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Implications of global warming: Two eras

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ABSTRACT

Attempts to ponder meaningfully about the very long-term implications of global warming requires thinking about long-standing trends in other variables that would be expected to interact with climate change over time. One can envision two quite different "eras," a first filled with considerable danger of both economic and environmental collapse. But—if humanity survives the first period—a second period of great promise for humanity and the global ecosystem is likely to emerge. The periods are discussed sequentially with an emphasis on the changing interactions among global climate, global population, international trade, population ageing, income growth and technological advance.

1. Introduction

The purpose of the present paper is to attempt to gain insights into the implications of global warming that is anticipated in the future. In attempting to think about really long-term implications, it seems naïve to look at global warming without thinking about long-standing trends in other variables that would be expected to interact with climate change over time. One can realistically envision two quite different "eras," a first filled with considerable danger of both economic and environmental collapse. But—if humanity survives the first period—a second period of great promise for humanity and the global ecosystem is likely to occur. The periods are discussed sequentially with an emphasis on the changing interactions among global climate, global population, international trade, population ageing, income growth and technological advance.

2. The issues for optimistic and pessimistic futurists

The coming years are fraught with economic-ecological peril. The situation is perhaps best characterized by contrasting the views about the future of the pessimists with those of the optimists:

2.1. The pessimistic futurists

The pessimists (e.g. Thomas Malthus, Paul Ehrlich, The Club of Rome) see rising incomes and population growth as undesirable, leading to one or both of two outcomes, both of them bad. First, increasing population and income imply under this view ever increasing resource usage with corresponding shortages leading to a "resource crash" and mass starvation. Should there be a sufficiently large resource base to escape this fate (likely in my view), the ever-increasing production levels imply ever-growing pollution, ultimately leading to an "environmental crash" destroying ourselves along with other species, with the present concern of CO_2 buildup resulting in runaway global warming being a particularly grim prospect.

These pessimistic arguments, most explicitly that of Malthus early on, rest largely on notions of exponential growth of income and population in a finite world. It is clearly the case that any positive level of exponential growth of population (and perhaps of income as well) cannot be sustainable indefinitely. In terms of food alone, exponentially-increasing populations would imply ever-increasing rates of production—yields would need to increase exponentially, or the amount of land put in agriculture would need to increase indefinitely, ultimately until there was no more land or sea available to increase the harvest. Again, the resulting outcome would, in this view, be an

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"environmental crash" destroying ourselves along with other species as humanity encroached on critical habitat. Impacts on energy sources and water usage would be similarly dire.

Pessimist futurists tend to view international trade as hurrying both of these processes along, with the likelihood of "pollution havens" developing along with the rapacious depletion of poor countries' natural resources as the latter are mined to supply the unending demands associated with worldwide growth in population and income. If trade raises the incomes of the countries participating in it, this too merely speeds up the process of destruction, although many pessimists are likely to favor a "level playing field" in terms of environmental and labor standards to be employed by the developing world's trading partners of Europe, the United States, and the rest of the developed world. Multi-national corporations are also typically seen by pessimists as exploiting labor, depleting resources, and harming the environments of already poor regions, particularly in the presence of non-democratic governments that do not place much emphasis on the welfare of their citizenry.

Moreover, pessimist futurists tend to view technological progress with suspicion, the reasoning being "better the devil you know than the devil you don't." New technologies, whether GMO foods or new chemical fertilizers or pesticides, have the potential to unleash unknown damages perhaps much in excess of those associated with well-known existing technologies. In the context of global warming certain "cheap fixes" (e.g. spraying sulfates into the upper atmosphere/stratosphere to increase albedo) are viewed with similar suspicion. In the pessimist world-view technological progress may have helped us in the past (e.g. the green revolution in the case of Malthusian food shortages, the invention of various environmental control devices), but that is no guarantee that such technological saviors will arise to meet unknown future environmental and resource threats, particularly the unprecedented rise in expected global temperatures. The pessimists take technical progress to be limited by the dynamic ecological carrying capacity of the planet and also tend to believe that the future will be full of unpredictable events. Pessimists tend therefore to believe that humans must form a union with nature, not try to "control" it. For them, the market can be useful if it is properly guided by sensible regulations dealing with resource usage and environmental quality.

