basic outlook does not change much. In explaining this position, Inglehart offers a socialization hypothesis claiming that our basic value structure is formed in our youth, and a scarcity hypothesis proposing that our values will focus most heavily on those items we lack. If, for instance, our life is highly insecure when we are young, one of our highest priorities will always be a safe and secure social and material environment (Inglehart & Abramson, 1994). This is not to say that our values won't change over time, but that our basic outlook will be strongly anchored by our coming of age experience. The result of this behavior pattern will be an increase in the extent of postmaterial values as younger generations replace older in the adult population (Abramson & Inglehart, 1995; Inglehart,

2008; Inglehart & Abramson, 1994, 1999). According to Inglehart, this inter-generational shift in value orientations can be ultimately explained in terms of Abraham Maslow's famous theory of the hierarchy of human needs (Inglehart, 1971; Maslow, 1987). The hierarchy hypothesized by Maslow includes (1) the basic needs such as food, drink, sleep, and sex; (2) the need for safety; (3) the need for a sense of belongingness including love, affection, and acceptance in a community; (4) the need for self-esteem flowing from prestige and social status; and (5) the need for self-actualization including being creative or accomplishing worthwhile purposes in life. The central point of Inglehart's research findings is that younger generations came of age farther up the hierarchy of needs than older and thus place relatively more importance on postmaterialist as opposed to materialists social goals. Moving up the needs hierarchy in effect shifts one in the direction of postmaterial experience as a more central focus and away from an emphasis on materialist economic experience.

Postmaterial Experience

While many of us are strongly oriented to expanding and reshaping our private world of material possession, some of us look increasingly to enjoying the publicly available experience of our cultural and natural legacy. The former among us I shall refer to as economic materialists, and the later as economic postmaterialists. If we are materialists our life's focus is on gaining control over objects and transforming them to mirror our deepest wishes. 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 ultimately calls sometimes for huge transformations of the material world. Witness the transformation of the global environment following, first, the agricultural revolution and, second, the industrial revolution (Harari, 2015). For postmaterialists, the essential quest in life is experiences of the physical world apart from any requirements for ownership and private control of it. Some material ownership and control is inevitably a part of our lives – we all need our own private supply of food, clothing, living space, and such – but post materialists look increasingly for experiences not necessarily contingent on ownership of physical objects in our field of perception. To summarize, a materialist is someone who focuses on seeking out the ownership of objects as an essential ingredient in the mental satisfaction interactions with them bring. A postmaterialist to the contrary is someone whose basic need for feelings of control

over objects has been met and is instead more directly oriented to the experiences of phenomena in the physical, social, and cultural world (Booth, 2018).

Ecological Release, Experience, and Entropy

In a strictly biological conception of economic behavior, mental experience drives material acquisitions. A feeling of hunger pushes us to acquire and consume food; cold temperatures, wind, and rain stimulate us to gain protective clothing or cover; sexual and family love cause us to copulate, reproduce, and acquire the material requirements for nurturing, protecting, and defending our lovers and kin. Mental motivations combined with the contingencies of daily experience drive our accumulation of control over material goods essential for long-term survival. We humans in contrast to other species enjoy the privilege of ecological release, meaning that we need not spend every waking hour in the satisfaction of our material necessities (Sahlins, 1974). This privilege comes to us by virtue of our special mental faculties that permit us to exploit nature's resources at uniquely high rates of economic efficiency. As a consequence, we can of course engage in the production of material goods well beyond our basic needs, or we can hang out and contemplate the beauties of the world around us, sing songs, or think the big thoughts. We can produce more than we need and use it to pay others to entertain us with stories or dance, teach us how to do mathematics, or to take us on guided nature walks. Economics doesn't distinguish between baking bread and presenting Shakespeare's Richard the III; both are economic goods for which people are willing to pay, and both offer mental stimuli and satisfaction. There is an important difference between them, however; bread is enjoyed in an act of physical consumption, and the pleasure of Richard the III is a shared perceptual and mental experience. The loaf of sourdough French bread I gobble down becomes unavailable to you, but we can both experience Shakespeare together without detracting from each other's pleasure. The experience of consuming a loaf of bread involves a using up of a material good, and the experience of consuming Richard the III does not. Experience requires stimulus from the physical world, but not necessarily a substantial physical transformation of that world. Experiences can be placed on a spectrum, heavily dependent on altering the material world at one end (eating bread and drinking wine or driving your Cadillac Escalade SUV around town), and not requiring any alteration at all on the other (enjoying a sunset or Shakespeare in the park). At one end you and I cannot consume the same exact material thing (a particular glass of wine), and at the other we can

(a sunset). The first activity is relatively more entropic than the second. The first absorbs nature's energy and reduces the chemical bonds of its material being and the second does not.

