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Malthusian Cycle

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Malthusian cycles are political-demographic cycles that were typical for complex premodern societies. Due to a number of mechanisms, within the premodern social systems (and some would argue even in the 21st century), population growth tended to produce a set of imbalances and strains, eventually resulting in political-demographic collapses and substantial population decline. After stabilization, the population growth usually restarted—marking the beginning of a new Malthusian political demographic cycle. This entry provides an overview of elements of the Malthusian cycle dynamics, a consideration of its political aspects, a summary of theories and mathematical models that have been advanced to explain the Malthusian cycles, and a discussion of the escape from the Malthusian trap and its political consequences.

Overview

The main assumptions of the original theory of Thomas Malthus (formulated in 1798) is that the population multiplies geometrically (2, 4, 8, 16...), whereas the production of food grows arithmetically (1, 2, 3, 4...). In modern academic language, the same idea is usually expressed in a slightly different way—the exponential growth of population is accompanied by the lineal increase in the production of the means of subsistence. As a result, according to Malthus, the population growth outstrips the food supply, leading to the decline of living standards to the bare survival level (this effect is also known as the “Malthusian Trap”).

Note that further academic research has demonstrated that in some respects, the Malthusian assumptions are true but only with very significant qualifications.

Premodern human populations tended to grow exponentially (but only in conditions of the absence of any significant resource limitations), and such a growth tended to be accompanied by a quasi-lineal economic growth (due to Ricardo’s “Law of Diminishing Returns”). However, in premodern social systems (due to very slow rates of technological growth), the absence of significant resource limitations could not continue for long. Malthusian economic demographic dynamics resulted in the decline of the standards of living of the majority of population to a bare survival level, growth of mortality and—consequently—to the slowdown of the population growth rates. Thus, in Malthusian systems, the population growth cannot continue exponentially for long.

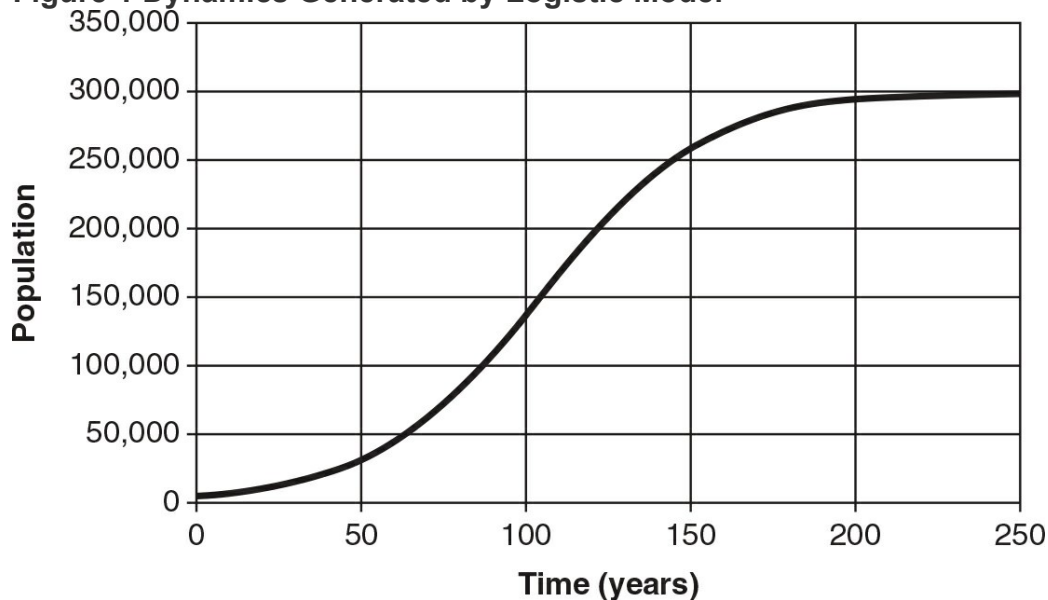
This was noticed already in 1838 by Pierre François Verhulst, who demonstrated that in Malthusian systems, population grows not exponentially but logistically, as described by the logistic mathematical model (1) proposed by him:

$$\frac{dN}{dt} = r \left(1 - \frac{N}{K} \right) N,$$

where N is population, r is rate of natural growth in total absence of resource limitations, and K is maximum carrying capacity.

The dynamics generated by this model are shown in [Figure 1](#). Logistic growth represents growth with saturation, which gives the following dynamics: accelerating growth rate at the beginning of the process is replaced by a slowdown in growth and the stabilization of population just below K level (whereas a sort of quasi-exponential growth is only observed at the initial phases of the process).