Population ageing, a phenomenon endemic to the developed world, is expected to expand rapidly to the developing world over the next many decades. Such ageing will result in additional food, energy, and water constraints, since the retired are users of resources but their labor is no longer available to at least partially mitigate shortages as they arise.

All of the endogenous variables of concern here (income growth, population increase, ageing, and international trade) appear to pessimists to exacerbate global warming and its consequences, and exogenous technological progress is unlikely to be able to offset such large effects, even if that technological progress is itself benign, a view pessimists eye with suspicion.

To the pessimist, the future looks bleak, with many longing for the simpler times of the past, nostalgically focusing on the slower less-crowded life-styles of years gone by. It is not that the pessimists do not see progress in certain areas (e.g. cleaner air in the United States, fish in the Thames River in England, better water quality in the Great Lakes), but they tend to see the world in a "one step forward, two steps back" way. To them, the glass is half empty, not half full and global environmental problems, with warming temperatures emphasized here, are seen as particularly intractable as a global public bad with worldwide incentives to free ride.

2.2. The optimistic futurists

Optimists (e.g. Julian Simon, Herman Kahn, Matt Ridley) see the growth in population and income in a very different way. To the optimist, a growing population provides more minds and labor to solve resource and environmental problems as they emerge. For example, only large populations can afford a Center for Disease Control, a large system of competitive universities, or an interstate highway system. They point to the elimination of smallpox and the impending elimination of polio as examples of how the specialization and division of labor, that large populations allow, results in a better world. Moreover, greater populations aggregated in cities provide more damage receptors there, hence larger benefits associated with more stringent environmental controls, particularly as those cities get richer.

As for ever-increasing incomes, optimists feel that higher incomes lead to greater demands for environmental quality, certainly a normal good and likely a superior good, with income elasticities of perhaps 1.5. They argue that it is the rich countries that impose the most stringent environmental laws; indeed, they argue that in poor countries any environmental laws that do exist are not enforced, due to more pressing needs elsewhere. Hence, rising incomes are expected to lead to greater political clamoring for improvements in a variety of dimensions of environmental quality.

Optimists see international trade as a two-part process, not as a "race to the bottom." First, trade increases the wealth of all trading partners, rich or poor, large or small. Second, the now-richer countries will demand higher levels of both environmental quality and labor standards. In their view, there will be no inevitable pollution havens, since the rising incomes of the citizens of poor countries will result in their governments putting into place the new institutions that they will demand to prevent that from occurring. Of the variables of concern here, population ageing is likely to be a worry of optimists as well as pessimists, if only because of the implications of continued ageing for the viability of social security and health expenditures.

Technological progress tends to be viewed much more favorably by the optimists than is the case with the pessimists, as a way to replace older, dirtier technologies with cleaner variants as such inventions and innovations become available. They point out that it is generally old technologies (e.g. fires in fireplaces, old cars lacking catalytic converters) that result in the environmental harms we commonly observe. And, they argue moreover that newer technologies are less resource-intensive (e.g. cell phones replacing optic fiber which replaced copper wire for transmitting electronic information). Indeed, many optimists believe that through technological change, humans can become largely independent of nature and the latter's resource constraints. The optimist vision of the future tends to assume, additionally, that technical progress is likely to effectively mitigate any future challenges, that the future will be a more-or-less unruffled continuation of past history, and that market incentives shape the nature of technological advance to provide solutions to resource and environmental problems as they emerge. Global warming, to the die-hard optimist is just another challenge to be overcome by humanity's ingenuity.

To the optimist, the future looks rosy, with many futurist optimists longing for the new gadgets, the improved environments they expect, and the ever-expanding resource base as knowledge leads to greater substitution possibilities. As with the pessimists, the optimists see some bad things happening (e.g. oil spills, hazardous substance explosions, nuclear concerns, anti-biotic resistant bacteria), along with the good things they expect. But, they tend to see the world in a "two steps forward, one step back" way. To them, the glass is half full, not half empty, although for many optimists global warming is seen as differing from traditional pollution damage in its intractability and global reach.

3. The dangerous next half-century: 2020–2070

It is very difficult for a pessimist futurist and an optimist futurist to even carry on a civil conversation about environmental quality, because their visions of how the world works are so completely polar to one another. This is perhaps most apparent in the divisiveness seen over CO_2 buildup and increments to global warming stemming from that buildup. As with most extreme positions, the true nature of the future is