Complications do arise. We can share a Shakespeare play, but if the audience is too big, some of us will not be able to get close enough to perceive all the action on the stage. In sharing a physical phenomenon, crowding can be a problem. Too many people detract from the experience. In some cases, such as a rock concert, where audience reaction is part of the experience, too few people instead can be a problem. In wilderness hiking, where the act of it does little to modify the physical world, the sharing of it can detract from the experience if one is running into someone on the trail too often or if all the good campsites are taken. In short, the number of people sharing an otherwise benign experience (i.e. with an innocuous physical impact) matters. In some cases the more the merrier, and in some more is bad (Olson, 1965).

While the direct enjoyment of a Shakespeare play is physically and entropically benign, its production is not. The stage, the costumes, and all the other necessary paraphernalia of making a play happen re-arrange the physical world just as does making loaves of bread. The difference between the two goods is that consuming the play is benign and the bread entropic. You and I can't consume the same loaf of bread but we can the same play. Some things in life are actually entropically free: you and I can enjoy the same sunset and the physical world is unchanged from what it otherwise would be. Of course, if the sunset is over Sonoran desert mountains, you and I will have used up material resources in our travels and caused some physical entropy, but once on the scene the extra physical changes we cause in watching the sunset becomes vanishingly small. And, of course, just walking around the desert will have some impact, but not much, especially if we step with care. In practice, experiences lay on a spectrum from heavily entropic to completely benign (causing near-zero entropy).

Entropy and the Form of Life

Richard Florida, a regional science professor, has gained star standing among urban planners for his book, *The Rise of the Creative Class* (Florida, 2002). Florida presents evidence for the emergence of an economically important group of individuals who play a driving role in a renaissance of downtown urban

revitalization and have a new take on life that bears the marks of post-materialist thinking. According to Florida, this creative class is composed of professionals, such as scientists, engineers, university professors, poets, novelists, entertainers, designers, architects, and opinion-makers who conceive new intellectual or artistic forms of economic or public value. Its members are at once bohemian and conformist. They have an intense desire for personal self-expression, which includes body-piercing jewelry and tattoos, but also possess a powerful work ethic and passion for personal accomplishment, especially in the digital arena doing software development or graphic arts. These are the people one increasingly sees sitting around gourmet coffee shops huddled over their computers or conversing in small groups about website design, solving a computer software problem, pulling off the conversion of an old commercial building into condominiums, or getting someone elected to political office. They don't like bureaucratic hierarchy, but believe strongly in being recognized for their work on its creative merits. They especially believe in social diversity of all kinds, and feel comfortable working with others of different races or sexual orientations. Members of the creative class both work and play hard, and express only limited interest in accumulating material possessions and are especially oriented to consuming individual and shared "experiences" such as adventure travel, road biking or rock climbing or other vigorous activities, offbeat theater performances, cutting edge studio art, or experimental musical events. While Silicon Valley is a suburban bastion for such individuals, they increasingly find urban centers such as downtown San Francisco, Seattle, or Minneapolis to be exciting places to live and work.

Youthful creative types, along with the return of aging suburban expats, fuel much of the boom in condominium construction and conversion of distinctive older commercial buildings to residences in downtowns around the country. Both groups are attracted to the excitement of urban street life in neighborhoods with concentrations of trendy restaurants, theaters, art galleries, espresso shops, brew pubs, bookstores, and entertainment venues. Retailing matters, but its orientation is to specialty foods or wines, boutiques, and outdoor stores that serve the active life of the new inner city residents.

The interest of affluent young professionals in downtown living finds confirmation in a Brookings Institution study of census data by Eugenie Birch, Professor of City and Regional Planning at the University of Pennsylvania (Birch, 2005). In a sample

of 44 cities, downtown population grew by ten percent in the 1990s and the number of households expanded 13 percent, a substantial recovery after years of decline. In 2000 25 to 34 year olds compose a quarter of downtown populations, up from 13 percent 30 years earlier. The proportion of downtowners having a bachelor's degree rose to 44 percent, a figure that exceeds both that for cities as a whole and their suburbs. The young and the educated moving downtown are exactly those groups where post-material values predominate.