Figure 1 Dynamics Generated by Logistic Model



Note: $r = 0.04$, $K = 300,000$, and $N_0 = 5,000$.

Verhulst's description of the Malthusian population dynamics is much more realistic than the one proposed by Malthus himself and has served as a basis of mathematical population biology to the present day. On the other hand, it can be applied only to complex Malthusian social systems, with very serious reservations. In practice, the population approaching the carrying-capacity ceiling implies very serious decline of living standards, and in complex Malthusian systems, this would result not in population stabilization but in sociopolitical destabilization, state breakdown, and political-demographic collapse.

Thus, the basic logic of the Malthusian cycle looks as follows: after the population reaches the ceiling of the carrying capacity of land, its growth rate declines toward zero values, and the system experiences significant stress with a sharp decline of living standards of the majority of the population, increasing severity of famines, growing rebellions, and *political instability*. Most complex agrarian systems had considerable reserves for stability; however, within 50 to 150 years these reserves usually got exhausted, and the system experienced a political-demographic collapse, when increasingly severe famines, epidemics, increasing internal warfare, and other disasters led to a considerable decline of population. As a result of this collapse, free resources became available, per-capita production and consumption increased again, the population growth resumed, and a new demographic cycle started.

Sergey A. Nefedov provides the following verbal description of the Malthusian political-demographic cycles. Every demographic cycle starts with a recovery phase, which is characterized by the presence of vacant land, population growth, increase in cultivated areas, and construction of new settlements as well as reconstruction of earlier settlements (destroyed during the preceding political-demographic collapse), low bread prices, high cost

of labor, low rents, a relatively high level of consumption, limited development of cities, crafts, and usury. After exhausting the resources of free land, the “compression” phase begins; this phase is characterized by the lack of available land, high land prices, peasant land shortages, the ruin of peasant proprietors, the spread of usury, high rents, growth of large estates, low per-capita calorie intake by the general population, decline in real wages, low cost of labor, high bread prices, frequent reports of famine and natural disasters, suspension of population growth, migration of the impoverished peasants to the cities where they try to make a living by crafts and petty trade, the growth of cities, the development of crafts and trade, a large number of unemployed and the poor, food riots and rebellions, the intensification of popular movements under the banner of property redistribution and social justice, attempts to carry out social reforms to alleviate the plight of the people, irrigation works, incentive policies for colonization and emigration, and eventually external wars to acquire new lands and reduce demographic pressure. Ultimately, the growing disproportion between population and available food resources leads to political-demographic collapse; this period is characterized by famine, epidemics, riots and civil wars, external invasions, destruction of large masses of population (demographic catastrophe), destruction or desolation of many cities, the decline of handicrafts and trade, the high price of bread, low land prices, destruction of a significant number of large land owners and redistribution of wealth, social reforms, in some cases having revolutionary scope.

Note that this verbal model specifies a number of direct and indirect indicators that can be used to identify political-demographic cycles and their phases. Using such indirect data, as well as his system of qualitative indicators of various phases of demographic cycles, Nefedov and Turchin have managed to detect more than 40 political-demographic cycles in the history of various ancient and medieval societies of Eurasia and North Africa. Thus they demonstrated that the demographic cycles are not specific to Chinese and European history only but should be regarded as a general feature of complex agrarian system dynamics.

Demographic Structural Theories of Malthusian Cycles

Jack Goldstone has proposed a demographic structural theory of political-demographic cycles that has been further developed by Peter Turchin. Within this theory, political-demographic collapses are explained not as direct results of overpopulation but rather through indirect influences of population growth on the sociopolitical structures.

First, Goldstone notes that the population growth in excess of the productivity gains of the land leads to the growth of staples’ prices that exceeds an agrarian state’s possibilities to increase its revenues. On the other hand, the growth of population leads by itself to the increase of an agrarian state’s expenses. Usually, an agrarian state could not find any other way to answer these problems but to raise taxes, notwithstanding the resistance of both elites and commoners. However, due to Malthusian economic demographic dynamics, these attempts fail to compensate for explosively growing expenses. Thus, even the increase in taxes could not prevent a fiscal crisis that turn out to be a logical result of the Malthusian cycle.

Second, fast population growth is accompanied by an even higher growth of the elite population (who tend to have higher levels of reproductive success). Thus the number of aspirants for elite positions in the state apparatus grows even faster than the total population, which leads to further growth of financial strains as the elite apply serious pressure upon the state in order to increase the number of elite positions. In addition, this leads to the growth of the competition within elites for the elite positions and, hence, to the splits within the ruling

class.

