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A Theory of Demographic Cycles and the Social Evolution of Ancient and Medieval Oriental Societies (translation)

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Author

Nefedov, Sergei

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Sergey Nefedov*

The theory of demographic (or ecological) cycles is one of the new directions in economic and social history; the distinctive feature of this direction is application of population dynamic models. American biologist and demographer Raymond Pearl laid the foundation of the theory of demographic cycles by showing that the quantitative changes of animal (and perhaps human) populations may be described by the so-called logistic equation (Pearl 1926). The solution of this differential equation is the logistic curve (fig. 1). The course of the logistic curve shows that at first, when resources are abundant and consumption level is high population grows rapidly. However, because resources are limited, population growth results in a decline of consumption per capita (curve 2 on fig. 1). We can observe such situation, for example, in China of the Qing dynasty (Fig.2. Consumption level is measured by the amount of liters of rice that an unskilled worker could buy with his day salary¹.)

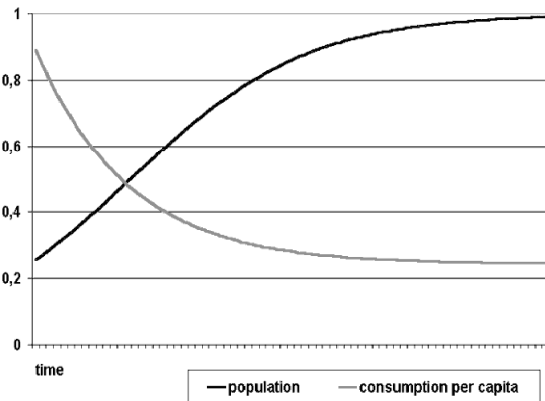


Fig.1. The logistic curve and the curve of consumption

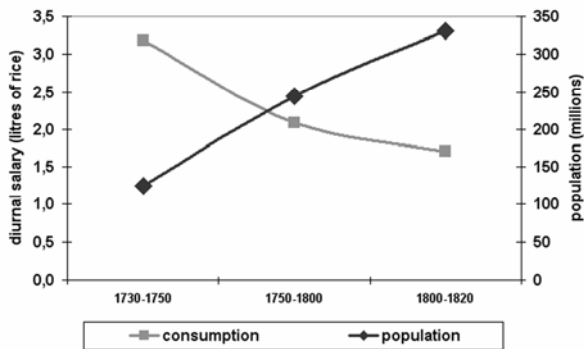


Fig. 2. The population and consumption in China of the Tsing epoch

The decrease of consumption causes a deceleration in population growth, which approaches an asymptote corresponding to the maximum possible number of the population when all the natural resources are used up. Achieving the maximum possible level means that people subsist at the minimal consumption level, practically on the verge of extinction, so that the natural growth is completely eliminated. This state of “hungry homeostasis” is in fact unstable. Fluctuations of natural factors can lead to “demographic crash”, disastrous starvation, or an epidemic. Such a disaster

results to a sudden population decrease, followed by the period of reconstruction in a new demographic cycle. Thus, from the demographic point of view, historical process is a series of demographic cycles. Per capita consumption oscillates as a mirror image of the demographic cycle, so that when population is high, real salary is low, and vice versa (fig. 3).

The theory of demographic cycles is a mathematical expression of Malthus’ famous ideas. The cyclic theory was not in demand by historians for a long time, because Malthus’ ideas were interpreted as something offensive. The existence of demographic cycles in history was proved by Wilhelm Abel and Michael Postan in the middle of the previous century (Abel 1934, 1935; Postan 1939, 1950;). Abel and Postan, analyzing economic history of Europe in the 12th- 14th centuries, showed that the population growth during that period lead to the shortage of cultivated land and to the rise of grain prices. Postan and Titov showed that after 1300 CE death rate tended to increase leading to slower population growth. This tendency might be explained by decreasing quality of life (Postan and Titov 1958-59). Declining quality of life and permanent starvation were exactly the factors that lead to the catastrophic consequences of the plague epidemic. Thus, the “Black Death” signified the demographic catastrophe, marking the end of the demographic cycle, which started in the period of the “great ploughing up” in the 12th century.

* The Russian Academy of Sciences, Institute of history and archaeology, Ural department. R. Luxembourg 56, Ekaterinburg, 620026 Russia. E-mail: nsa@etel.ru

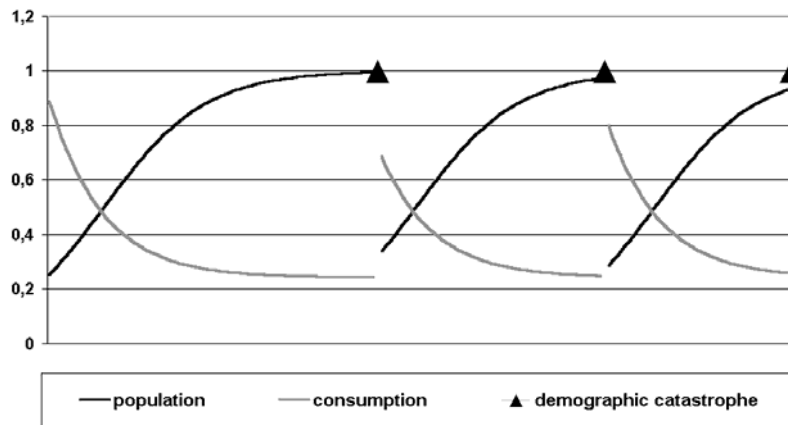


Fig. 3. Demographic cycles

After Abel's and Postan's work the theory of demographic cycles was widely recognized. Its description can be found in the works of well-known scientists, such as F. Braudel, R. Cameron, E. Le Roy Ladurie, K. Cippolla (Braudel 1966, 1986; Cameron 1989; Ladurie 1966; Cippolla 1976). Later, a new line of theoretical research started within the framework of "historic sociology" that examined the revolutions of the Early Modern Time. One of the achievements of the "theory of

revolution" was the work of Jack Goldstone who, using a great variety of facts, showed the role of overpopulation in the revolutions of the 17th -19th centuries (Goldstone 1991).

Specialists identified eight demographic cycles in the history of Europe: the cycle of the republic of Rome; the cycle of the Early Roman empire; the cycle of the Christian empire, broken by the barbarian invasions; the cycle of the Carolingians; the cycle of the Middle Ages, ended by the Black Death; the first cycle of Modern Age, ended by the English revolution, the Fronde and the Thirty-years war; the second cycle of the Modern Age, ended by the great French revolution and the Napoleonic wars (Braudel 1986; Turchin 2003). After that the industrial revolution began, people's life changed rapidly, steamboats started to bring grain to Europe from America and Russia, food resources rose and there were no more limits on demographic growth. Thus, the industrial break-through disturbed the sequence of demographic cycles, for some time, and perhaps forever.