Not all the creative occupations referred to by Florida in his writings enjoy the affluence of the creative class as a whole. True creativity doesn't necessarily bring wealth as the artists of the world historically discover repeatedly. Yet it is this group that concentrates most heavily among all occupations in the central city today and serves as a driving force for neighborhood renewal (Ann Markusen & Schrock, 2006; Strom, 2010). The popular image of starving artists or aspiring actors living in garrets and waiting tables for their living stands up to academic scrutiny. Artists (defined broadly to include actors and directors, announcers, architects, drama and music teachers, authors, dancers, designers, musicians and composers, painters, sculptors, craft artists and printmakers, and photographers), in comparison to other professionals, are highly educated but poorly paid (Alper & Wassall, 2006). They often hold multiple jobs in a given year, work outside their chosen occupation to make ends meet, face frequent periods of unemployment, and contend with an income distribution highly skewed towards the relatively few who experience substantial success. Financial accomplishment as an artist is a 'winner take all' gamble that very few achieve. Nonetheless, the number of artists has grown more than twice as fast as the labor force in recent decades, reflecting an expansion in public demand for the products and experiences artists have to offer as well as a continued willingness of many artists to endure a lower income for the intrinsic rewards of creative work.

Given their economic vulnerability, artists normally choose to locate in inner city neighborhoods with inexpensive rents (A. Markusen & Gadwa, 2010). For those who require studios or places to rehearse, declining, seedy commercial or industrial areas often provide affordable space in which to both work and live. Artists concentrate in central cities to a greater degree than most other occupations and tend to cluster together in neighborhoods that best suit their needs for expansive but cheap workspace, artistic community connections, and

access to customers. Clustering enables interactions, from which spring ideas and information on economic opportunities, and the concentration of supporting art galleries and display spaces or performance venues.

A modest trend towards high-density city living in the U.S. and other auto-centric countries may not seem like much, but if it continues it will be a big deal. A shift to living at higher densities along European lines may well come in the nick of time to help reverse our ominous march to climatic warming (Newman & Kenworthy, 1999). If you live in a densely packed urban setting instead of a spatially expansive suburb, you move around much less to get to work, for shopping, and doing all the other things you love to do. When you do move around, chances are greater that you will walk, bike, or take public transit than if you live in a low-density suburb where odds are that you would drive everywhere because everything is so far apart. In short, if you move from suburb to city, you will cut back on your driving and the volume of auto-related greenhouse gas emissions you cause. Also in the city, chances are you will live in a smaller dwelling that requires much less greenhouse gas-emitting energy for heat and light, and if you live in a multi-family unit and share heat-emitting exterior walls and roof areas with others, your dwelling will be much more energy efficient than a single family, low rise house in the suburbs. By deciding to live in the city, you will do the environment a big favor whether you think much about it or not. If you are a post-material environmentalist, you might even decide to live in the city to live out your own philosophical values apart from realizing the benefits of city living.

Evidence for Postmaterial Values and Experience

The form that one's life takes matters for its use of material resources and impact on the environment. Living in a high-density city with multiple modes of transportation in general will be less entropic than life in a low-density suburban environment. The experience of life will differ as well in the former than the latter. In the central city, more of daily life will be spent in the public arena moving around, strolling in parks, hanging out at sidewalk cafes, and enjoying various cultural amenities that concentrate at urban centers. Suburban living with its heavy auto-dependency will be intrinsically more entropic than daily being in the central city. The density at which individuals live around the world truly matters for environmental sustainability as outline in the works of Peter Newman and Jeffrey Kenworthy (Newman & Kenworthy, 1999, 2015).

What one does in that daily life matters as well. The life of a postmaterial urban artist whose labor constitutes the vast bulk of an art object's economic value will be less entropic than, say, a highway engineer who designs freeway ramps and bridges. By the simple act of living a central city with all its opportunities for post material experiences, one lives less entropically than would be the case in a suburban location. While how one lives and what one does intuitively matters for environmental sustainability, direct empirical evidence on the values individuals possesses and their effect on the environment is only just beginning to be accumulated.