Third, the population growth leads to the growth of rents, impoverishment of peasants, migration to cities, decline of real wages, bread riots, and mass discontent.

Fourth, rapid population growth leads to the expansion of youth cohorts. This part of the population is most inclined to radicalism and suffers especially from the lack of employment opportunities. In addition, this part of the population is especially well mobilized for various revolts, rebellions, and civil wars.

Fifth, the growing elite competition and popular discontent leads to the development of ideological conflicts, producing ideological “banners” for future rebellions.

According to Goldstone, all these tendencies lead to the state breakdown that triggers an all-out political-demographic collapse, after which a new cycle would develop.

Political-Demographic Cycles in the Premodern Islamic Middle East and North Africa (MENA)

Premodern political-demographic cycles display a very considerable regional variability. By now, special attention has been paid to the study of the political demographic cycles in the Islamic Middle East and North Africa that differed in a very substantial way from the ones in the other premodern civilizations.

The carrying capacity in the premodern Middle East is shown to have grown considerably higher than the population, whereas the population growth was significantly slower than throughout the world system (outside the Middle East). This phenomenon could be at least partly accounted for by the mechanisms of political-demographic cycles typical for the Islamic Middle East.

Medieval Middle Eastern political-demographic cycles had a rather short length (approximately 90 years). During the relatively short Middle Eastern political-demographic cycles, population simply had not enough time to reach the carrying capacity of land. Political-demographic collapses took place well before the population reached the carrying capacity level, and the Medieval Middle East suffered from underpopulation rather than overpopulation. The population of medieval MENA fluctuated well below the carrying capacity.

Thus the political-demographic cycle models that connect demographic collapses with the ecological niche saturation and that describe rather well political-demographic dynamics of premodern China do not appear appropriate for the medieval Middle East. Hence, it might not be a coincidence that the mathematical model that appears to be more appropriate for describing the political-demographic dynamics of the medieval MENA than the rest of the models is the one that was developed by Turchin in an attempt to formulate in a mathematical form some part of the theory of Abd al-Rahmaṇ Ibn Khaldūn (1332–1406). Note that Ibn Khaldūn spent his life just in the medieval MENA region.

Turchin developed two “Ibn Khaldūn models,” within which political-demographic collapses are produced not by actual overpopulation but rather by elite overpopulation. Elite overproduction can take place in a generally underpopulated country (or at least in a country whose population is still significantly below the saturation level). Hence, these models suggest a direction within which the political-demographic dynamics of the medieval MENA

could be adequately described.

However, these models fail to describe adequately the political-demographic dynamics of the medieval MENA. Though Turchin's models were no doubt inspired by Ibn Khaldun's treatise, Turchin moved rather far from the original Ibn Khaldun's theory in the process of the model development, and thus, not so much of it survived in the final versions of the models. It has been shown that in order to produce a mathematical model describing the medieval MENA political-demographic dynamics in a more accurate way, it makes sense to try to follow Ibn Khaldun's theory more closely.

Ibn Khaldun's observations on the role of climatic fluctuations as an important factor of political-demographic dynamics appear to be of special interest. It has been shown that by taking them into consideration, it is possible to develop the basic mathematical model that describes the medieval MENA political-demographic dynamics more accurately.

As in Turchin's extended model, in the basic model of the medieval MENA political-demographic cycles, the increase of the natural elite growth rate leads to a decline in the length of the political-demographic cycles, whereas its decrease results in the lengthening of those cycles. Thus, it turns out to be possible to produce the model that describes rather adequately the basic features of medieval European political-demographic dynamics through the decrease by four times of the MENA natural elite growth rate coefficient (which would correspond to the strictly monogamous reproduction context typical for all the medieval European Christians, including the elites).

One of the main simplifying assumptions of the basic model is that the technologically determined carrying capacity of land is assumed to be constant. In reality, of course, it was not a constant but a variable with a pronounced long-term upward trend dynamic. This trend is conditioned by technological innovations whose intensity also tends to grow. In this way, this variable is treated in our extended model, which makes it possible to investigate numerically the influence of the "secular cycle" structure on the "millennial" economic and demographic trends. The extended model also takes into account the "Boserupian" effect—such that relative overpopulation creates powerful stimuli for generating and introducing innovations that raise the carrying capacity of land.

The numerical investigation of this model suggests that within the European (monogamous) versions of the model, subsistence technologies do tend to develop faster than they do within the MENA (polygynous) versions. The comparison of population at cycle peaks indicates that, within the MENA model, population tends to approach the ceiling of the carrying capacity of land to a much smaller degree than is observed within the European version of the model. It is remarkable that within the MENA model, a significant increase in the carrying capacity could take place without parallel demographic growth. What is more, for considerable periods of time, the growth of carrying capacity can be accompanied by a certain population decline, which appears to have been actually observed for certain parts of medieval MENA history.

