Population Models

Thomas Malthus

Thomas Robert Malthus was the first economist to propose a systematic theory of population. He articulated his views regarding population in his famous book, *Essay on the Principle of Population* (1798), for which he collected empirical data to support his thesis. Malthus had the second edition of his book published in 1803, in which he modified some of his views from the first edition, but essentially his original thesis did not change.

In *Essay on the Principle of Population,* Malthus proposes the principle that human populations grow exponentially (i.e., doubling with each cycle) while food production grows at an arithmetic rate (i.e. by the repeated addition of a uniform increment in each uniform interval of time). Thus, while food output was likely to increase in a series of twenty-five year intervals in the arithmetic progression 1, 2, 3, 4, 5, 6, 7, 8, 9, and so on, population was capable of increasing in the geometric progression 1, 2, 4, 8, 16, 32, 64, 128, 256, and so forth. This scenario of arithmetic food growth with simultaneous geometric human population growth predicted a future when humans would have no resources to survive on. To avoid such a catastrophe, Malthus urged controls on population growth.

On the basis of a hypothetical world population of one billion in the early nineteenth century and an adequate means of subsistence at that time, Malthus suggested that there was a potential for a population increase to 256 billion within 200 years but that the means of subsistence were only capable of being increased enough for nine billion to be fed at the level prevailing at the beginning of the period. He therefore considered that the population increase should be kept down to the level at which it could be supported by the operation of various checks on population growth, which he categorized as "preventive" and "positive" checks.

The chief preventive check envisaged by Malthus was that of "moral restraint", which was seen as a deliberate decision by men to refrain "from pursuing the dictate of nature in an early attachment to one woman", i.e. to marry later in life than had been usual and only at a stage when fully capable of supporting a family. This, it was anticipated, would give rise to smaller families and probably to fewer families, but Malthus was strongly opposed to birth control within marriage and did not suggest that parents should try to restrict the number of children born to them after their marriage. Malthus was clearly aware that problems might arise from the postponement of marriage to a later date, such as an increase in the number of illegitimate births, but considered that these problems were likely to be less serious than those caused by a continuation of rapid population increase.

He saw positive checks to population growth as being any causes that contributed to the shortening of human lifespans. He included in this category poor living and working conditions which might give rise to low resistance to disease, as well as more obvious factors such as disease itself, war, and famine. Some of the conclusions that can be drawn from Malthus's ideas thus have obvious political connotations and this partly accounts for the interest in his writings and possibly also the misrepresentation of some of his ideas by authors such as Cobbett, the famous early English radical. Some later writers modified his ideas, suggesting, for example, strong government action to

ensure later marriages. Others did not accept the view that birth control should be forbidden after marriage, and one group in particular, called the Malthusian League, strongly argued the case for birth control, though this was contrary to the principles of conduct which Malthus himself advocated.

Paul Ehrlich - Neo Malthusian

As global populations rose spectacularly in the 20th century, theoretical debates over the extent and causes of the population problem expanded. Thomas Malthus and Karl Marx had set the initial stage for the world population debate, but other population theorists - including Paul Ehrlich, Julian Simon, Garrett Hardin, and Barry Commoner - would carry the ongoing discussion in the second half of the 20th century.

In 1968, as world population hovered above 3 billion, Paul Ehrlich authored the book *The Population Bomb,* a widely read publication that sold several million copies in the United States alone. Ehrlich, a biologist, maintained that the rate of population growth was outstripping agricultural growth and the capacity for renewal of Earth's resources. Given current rates of natural increase, Ehrlich predicted "certain" demographic disaster in response to eventual food shortages and disease. In the opening to his book, he wrote: "The battle to feed all of humanity is over" and later stated that, "In the 1970s and 1980s hundreds of millions of people will starve to death in spite of any crash programs" (Ehrlich 1968). Ehrlich argued that industrialized regions such North America and Europe would be required to undertake "mild" food rationing as starvation spread across the developing worlds of Asia, Latin America, and Africa. In a worst case scenario, he predicted that the lack of food security in the developing world would set into motion several geopolitical crises that could result in thermonuclear war. At its core, Ehrlich's population theory contained three major elements: a rapid rate of change, a limit of some sort, and delays in perceiving the limit.