Until recently, the study of demographic cycles was limited to Europe and to a few Asian countries of the early modern time. This paper is devoted to the research on demographic cycles in countries of the Orient in the antiquity and the Middle Ages. Fernand Braudel suggested that the history of the East went in the same rhythm of demographic cycles as the history of the West, but Rondo Cameron pointed out the lack of evidence supporting this theory (Braudel 1966:19; Cameron 1970: 457). This disagreement is related to the fact, that a historian, as a rule, does not have at his disposal any direct information about population, and there is no precise method of defining a demographic cycle without using this information.

In order to develop such a method and to define typical features of the demographic cycle, I attempt to construct a mathematical model that simulates economic processes occurring during the cycle. The model takes into account the fact that the amount of cultivated lands depends on the size of the population, the productivity of land, and the per capita consumption per capita of farmers. The model also takes into account the connection between the consumption and the size of the population; connection between prices and the consumption per capita; dynamics of the change from a farmer to a tenant; dynamics of the consumption by these population sections, growth of large land ownership, dynamics of the farmers' debts etc. On the whole, the mathematical model is the discrete analogue of four integro-differential equations. The verification of this model was carried out using the facts concerning the history of China of the 1st -2nd century, because there is much data for this period on population and the cultivated area, which makes it possible to compare the calculated numbers with the reality. Experiments with the model showed that in a stratified society logistic cycles have a more complicated nature, than those in a biological environment (as studied by Pearl). Besides the cyclic recurrence due to the instability of the equilibrium, there are mechanisms connecting the growth of social differentiation to declining consumption per capita. The instability of private property leads to the bankruptcy of farmers and to accumulation of resources in the hands of large owners, which in itself leads to a demographic crash (Nefedov 2002, 2003).

Comparing the facts from historical sources, modeling experiments allowed identifying typical features of a demographic cycle. Every demographic cycle starts with the *period of the inner colonization* (or *period of the reconstruction*), characterized by an abundance of free lands, growth of the population, increase of sown areas, building of new (or reconstruction of earlier destroyed) settlements, low bread prices, high cost of labor, a relatively high level of consumption, a limited development of cities and crafts, a restricted development of renting and money-lending. After the exhaustion of resources comes *the period of the compression*. Typical features of this period are high land prices, low farmer/land ratios, bankruptcy of landowners, spreading of money-lending and renting. Peasants who own land sell their fields to landowners and users, becoming tenants or agricultural workers. Owners with large land holdings become common. Other features of the period of the compression are a low consumption level by most of the population, sinking level of real salary, low cost of

labor, high bread prices, frequent reports of famine and other disasters, slowing down of the growth of population, bankrupt farmers leaving for cities, growth of cities, development of crafts and trades, many people without work and paupers, hunger strikes and revolts, growing activity of popular movements demanding land redistribution and social justice. Attempts are made to carry out social reforms in order to improve the life of common people, conduct irrigation projects in order to increase the productivity of land. Government promotes policies encouraging colonization and emigration, foreign wars in order to get new lands and reduce the demographic pressure. The poor population cannot pay the taxes, and Goldstone considers financial crisis of the state and intensification of intra-elite competition consuming public revenues as the important feature of this period (Goldstone 1991: 24). John Komlos adds information about people losing weight and strength and general weakening of bodies². Declining health enhances diffusion of terrible epidemics.

Finally the growing disproportion between the quantity of the population and the available food resources leads to an *ecosocial crisis*. Typical features of this period are famine, epidemics, uprisings and civil wars, death of a large part of the population leading to demographic catastrophe, destruction or desolation of many cities, decay of crafts and trades, high bread prices, low land prices, death of a greater part of large owners and redistribution of private property, and social reforms in some cases having revolutionary character. A well-known French expert in demography Alfred Sauvy formulated the thesis, that overpopulation generates autocracy (Sauvy 1977). Here we see the mechanism of this process. Overpopulation generates famine, famine generates revolts and civil war, war generates military dictatorship and dictatorship generates autocracy.

The ecosocial crisis makes the state weaker and it can be conquered by external enemies. If the conquest happens before the crisis, in the phase of compression, then we deal with an interrupted cycle. In some cases *intercycles* begin after a catastrophe; intercycles are periods when inner wars and outside invasions prevent economic stabilization and reestablishment of the conditions for population growth. A new cycle begins when the situation is stable.

The features listed above make it possible in many cases to pick out a demographic cycle, even without having information about population dynamics. Using this method I selected more than 50 cycles in the history of the countries of the Orient. It is necessary to take into account that the delineation of every cycle needed serious analysis of socio-economic history of a particular country, and I cannot provide all the details here, so I refer the readers to the specific articles dealing with this problem (Nefedov 1999, 1999a, 1999b, 2001, 2001a, 2001b, 2001c)³. In some cases it is possible to construct curves of consumption, which are an exact mirror-image of the demographic cycle; in other cases the conclusions were made taking into account a combination of all the features listed above. Finally, there are cases, when the available information was not enough to make a certain conclusion. So I only list here the summary of findings that confirm Fernand Braudel's thesis about human history consisting of a series of demographic (population) cycles – just like the history of every biological population.

I pay special attention to political evolution and evolution of property relations during a cycle. Some definitions are necessary to explain the comments below. An original situation is the *society with private ownership* characterized by democratic or oligarchic form of government (state A). A classical demographic cycle transforms this society to *étatist monarchy* (state B). By *étatist monarchy* we mean the state characterized by autocracy, state regulation of the economy, and predominance of state ownership of land. *Étatist monarchy* can coexist with small peasants' property, but *étatist monarchy* hinders the development of the large land property. Significant estate differences are absent in this state and it is possible to say that it is a state of a socialist type. When outside enemies (for example, nomads) conquer this state, they often do not change its frame, but they become a prevailing military estate and significant estate differences take place. We call such state the *estate monarchy* (state C). In another case the conquerors divide the country into fiefs, a vassal structure and a *classical feudalism* occurs (state D). Besides, the combination of a monarchy and relations of private ownership (including large land property) may appear as a result of a weakening of state regulation in *étatist monarchy*. We shall call such society a *monarchy with private ownership* (state A_b). Finally, we shall identify the variant of a *palliative monarchy*, when weak monarchic authority coexists with feudal lands and private lands. Such a society often appears as a result of decomposing *étatist monarchy* (state A_c).