Inglehart Postmaterial Values

A lengthy literature exists on the global presence and effects of Inglehart postmaterial values and is summarized in a variety of sources (Abramson & Inglehart, 1995; Booth, 2017; Inglehart, 2008; Welzel & Inglehart, 2008; Welzel, Inglehart, & Deutsch, 2005). Such values have expanded their presence over time in both Europe and the U.S., although they may have suffered a setback more recently as a consequence of the recent growing popularity of conservative populist politics in many countries (Inglehart & Norris, 2016, 2017). An extensive literature using the World Values Survey and other survey data confirms that postmaterial values positively predict political support for environmental protection as well as public action in support of the environment (Booth, 2016, 2017). In my own research, a measure of environmental concern is taken from a two-part question that requires a trade-off between environmental protection and economic growth. Each respondent chooses one of the following two statements that best reflects their attitude: (1) Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs; (2) Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent. Three different questions provide measures of actual respondent behaviors directed at environmental protection, including whether the respondent (1) is an inactive or active member of an environmental organization, (2) has recently given money to an ecological organization, or (3) has recently participated in a demonstration for some environmental cause. In all cases, an index of Inglehart postmaterial values predicts environmental support and environmental action in the U.S. as well as for a global sample that includes 60 countries. To the extent that such individual attitudes and actions get translated into government action in the political arena, postmaterial values contribute to environmental sustainability.

Postmaterial Experience

The effect of postmaterial values on political support and actions in favor of the environment matters only if such support and actions get translated into actual government policies that diminish environmental pollution and increase environmental sustainability in practice. So far the evidence for this being the case is fairly limited although convincing (Gerhards & Lengfeld, 2008; Tjernstrom & Tietenberg, 2012; Zahran, Kim, Chen, & Lubell, 2007). A shift in favor of an increased orientation to postmaterial experience could lead more directly to environmental sustainability by reducing the entropy of daily human activities as explained above. These activities depend first and foremost on the reality of postmaterial experiences in everyday life.

The presence of postmaterialist experience on a global basis has only just begun to be investigated empirically. In my own work, using data from the World Values Survey, I have found evidence that global participation in such experiences as (1) membership in voluntary organizations, (2) participation in work that offers creative tasks and independence such as that undertaken by artists, and (3) participation in political action to be relatively extensive in a large global sample covering 60 countries (Booth, 2018; World Values Survey Association, 2015). I also find using regression analysis that a desire for riches fundamental to the accumulation of material possessions fails to predict memberships in voluntary organizations, and is a negative predictor of creative and independent work and participation in political action. In sum, those who focus on accumulating material possessions lack an interest in post material experiences. Positive statistical predictors for all three forms of experience activities include the importance to the respondent of thinking up new ideas and being creative, doing something for society, and looking after the environment. The nature of the three types of activities themselves matter for participation, as opposed to any private material benefits they confer.

These three forms of individual activity typically lack an orientation to the accumulation of material possessions or an extensive incremental need for material possessions beyond a basic threshold. There are, of course, exceptions. The creative highway engineer who thinks up new ways to build freeway overpasses and bridges would be engaged in an activity that supports a highly entropic activity, motor vehicle travel. This would be much less the case for the musician or

landscape photographer. Nonetheless, statistical predictors suggest that those engaged in creative and independent work are less orientated than others to the accumulation of material possessions and are more likely to possess a desire to do something for the environment. In addition to possible positive consequences for the politics of environmental protection, the expansion of a postmaterial outlook on life can cause a shift to a less entropic and more environmentally sustainable way of life. Instead of spending our days worried about accumulating more material possessions, we can focus on the daily experiences of life embodied in social interactions, cultural activities, and the wonders of the natural world. To do this we indeed require basic economic and physical security, but once accomplished we have the ecological luxury of focusing our attention on the existing wonders we encounter in daily life without adding much to the material transformation of the world.

An expansion of postmaterialism globally could in theory have a direct positive effect on environmental sustainability, but this proposition remains an untested hypothesis. Environmental economists have, however, invested heavily in a testing a related somewhat more general hypothesis that rising per capita income in individual countries ultimately leads to a reduction in per capita pollution emissions. In short, economic development in itself constitutes the final solution to environmental problems. If this is the case, then an expansion of postmaterialism contingent on rising individual economic security would accelerate that trend. Unfortunately the validity of this more general hypothesis remains to be settled, as we will now see.

Postmaterialism and Environmental Kuznets Curves

The gold standard for investigating the link between affluence and the environment is something called an "Environmental Kuznets Curve", named for an economist, Simon Kuznets, who discovered the presence of such a curve in the case of income inequality (Kuznets, 1955) a conclusion that only recently has come under challenge in the works of Thomas Piketty (Piketty, 2014). According to environmental Kuznets curve theory, as an economy advances from an agricultural to a modern industrial and digital economy, and as per capita incomes grow, environmental problems such as water and air pollution increase, but at some point such problems begin to diminish because of advances in pollution control technology and increased environment regulation fostered by a rising middle