While some criticized Ehrlich's work as simply a repetition of Malthus's 19th century argument, Ehrlich's most vocal opponent, economist Julian Simon, was skeptical of the more central tenets of the population bomb, particularly the definition of limits. In the 1970s, Julian Simon published two central pieces that served to galvanize the population debate: *The Economics of Population Growth* (1977) followed by *The Ultimate Resource* (1981). Simon argued that the relationship between population growth and economic growth was not as simple as Ehrlich believed, and that the extent to which population pressure impacted resources was overstated. The crux of Simon's argument centered on his belief that Ehrlich's limit on the availability of resources was misdirected. Simon instead argued that it was not possible to have too many people, for the only limit in determining the scarcity of resources was human imagination. People, the economist suggested, were the ultimate resource. According to Simon, ingenious, resourceful humans had the capacity to invent crops with higher yields, or to construct inexpensive, safe housing for growing populations. Simon's other contention was that current views on population and resource issues failed to take the long view, and that frequently too short a time frame was considered when examining demographic problems.

Ester Bosrup

Ester Boserup (1910–1999) was a Danish economist who specialised in the economics and development of agriculture. She worked for the United Nations and her experience working in low- and middle-income countries such as India helped to shape her theory of the relationship between human population growth and food production.

In her work 'The Conditions of Agricultural Growth: The economics of agrarian change under population pressure' (1965), Boserup challenged Malthus's conclusion that the size of the human population is limited by the amount of food it can produce. She suggested that food production can, and will, increase to match the needs of the population.

Drawing on her knowledge of farming in the developing world, where populations were growing quickly, Boserup argued that the threat of starvation and the challenge of feeding more mouths motivates people to improve their farming methods and invent new technologies in order to produce more food.

Boserup described this change as 'agricultural intensification'. For example, a farmer who has four fields to produce food for his family might grow crops in three of the fields, but leave the fourth field empty as the ground is dry and his crop will not grow there. However if the farmer has two more children, the pressure to produce more food might drive him to build irrigation canals to bring water to the fourth field or to buy a different type of seed that will grow in drier ground. He would change the way he farms to make sure that he has enough food to support a larger family.

Club of Rome

The Club of Rome are a group of industrialists, scientists, economists and statesmen from 10 countries, who first met in 1968. In 11972, They published 'The Limits to Growth', which concluded that if present growth trends in world population continue and if associated industrialisation, pollution, food production and resource depletion continue unchanged, the limits to growth on this planet would be reached sometime in the next 100 years. Five variables were examined in the original model, on the assumptions that exponential growth accurately described their patterns of increase, and that the ability of technology to increase the availability of resources grows only linearly. These variables are:

1. World population,
2. Industrialization,
3. Pollution,
4. Food production
5. Resource depletion.

The authors intended to explore the possibility of a sustainable feedback pattern that would be achieved by altering growth trends among the five variables. The most probable result would be sudden and uncontrollable decline in both population and industrial capacity.

In 1991, the book, The First Global revolution, written Alexander King and Bertrand Schneider was written. It was perceived as a blueprint for the twenty-first century at a time when the Club of Rome thought that the onset of the first global revolution was upon them. The authors saw the world coming into a global-scale societal revolution amid social, economic, technological, and cultural upheavals that started to push humanity into an unknown. The goal of the book was to outline a strategy for mobilizing the world's governments for environmental security and clean energy by purposefully converting the world from a military to a civil economy, tackling global warming and to solve the energy problem, dealing with world poverty and disparities between the northern hemisphere and the Southern Hemisphere.