I. The cycles in the history of Mesopotamia:

1. The first Sumerian cycle (till the middle of the 23rd century B. C.). It is a primary cycle started with the process of initial colonization and due to that it continued much longer than usually. The cycle was characterized by the predominance of society with private ownership within the system of the cities-states ("policies"). One part of land belonged to the small and large proprietors, the other part belonged to large temples economies; these lands were processed by "working groups" of agricultural workers. The phase of compression was characterized by the ruin of peasants and other classical indications of overpopulation. It was finished by a civil war, demographic catastrophe and the building of a uniform state based on principles of *étatist monarchy* - "empire". (Such transformation is designated as AB).

2. The second Sumerian cycle (the middle of the 23rd century – the middle of the 22nd century B. C.). The étatist monarchy prevailed during the cycle. The temples economies were subordinated to kings and became the basis of public sector of economy, but the private sector was saved too. The phase of compression was characterized by ruin of the peasants. The cycle was interrupted by the barbarous invasion and the country was conquered by the barbarians. The catastrophe resulted in the fall of the empire and returning to a society with private ownership and a system of cities-states. (Such transformation is designated as BA^c. The superscript “c” means conquest).

3. The third Sumerian cycle (the middle of the 22nd century – the end of the 21st century B. C.). The cycle began with domination of relations of private ownership. However étatist monarchy already became a social tradition and consequently the restoration of the empire took place during the phase of compression, prior to the beginning of ecosocial crisis. In this cycle the basic part of the population was concentrated in “working groups” of state-temples economies. The sale of land was prohibited in the private sector. The cycle was interrupted by the barbarous invasion and the country was conquered by barbarians. The catastrophe resulted in the fall of the empire and returning to a system of cities-states and monarchy with private ownership. The temples economies were turned to huge private corporations. (Such transformation is designated as A^cBA^c).

4. The first Old Babylonian cycle (the beginning of the 19th century – 1740-s B. C.). Before the cycle there was an intercycle for about one hundred years (the 20th century B. C.). The period of the reconstruction began with a domination of relations of private ownership. The restoration of the empire took place during a phase of compression. As in the previous cycle the main part of the population was concentrated in “working groups” of state-temples economies and the sale of private land was prohibited. The cycle was interrupted by the invasion of barbarians and the civil war, but the barbarians were defeated and the war was won by the empire. (Transformation A^cB).

5. The second Old Babylonian cycle (1740-s – 1590-s B. C.). The étatist monarchy prevailed during the cycle. The cycle was interrupted by the barbarous invasion and the country was conquered by the barbarians. The catastrophe resulted in the fall of the empire. The conquerors -Kassites- became the privileged military estate of the new society, but the authority of Kassite kings was weak and it coexisted with almost independent cities-states and the private property of land. (Transformation BA^c).

6. The Middle Babylonian cycle (the end of the 15th century – 1150-s B. C.). Before the cycle there was an intercycle for about two hundred years (16th -15th centuries B. C.). The catastrophe was more destructive, than in the previous cycles. The breakage with traditions of the previous étatist monarchy was marked, therefore the cycle had a primary character and it was characterized by the existence of the system of cities-states and monarchy with private ownership. Temple economies were turned to private corporations. The cycle was interrupted by the barbarous invasion; Babylon was conquered by the barbarians. (No transformation A^c A^c).

7. The Middle Babylonian cycle in Assyria (the beginning of the 14th century – the middle of the 11th century B. C.). Assyria was not conquered by the Kassites; from old times it was the city-state based on the society with private ownership. Therefore we consider cycles in Assyria separately. The period of reconstruction began with the domination of relations of private ownership. For the phase of compression attempts of an establishment of étatist monarchy were marked and the monarchy with private ownership appeared. The length of the cycle can be explained by the establishment of colonies in the conquered territories. The cycle was interrupted by the barbarous invasion, which resulted in the demographic catastrophe. Assyria resisted against the invasion in spite of considerable losses. (Transformation AA_b).

8. The first Assyrian cycle (the beginning of the 9th century – the middle of the 8th century B. C.). Before the cycle there was an intercycle for about a hundred years. In this cycle the predominance of private property relations proceeded. The phase of compression was characterized by the ruin of the peasants and the other classical indications of overpopulation. The cycle was finished by the civil war, the demographic catastrophe and the formation of the empire based on principles of étatist monarchy. (Transformation A_bB).

9. The second Assyrian cycle (the middle of the 8th century – the end of the 7th century B. C.). The étatist monarchy prevailed during the cycle. The cycle was interrupted by barbarous invasion and the country was conquered by the barbarians-Persians. The conquerors borrowed despotic tradition and the conquest resulted in the birth of estate monarchy. The Persians became the privileged military estate of the new empire. (Transformation BC^c)

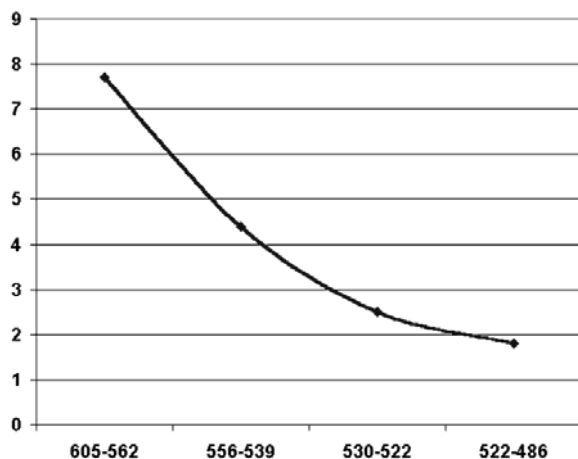


Fig. 4. The curve of consumption in Babylon (610-s – 480-s B. C.).

10. The first New Babylonian cycle (the middle of the 9th century – 680-s B. C.). Before the cycle there was an intercycle for about three hundred years (the middle of the 11th century – the middle of the 9th century B. C.). The society with private ownership dominated during the cycle. The period of compression was filled by Assyrian encroachments and struggle of the Babylon oligarchy with Assyrian kings. The cycle was interrupted by Assyrian conquest, which resulted in the demographic catastrophe. (No transformation $A^c A^c$).

11. The second New Babylonian cycle (610-s – 480-s B. C.). Before the cycle there was an intercycle for about seventy years. The relations of private property dominated like in the previous cycle. The cycle is relatively well documented in different sources, and data available in papers by W. H. Dubberstein and M. A. Dandamaev (Dubberstein 1939; Dandamaev 1974) allow making a curve of consumption (fig. 4). The diagram shows, how many liters of barley could an unqualified worker buy for his daily salary, and it corresponds with the curve for a classic demographic cycle. In the phase of compression attempts of étatist monarchy establishment and the struggle between an oligarchy of proprietors and kings were marked. This struggle resulted in the conquest of Babylon by the barbarians-Persians. The Persians established the estate monarchy in Babylon. The revolts against this condition resulted in the demographic catastrophe. (Transformation $A^c C^c$).