class with political demands for a higher quality environment. In brief, plotted against a country's per capita income over time, the curve of pollution emissions per person has an inverted U-shape. The hypothesis remains controversial and has generated numerous research papers in environmental economics, some finding empirical support for the it, and others denying its existence (Ben Jebli, Ben Yousseff, & Ozturk, 2016; Galeotti, Lanza, & Pauli, 2006; Stern, 2004). The controversy continues, especially for greenhouse emissions such as carbon dioxide. The best one can say is that the curve may exist for relatively wealthy countries such as those belonging to the OECD, but there is little evidence for it outside the OECD. In short, poor countries of the world face environmental deterioration as they develop under prevailing economic arrangements, and the rich have achieved stability and perhaps modest reductions in their environmental impacts. In the case of greenhouse gases, the rich, western industrialized countries of the world of course bear most of the responsibility historically for cumulative greenhouse gas emissions, most of which continue to persist in the atmosphere to this day (Freidrich & Damassa 2014).

To put it in Kuznets curve lingo, a turn to postmaterialism bends the curve downward more quickly than otherwise by increasing political support for the environment and shifting human activities in a less entropic direction. The problem with the rise of postmaterialism is that its advance occurs at a fairly glacial pace (Inglehart & Norris, 2017) while such environmental problems as climate change and natural habitat degradation are advancing much more rapidly (Intergovernmental Panel on Climate Change, 2015).

Population and Postmaterialism

In contrast to the modest pace of postmaterialism, global human fertility has plummeted from around 6 children per female to about 2.5 in the last 75 years (World Bank, 2017), an amazing drop by historical standards, but substantial population growth yet remains in the pipeline (World Bank Population Blog, 2015). Before global population begins to stabilize due to reduced fertility, still more downward pressure on environmental sustainability will occur in the near future as added individuals expand global material consumption. Whether a shift to postmaterialism and a less entropic way of life also operates to increase sustainability by fostering an added reduction in human fertility and ultimately population growth remains an open question yet to be explored empirically.

Across countries, post-material values are more extensive on average in high- than low-income countries as confirmed by data from a sixty-country sample from the latest World Values Survey (World Values Survey Association, 2015). Population fertility for these same countries, is negatively correlated to per capita income as can be expected in light of the “demographic transition” (Kirk, 2010; World Bank, 2017a; World Values Survey Association, 2015). Postmaterial values and reductions in fertility are thus correlated, but correlation, of course, is not the same thing as causation. The reduced emphasis on economic accomplishment in a postmaterial way of life may, or may not result in a reduced desire to procreate. This question has yet to be investigated. In the U.S., fertility is declining among younger women who are delaying getting married, having children later in life, and having fewer children (Stone 2018). Since postmaterialism is relatively higher among younger people worldwide, such a decline in fertility may well be attributable to a postmaterial way of life. If so, then postmaterialism will indeed lead to a demographic shift reducing human fertility and increasing environmental sustainability. By decreasing the number of children they have, couples can have a profound long-term effect on the environment, especially for reducing greenhouse gas emissions (Wynes & Nicholas 2017).

Whatever the actual relationship between postmaterialism and human fertility, a rise in global per capita income does nonetheless have a double effect as described above: (1) a shift to less entropic postmaterial values and experience, and (2) a decline in human fertility. Both ultimately benefit global environmental sustainability.

Conclusion

A problem for sustainability yet arises because the shift to postmaterialism and reduced human fertility, each beneficial to the environment, are both advanced by an increase in per capita living standards on a global basis that can itself cause a decline in environmental sustainability. This is the critical dilemma of economic development as a way out of the environmental crisis.

To moderate such a decline, public efforts are essential that shift the global economy to clean energy and bring a halt to habitat degradation for all of the world's species. While optimism in today's political arena on the face of it seems unwarranted, an advance in postmaterialism could in the end make a difference

given the current relatively even split between forces for and against public action addressing climate change. A few more young postmaterialists in the political mix, especially in the USA, could tip the balance for the outcome of future elections in the favor of political actions that mitigate environmental degradation, but this remains to be seen (Booth, 2017). The one other hope is the downward plunge in clean energy unit costs will continue and eventually force fossil fuels out of the global energy market (Lazard, 2017). This could be a big bonus for solar-rich less developed countries arrayed around the equator. These same countries possess some of the highest population fertility rates in the world that could be dampened by solar-driven economic development to the benefit of our environmental future. Moreover, such development will skip over environmentally damaging fossil fuels, a primary source of pollution historically, and go directly to environmentally sustainable renewable energy. Sliding down the rightward side of the environmental Kuznets curve for the world as a whole is a possibility, but doing so in time to forestall climate change and degradation of the global environment requires concerted public action to accelerate the trend to clean energy and sustainability around the world.

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