It has been shown with respect to Egypt that the closest fit with the actually observed long-term political-demographic dynamics in the 1st to 18th centuries CE is observed when one brings the model closer to the Egyptian history realities. This allows us to take into consideration the fact that during the aforementioned period covered, one observes the transition from strictly monogamous elites to elites who practiced polygyny in a rather extensive way. This model provides a mathematical description of the phenomenon that has been detected through the analysis of the economic-demographic dynamics of Egypt in the 1st to 18th centuries: significant increases in the carrying capacity of land were accompanied

by a comparatively insignificant population growth. Thus, such models suggest possible ways to account for this phenomenon.

Escape From the Malthusian Trap and “a Trap at the Escape From the Trap”

Malthus is often called a “prophet of the past,” and this statement is not without certain grounds. His theory described rather accurately the demographic and economic dynamics of complex agrarian societies caught in the Malthusian trap (in fact, these were the only societies known to Malthus). However, a true historical paradox was that precisely in that very time when Malthus formulated his famous theory and in that very country where he did this, we could observe the start of the first successful escape from the Malthusian trap. It was in Britain immediately after Malthus that the Malthusian theory first stopped working.

Britain in the 19th century (and, soon after, many other Western European countries) stepped on the path of modern economic growth and successful modernization. Counter to Malthus’s expectations, they managed to achieve a more or less sustainable economic growth far exceeding the population growth rate. In fact, this led to a significant decline of mortality rates (which was later named “the first phase of demographic transition”) and hence to a dramatic increase of population growth rates. But successful modernization allowed Western Europe (and its offshoots) to increase the economic growth rates over population growth rates. Contrary to Malthus’s expectations, in the 19th century, the explosive growth of the Western European populations was accompanied by even faster economic growth, which allowed them to escape the Malthusian trap, in the late 19th and the early 20th centuries. This escape was finalized by the second phase of the demographic transition characterized by a sharp fertility decline, which finally eliminated the risk of the population growth to exceed the economic growth rate. Afterward, the Western European escape from the Malthusian trap was followed by almost all the other regions and countries of the world, and by now the only macro-region of the world where the risk of Malthusian collapses remains substantial is tropical Africa.

However, paradoxically, the very escape from the Malthusian trap tends to systematically generate serious political upheavals. The emergence of major sociopolitical upheavals following escape from the Malthusian trap is not an abnormal but a regular phenomenon, as discussed in what follows.

The start of the escape from the Malthusian trap tends to bring about a precipitous death rate decline and, consequently, an explosive acceleration of the population growth rates (which in itself can lead to a certain increase in sociopolitical tensions). The start of the escape is accompanied by especially strong decreases in infant and under-age-5 mortality, which raises the proportion of youth in the overall population (and especially in the adult population)—the so-called youth bulge. This increases sharply the proportion of the part of population most inclined to radicalism.

The explosive growth of the young population requires the creation of enormous numbers of new jobs, which is a serious economic problem. The youth unemployment growth can have a particularly strong destabilizing effect, creating an “army” of potential participants for various political upheavals, including civil wars, revolutions, and state breakdowns.

Escape from the Malthusian trap stimulates a vigorous growth of the urban population. Besides, excessive population is pressed out from the countryside by the growth of agricultural labor productivity. Massive rural-urban migration almost inevitably creates a

significant number of those dissatisfied with their current position, as initially most of the rural-urban migrants can only get unskilled, low-paid jobs and low-quality accommodation.

Escape from the Malthusian trap is achieved through the development of new economic sectors as well as declines of the old sectors. Such structural changes cannot proceed painlessly, as many workers have skills that are no longer valued and are obliged to take up low-paying, unskilled jobs, which makes them socially discontented.

The young people make up the majority of rural-urban migrants, so the “youth bulge” and intensive urbanization factors act together, producing a particularly strong destabilizing effect. Not only does the most radically inclined part of the population rocket up in numbers, but it also gets concentrated in major cities/political centers. This can result in serious political destabilization even against the background of a rather stable economic growth. The probability of political destabilization naturally increases dramatically if an economic crisis occurs or if the government loses its legitimacy owing to any other causes (such as military defeats).

See also [Civil Wars](#); [Modernization Theory](#); [Radicalization](#); [Social Revolts](#); [Social Stratification and Inequality](#); [State Development](#); [Youth and Political Change](#)

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Further Readings

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