12. The Persian cycle (480-s – 330-s). Persian warriors received small lands, which were processed by slaves and tenants. The compression resulted in a decrease of military estates; despite the prohibition of sale the poor warriors sold the lands to usurers. Thus the estate society was gradually transformed to a society with private ownership. The decomposing of Persian military estate resulted in the fall of Persian monarchy under the attacks of the new conquerors - the Macedonians. (Transformation $C^c A^c C^c$).

13. The Seleucidian cycle (270-s – 130-s B. C.) Before the cycle there was an intercycle for about sixty years (330-s – 270-s B. C.). The Macedonians replaced the Persians in a role of military estate of estate monarchy. The compression resulted in the weakening of the monarchy and a slow transformation of an estate society to a society with private ownership (as in the previous cycle). The decomposing of the Macedonian military estate resulted in the fall of the Seleucidian monarchy under the attacks of the new conquerors - Parthians. (Transformation $C^c A^c D^c$).

14. The Parthian cycle (50-s B. C.– 160-s A. D.). Before the cycle there was an intercycle for about eighty years (130-s – 50-s B. C.). The Parthian invasion resulted in a breakage of preceding monarchic tradition. The social synthesis passed with the predominance of Parthian nomad traditions; the feudal society with weak monarchic authority appeared as the result. The leaders of aristocratic clans had extensive possessions; they were almost independent, and their convention of leaders chose the kings. The simple warriors owned small lands, which were processed with slaves and tenants. The compression resulted in the further weakening of the state and the feudal anarchy; during the anarchy the Roman invasion and the plague produced demographic catastrophe. The crisis resulted in some kind of intensifying of the monarchy, but on the whole the cycle passed in conditions of domination of feudal and private ownership relations (Transformation $D^c A^c$).

15. The first Sassanian cycle (230-s – 490-s). Before the cycle there was an intercycle for about seventy years (160-s – 230-s). The compression at the end of the cycle resulted in the social revolution and the establishment of étatist monarchy. The aristocracy was destroyed, the lands of ordinary warriors began to be controlled by the state. (Transformation $A^c B$).

16. The second Sassanian cycle (490-s – 630-s). The cycle passed in conditions of domination of étatist monarchy. It was interrupted by the Arabian invasion and the conquest of the country by the Arabs. The conquest resulted in the establishment of estate monarchy. (Transformation BC^c).

17. The cycle of the Umayyad epoch (650 – 750-s). The Arabs did not allot lands to the warriors. The Arabian military estate received the majority of the state taxes from the population, therefore taxes were very heavy. It narrowed down the ecological niche. When the population increased and the compression began, the

allotments of the peasants decreased and the taxes became intolerable. The peasants sold the land to usurers, though the sale of land was prohibited formally. Eventually the grandiose anti-tax revolt began and Umayyad dynasty was destroyed. However the civil war resulted in the demographic catastrophe. (No transformation $C^c C$)

18. The first cycle of the Abbasid epoch (750–830-s). New Abbasids dynasty has deceived expectations of the people and has not reduced the taxes. In the beginning of the 9th centuries the compression began again and it brought about a wave of revolts again. Abbasid

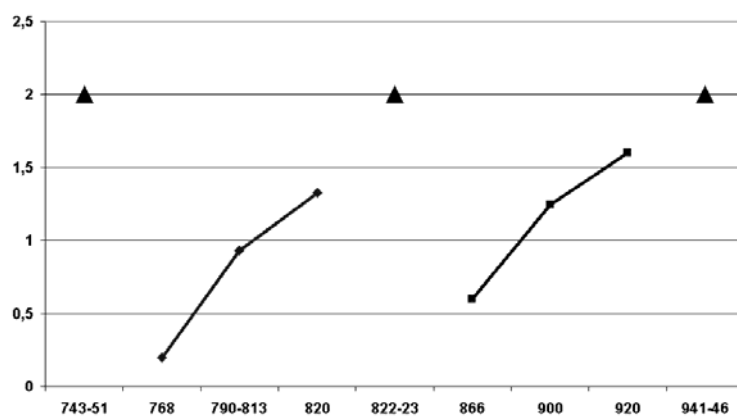


Fig.5. Cycles of the prices in Iraq (740-940-ss).

dynasty was forced to reduce the taxes and to cancel the pensions for the Arabian military estate. The revolts were suppressed, but they resulted in the new demographic catastrophe and the disintegration of the Arabian Caliphate. (Transformation CA_b). The data available in the works by E. Ashtor and O. G. Bolshakov (Ashtor 1976; Bolshakov 1984) allow to make curves for grain prices for Iraq in 8th -10th centuries (fig. 5, the black triangles show demographic catastrophes). The salary stays stable for long periods, so the price curves are exact antithesis to the consumption curves, and the price cycles reflect the consumption cycles and the demographic cycles. The problem of demographic and price cycles in the Near East was earlier considered by E. Ashtor (Ashtor 1969, 1976), but Ashtor analyzed average prices for the whole centuries, thus “smoothing away” three cycles (17 – 19) by combining them into one.

19. The second cycle of the Abbasid epoch (830 - 930-s). The disintegration of the Arabian Caliphate was accompanied by the weakening of the central authority and the state regulation. The land began to be on sale and the monarchy with private ownership was formed. In the beginning of the 10th century we can observe the compression in this society with such characteristic indications as an increase of large landed property, an augmentation of cities, a rough development of crafts and a trade. The compression resulted in the demographic catastrophe, the terrible famine and the plague in 930-s years. After this catastrophe the long period of internecine wars and Turkic invasions began. In the middle of the 11th century the country was conquered by Turkomans, which became the military estate of new estate monarchy Saijuq Sultanat. (Transformation A_bC^c)

20. The Saijuq cycle (1050 - 1150-s). Turkoman warriors received lands with the peasants. In the phase of compression numerous peasants’ revolts were marked. The assassins killed the leaders of the state and it resulted in the weakening of the central authority, the internecine wars and the disintegration of the state. In the middle of the 12th century Baghdad caliphs managed to take away the authority from the Turkomans and to restore the étatist monarchy. (Transformation C^cB).

21. The cycle of the later Caliphate (1160–1250-s). The cycle was characterized by the predominance of

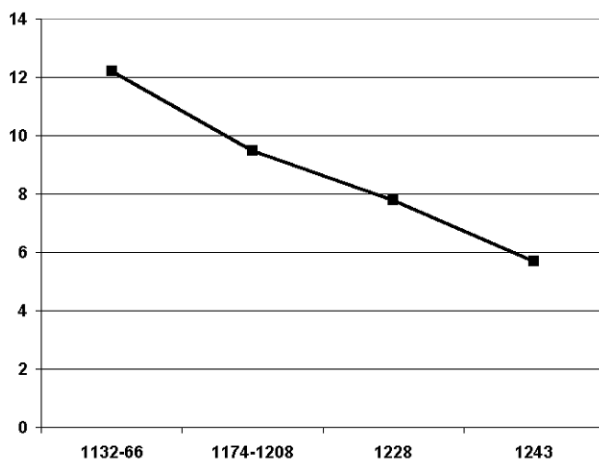


Fig. 6. The curve of consumption in Iraq (1130-1240-ss).

étatist monarchy and high development of state regulation. In a phase of compression the revolts in cities were marked. The cycle was finished by the Mongolian conquest. (Transformation BC^c). The data available in monograph by O. G. Bolshakov (Bolshakov 1984) allow making the consumption curve (fig. 6). The diagram shows, how many liters of wheat a worker could buy for his daily salary. (The difference in numbers in comparison to fig. 3 is explained by the fact that while making Fig. 3 the prices of hungry years were also considered, but while making fig. 6 – only the “normal” prices where taken into account.)

II. The cycles of the history of Egypt:

1. The first cycle of the Earlier Kingdom (before the reign of Pharaoh Mina). The existence of cities-states (“nomes”) was characteristic for the first centuries of the Egyptian history (as in Mesopotamia), but the information about the development of private property was not saved. In pharaoh Mina government the étatist monarchy based on state-temples economies (as in Mesopotamia) was established.

2. The second cycle of the Earlier Kingdom (from Mina till Hasehem). The étatist monarchy prevailed during the cycle. The cycle came to an end with the civil war and the demographic catastrophe in Hasehem government.

3. The cycle of the Old Kingdom (III – VI dynasties). The étatist monarchy based on state-temples economies prevailed in the beginning of the cycle. In the phase of compression processes of privatization of temples economies and decomposing of étatist monarchy were marked. The cycle was finished by revolts, civil wars and barbarous invasions. The catastrophe resulted in the fall of the empire and the return to a system of the cities-states based on a monarchy with private ownership. It is necessary to note, that the beginning of the Egyptian history is badly documented and definition of the three first cycles has a hypothetical character.

4. The first cycle of the Middle Kingdom (the end of the 22nd century – the beginning of the 20th century B. C.). Before the cycle there was an intercycle for about one hundred years. In the phase of regeneration the predominance of relations of private ownership was marked. The cycle was finished by revolts and the attempt of the étatist monarchy establishment. (No transformation A_bA_b).

5. The second cycle of the Middle Kingdom (the beginning of the 20th century – the beginning of the 17th century B. C.). The cycle was characterized by the coexistence of monarchy and relations of private ownership.

There was intensification of monarchy and restriction (or liquidation) of a private sector of economy in the phase of compression. The length of the cycle is explained by great irrigation works. The cycle was interrupted by the barbarous invasion and the North Egypt was conquered by the barbarians. The catastrophe resulted in the destruction of the étatist monarchy and the privatization of temples economies. (Transformation $A_bBA^c_b$).

6. The cycle of the New Kingdom (the middle of the 16th century – the middle of the 12th century B. C.). Before the cycle there was an intercycle for about one hundred years. In the beginning of a cycle the significant development of relations of private ownership was marked (a monarchy with private ownership). In the phase of compression the restoration of étatist monarchy took place and pharaohs restored monitoring of temples economies. The length of the cycle is explained by large irrigation works and by the invention of shaduf. The cycle was finished by revolts and the Lybian invasions. The catastrophe resulted in the destruction of the étatist monarchy and the conquest of the country by Lybians. (Transformation $A^c_bBA^c_c$).

7. Saissian cycle (the middle of the 7th century – the beginning of the 5th century B. C.) Before the cycle was an intercycle for about four hundred years (the period of civil wars and Lybian invasions). In the beginning of the cycle the significant development of the relations of private ownership was marked. In the phase of compression the restoration of the étatist monarchy took place. The oligarchy invites the Persian kings to prevent an approach of the étatist monarchy. But the kings follow the Assyrian tradition and they aspire to an autocracy. The conflict between the oligarchy and the Persian kings resulted in the war, the demographic catastrophe and the victory of the estate monarchy. Persians became a privileged military estate of the new empire. It is necessary to note a parallelism with the second New Babylonian cycle in Mesopotamia. (Transformation $A^c_cBC^c$).

8. The Persian cycle (480 – 330-s B. C.). The phase of regeneration was characterized by the domination of Persian estate monarchy. In the phase of compression the revolt of Egyptians resulted in the expulsion of the Persians and the regeneration of étatist monarchy. The cycle was interrupted by the Persian invasion and by the Macedonian conquest. (Transformation C^cBC^c).

9. The first Ptolemaic cycle (330 – 200-s B. C.). The Macedonians replaced the Persians in the role of military estate of estate monarchy. In the phase of compression there was an Egyptians revolt which resulted in the civil war and the demographic catastrophe. The outcome of the crisis was the smoothing of the estate differentiation and the étatist monarchy regeneration. (Transformation C^cB)

10. The second Ptolemaic cycle (190 – 40-s B. C.). The étatist monarchy prevailed during the cycle. In the phase of compression the revolt of the Egyptians took place again. There was gradual privatization of military lands. The cycle is finished by large famine, epidemics and the Roman conquest. (Transformation BC^c).

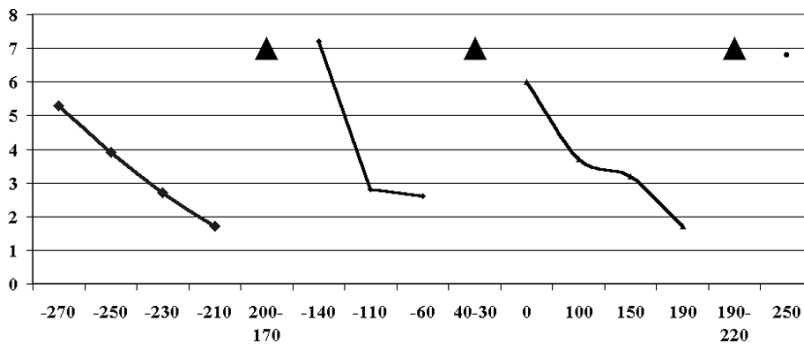


Fig. 7. Curves of consumption in Egypt from the 3rd century B. C. to the 3rd century A. D.

cycle was finished by the potent peasants' revolt and the demographic catastrophe. For the three cycles from the 3rd century B. C. to the 3rd century A. D. data available in papers by Fr. Heichelheim and A. Johnson (Heichelheim 1930, Johnson 1936) allow to make the consumption curves (fig. 7, the black triangles show demographic catastrophes). The diagram shows, how many liters of wheat an unqualified worker could buy for his daily salary. The sinking consumption shows the growth of demographic pressure during each cycle. The sudden growth of consumption in 180 – 150-s and in 50 – 39-s B. C. shows the reduction of the population, that means demographic catastrophe. These catastrophes are also fixed by the combination of other features. (Transformation C^cA_b)

12. The first Byzantine cycle (300 – 540-s). Before the cycle there was an intercycle for more than one hundred years. During the intercycle a complete privatization of state land took place, therefore monarchy with private ownership prevailed in this cycle. In the phase of compression the revolts began and the regeneration of étatist monarchy was made. The cycle was finished by the epidemic catastrophe, by the "great plague". (Transformation A_bB).

13. The second Byzantine cycle (550-630s). The cycle passed in conditions of the étatist monarchy domination. It was interrupted by the Arabian invasion and the conquest of the country by the Arabs. The conquest resulted in an establishment of the estate monarchy. (Transformation BC^c).

14. The cycle of the Umayyad epoch. (650 – 730-s). The compression was accelerated by the sharp raise of taxes and it was accompanied by the peasants' revolts. The terrible famine and the epidemic resulted in the demographic catastrophe. (No transformation C^cC).

15. The first cycle of the Abbasid epoch. (730 – 830-s). The new compression resulted in the grandiose revolt and the demographic catastrophe. The revolt was suppressed, but the disintegration of Caliphate resulted in the Egypt independence. (No transformation CC).

16. The second cycle of the Abbasid epoch (830 – 960-s). The new compression resulted in the terrible famine, the epidemic and the demographic catastrophe again. During the crisis Egypt was conquered by the Ishmailites from Tunis. The leveling ideology by the Ishmailites was the response of popular masses against the heavy tax exploitation. It was spread in the whole Arabian world including Egypt. The encroachment from Tunis was welcomed by the people, therefore we do not consider this encroachment as a conquest. The Ishmailites victory meant the restoration of étatist monarchy. (Transformation CB).

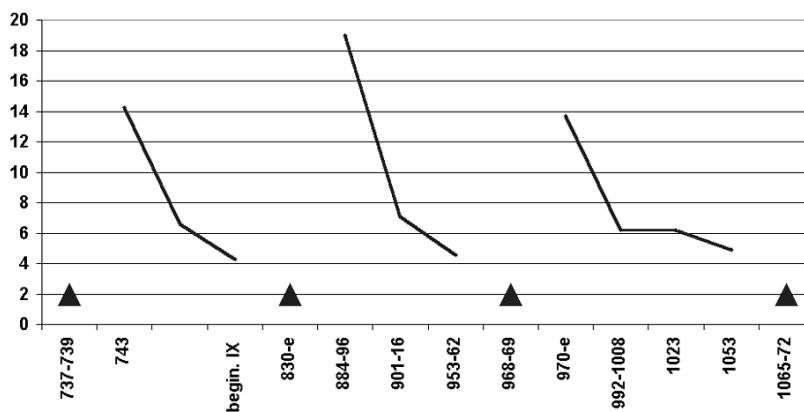


Fig. 8 .Curves of consumption in Egypt. 8th-11th centuries.

17. The first cycle of the Fatimid epoch (970 - 1060-s). The étatist monarchy prevailed during the cycle. The new compression resulted in terrible famine, epidemic and demographic catastrophe again. (No transformation BB). For the last three cycles the data available in works by E. Ashtor and O. G. Bolshakov (Ashtor 1976; Bolshakov 1984) allow to make consumption curves (fig. 8, while making fig. 7 the prices of the hungry years were also considered, while making fig. 7 – only the “normal” prices, it

explains the difference from fig. 6.). As noticed above, E. Ashtor studying this period took into account average prices for the entire century, and combined three cycles into one. But the diagram from fig. 7 shows undoubtedly three cycles, and the historical sources describe the demographic catastrophes, that separate them.

18. The second cycle of the Fatimid epoch. (1070 – 1140-s). The étatist monarchy prevailed during the cycle. In the middle of the 12th century the large famine resulted in the new demographic catastrophe; at the moment of the crisis the country was conquered by the Turkomans. Turkoman warriors receive lands with the peasants and they became the privileged military estate of the new estate monarchy. (Transformation BC^c).

19. The cycle of the Mamluk epoch (1260 – 1340-s). Before the cycle there was an intercycle for more than one hundred years (the period of civil wars and wars with the crusaders). The estate monarchy prevailed during the cycle. In a phase of compression the intensifying of a central authority was marked; the authority tried to defer the crisis. Nevertheless in the middle of the 14th century the epidemic catastrophe took place. (No transformation C^cC).

III. The cycles of the history of China:

The cycle of the Chou epoch (till the end of the 6th century B. C.) was a primary cycle, which began with the process of the pristine colonization therefore the cycle preceded much longer than usual. About the 16th centuries B. C. the conquest of North China by the peoples intruded from the Great Steppe took place; then another encroachment repeated in the 11th century B. C. Therefore in the Chou epoch we see feudal lands and a private possession of land at the weak imperial authority. Then the compression began and it resulted in the ecosocial crisis and the birth of several étatist monarchies in the Hwang Ho valley. (Transformation A_cB)

1. The cycle of the Epoch of battling kingdoms (the 5th century – the end of the 3rd century B. C.). Though early Chinese étatist monarchies effected a redistribution of land and tried to help peasants the state regulation was not sufficient. The land was a private property and it was still on sale. Therefore in the phase of compression a ruin of peasants took place. A shortage of land and the heavy taxes by Chin Shihuiuhg resulted in the revolt and the fall of empire Chin. (Transformation BA_b).

2. The cycle of the Early Han epoch (the beginning of the 2nd century B. C. – the beginning of the 1st century A. D.). For the beginning of the cycle development of relations of private ownership and a weak

monarchic authority were characteristic. In the phase of compression the restoration of étatist monarchy took place and the étatist monarchy tried to provide peasants with land with the help of state regulation methods. However the further compression resulted in the new development of the society with private ownership, the decomposing of the monarchy, the ruin of peasants, to the overall revolt and the demographic catastrophe. Eventually, the ecosocial crisis restores the étatist monarchy . (Transformation A_bBA_bB).

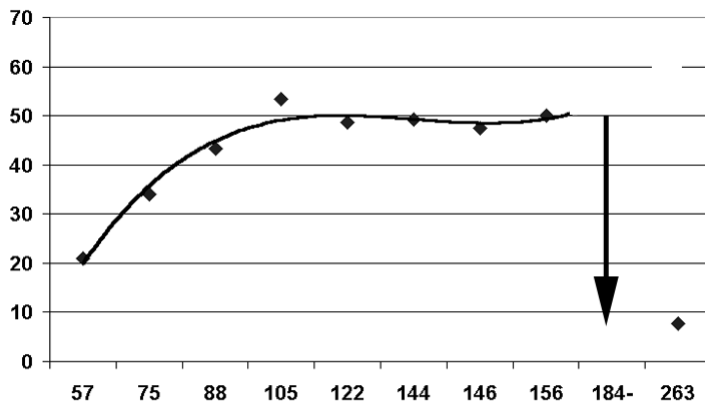


Fig. 9 . The population of China in 1-3th centuries (millions)

the decomposing of monarchy, the ruin of peasantry, to the overall revolt. Eventually, the ecosocial crisis restored the étatist monarchy. (Transformation BA_bB). There is information about the size of the population for this cycle⁴. It can be seen on the diagram (Fig. 9) that the growth of the population corresponded mainly to the logistic rules. In 180 – 190 there was a demographic catastrophe, after that started the period of wars, till the middle of the 3rd century the population decreased five times according to official documents.

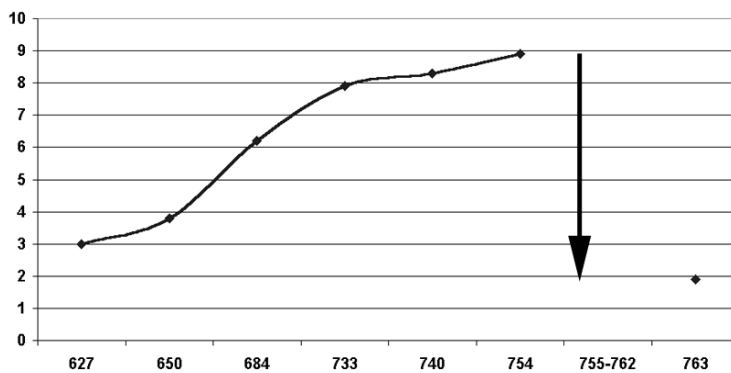


Fig. 10. The population of China in 7th-8th centuries (millions farms)

invasions. The estate monarchy prevailed during the cycle. In the phase of compression the regeneration of the étatist monarchy took place. However the revolt of the military estate resulted in the demographic catastrophe and the regeneration of the estate monarchy. (Transformation C^cBC).

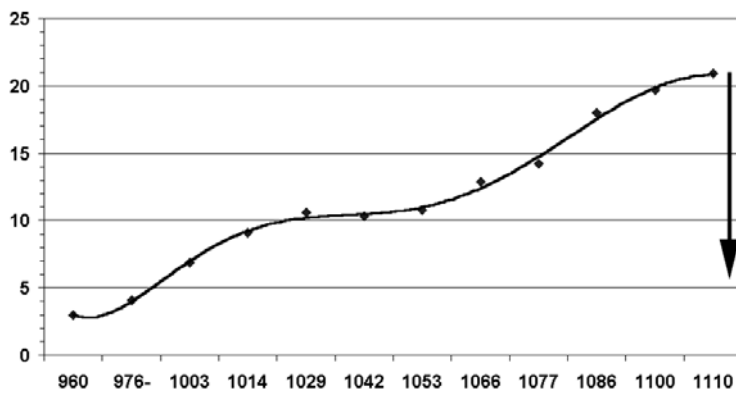


Fig.11. The population of China in Sung epoch (millions farms)

land property. (Transformation BA_b). There is information about the size of the population for this cycle (Lee

3. The cycle of the Later Han epoch (40 – 180-s). The new étatist monarchy has allotted the peasants by a land, but it has not confined a private property further. In a phase of compression the development of relations of private ownership resulted in

4. The cycle of the Tsin epoch. (260 – 320-s). The étatist monarchy prevailed during the cycle. State ownership of land and the system of equal peasant's allotments took place. The cycle was interrupted by a nomads' invasion. The nomads became the privileged military estate of the new estate monarchy . (Transformation BC^c).

5. The cycle of the North Vej epoch. (400 – 540-s). Before the cycle there was an intercycle for about 80 years, the period of the nomads'

6. The cycle of the Sui epoch. (550 – 620-s). The estate monarchy prevailed during the cycle. In the phase of compression the overall revolt resulted in the demographic catastrophe and the regeneration of the étatist monarchy. (Transformation CB).

7. The first cycle of the T'ang epoch. (630 – 750-s). The étatist monarchy prevailed during the cycle. Though the system of equal allotments existed the sale of land began in the phase of compression. The military mutiny resulted in the civil war and the demographic catastrophe. After the war the monarchy coexisted with the private

1921: 436). It can be seen on the diagram (Fig. 10) that the growth of the population conformed mainly to the logistic rules. In 755 – 762-s there was a demographic catastrophe, which destroyed $\frac{3}{4}$ of the population .

8. The second cycle of the T'ang epoch. (760 – 880-s). In the phase of compression the ruin of the peasants resulted in the large peasants' revolt and the demographic catastrophe. The state collapsed and long period of intrinsic wars began. (No transformation A_bA_b).

9. The cycle of the Sung epoch (950 – 1120-s). Before the cycle there was an intercycle for about seventy years. In the phase of compression the monarchy set through active reforms in order to lessen the demographic pressure. Cultivation of the new lands extended greatly the ecological niche of China – the period of the inside colonization starts and the population begins to grow. After exhausting of the cultivated lands the phase of compression starts again in the 12th century. So the curve of the growth of population in the Sun epoch consists of two combined logistic curves (Fig. 11⁵). This example shows the role of technical inventions, which extend the ecological niche and bring the logistical curve to a new level. The cycle was interrupted by the nomads' invasion and conquest of North China. (Transformation A_bC^c for North China and no transformation A_bA_b for South China).

10. The cycle of the Kin epoch in North China. (1140 – 1210-s). The estate monarchy prevailed in the beginning of the cycle. In a phase of compression the regeneration of étatist monarchy took place. The cycle was interrupted by the Mongolian conquest. (Transformation C^cBC^c for North China and no transformation A_bA_b for South China)

11. The cycle of the Yuan epoch (1260 – 1350-s). Before the cycle there was an intercycle for about fifty years – the period of the Mongolian conquest. The estate monarchy prevailed in North China in the beginning of a cycle. But in South China the conquest was not accompanied by essential modifications of the social system. In the phase of compression the ruin of peasants resulted in the large revolt and the regeneration of étatist monarchy. (Transformation C^cB for North China and A_bB for South China).

12. The cycle of the Ming epoch (1360 – 1640-s). The étatist monarchy prevailed in the beginning of the cycle. In the phase of compression the sale of land and the ruin of peasants took place. The ruin of peasants resulted in the large revolt, but the landowners asked the Manchus for help, and the latter conquered China. (Transformation $BA_bA_c^c$).

IV. The cycles of the history of India:

In India there are only four demographic cycles to pick out because of small amount of documentation of that ancient period.

1. The first cycle of the Sultanate of Delhi (1250 – 1340-s). The cycle began after the Mussulman conquest of India. Mussulman warriors became privileged military estate of the new state. In the beginning of the 13th century the transformation of the Indian society took place under a military pressure of Mongols. Sultan Ala'u'ddin has taken away the lands from the warriors and has copied the Persian-Mongolian étatist monarchy. This example shows, that the military pressure can replace demographic pressure in some cases and étatist monarchy can be spread by copying. In 1340-s the high taxes resulted in the large famine and epidemics, which meant demographic catastrophe. The weakening of a monarchy was the outcome of the catastrophe and revolts. (Transformation $C^cB^cA_c$, B^c means the copying of étatist monarchy).

2. The second cycle of the Sultanate of Delhi (1350 – 1390-s). The weakening of the state opened the country for the conquerors. In 1399 Delhi was conquered by Timur's army. Afghan tribes came together with this army to India and divided the country into feudal principalities. (Transformation A_cD^c).

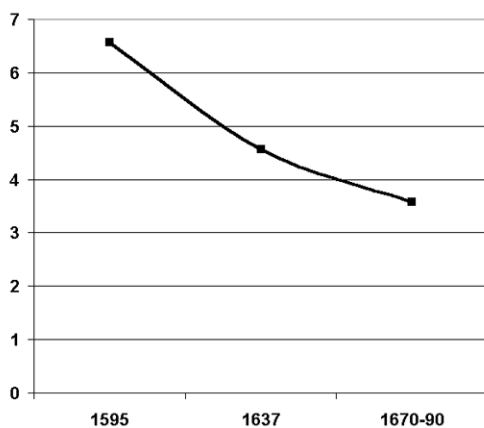


Fig. 12. Curve of consumption in India in Mughals epoch

3. The Afghan cycle (1450-1550-s). The internecine wars proceeded more than 50 years, then the Lodis dynasty united Northern India. In the middle of the 16th century the military pressure and the copying resulted in the regeneration of étatist monarchy again. (Transformation $D^cA_cB^c$).

4. The cycle of the Mughal Empire (1570 – 1710-s). The étatist monarchy prevailed during the cycle. In the phase of compression the shortage of land was discovered for the first time in the history of India and the demographic factor began to react. The ruin of peasants both the revolts of peasants and national minority were marked. The peasants could not pay the taxes and the

financial crisis resulted in a weakening of the state. This weakening led to the separation of provinces and the lack of force to resist outside enemies. Eventually, the Nadir-Shah's invasion resulted in the fall of the empire. After the long season of intrinsic wars the country was conquered by Englishmen. (Transformation BC^c). In fig. 12 the sinking level of consumption in the period of the Mughals is to be seen⁶. It should be noted, that the question about the reason of the crisis and decay of the Mughal Empire is still a controversial subject. We think, that the curve shows quite obviously, that the decay of the Empire was caused by an ecosocial crisis, finishing the demographic cycle in the 16th -17th centuries.

Now we can summarize the data on social-political transformations during the cycles.

We have the sequence of transformations for Sumer and Babylonia (the number of a cycle is indicated in brackets):

Ia) AB(1)-BA^c(2)-A^cBA^c(3)-A^cB(4)-BA^c(5)-A^cA^c(6)-A^cA^c(10)-A^cC^c(11)

The sequence of transformations for Assyrian and later Mesopotamia:

Ib) AA_b(7)-A_bB(8)-BC^c(9)-C^cA_cC^c(12)-C^cA_cD^c(13)-D^cA_c(14)-A_cB(15)-BC^c(16)-C^cC(17)-CA_b(18)-A_bC^c(19)-C^cB(20)-BC^c(21).

The sequence of transformations for Egypt (we note the transformations since the fourth cycle, as the first three cycles are insufficiently documented):

II)A_bA_b(4)-A_bBA^c(5)-A^c_bBA^c(6)-A^c_cBC^c(7)-C^cBC^c(8)-C^cB(9)-BC^c(10)-C^cA_b(11)-A_bB (12)- BC^c (13)-C^cC (14)-CC(15)-CB(16)-BB(17)- BC^c(18)-C^cC(19)

The sequence of transformations for North China:

III) A_cB (1)-BA_b(2)-A_bBA_bB(3)-BA_bB(4)-BC^c(5)-C^cBC(6)-CB(7)-BA_b(8)-A_bA_b(9)-A_bC^c(10) -C^cBC^c(11)-C^cB(12)-[A_bA_b(10a)- A_bA_b(11a)-A_bB(12a) for South China]-BA_bA_c(13)

The sequence of transformations for North India:

IV) C^cB^cA_c (1)-A_c D^c(2)-D^cA_cB^c(3)-B^cC^c(4).

There are as many as 57 cycles in these sequences. 25 cycles (about a half) were finished by the conquest of the country by outside enemies. It testifies that the conquest is the natural outcome of the crisis. But we wish to see natural development without conquests. For this purpose we shall remove from sequences the cycles completed by conquests except for multiple cycles having intrinsic transformation. In these multiple cycles we shall remove last letter (outcome of conquest).

Ia.1) AB(1)--A^cB(3)-A^cB(4)---

Ib.1) AA_b(7)-A_bB(8)--C^cA_c(12)-C^cA_c(13)-D^cA_c(14)-A_cB(15)--C^cC(17)- CA_b(18)--C^cB(20).

II.1)A_bA_b(4)-A_bB(5)-A^c_bB(6)-A^c_cB(7)-C^cB(8)-C^cB(9)--C^cA_b(11)-A_bB(12)--C^cC(14)-CC(15)-CB(16)-BB(17)-C^cC(19)

III.1) A_cB (1)-BA_b(2)-A_bBA_bB(3)-BA_bB(4)--C^cBC(6)-CB(7)-BA_b(8)-A_bA_b(9)--C^cB(11)-C^cB(12) - [A_bA_b(10a)- A_bB(12a) for South China]-BA_b(13)

IV.1) C^cB^cA_c (1)--D^cA_c(3).

We research a direction of the evolution in cycles, which began in conditions of the predominance of society with private ownership. For this purpose we shall leave only those cycles, which begin with the letter A.

Ia.2) AB(1)--A^cB(3)-A^cB(4)

Ib.2) AA_b(7)-A_bB(8)---A_cB(15)---).

II.2)A_bA_b(4)-A_bB(5)-A^c_bB(6)-A^c_cB(7)---A_bB(12)---

III.2) A_cB(1)-A_bBA_bB(3)--A_bA_b(9)--[A_bA_b(10a)-A_bB(12a) for South China]

We have 16 cycles, which began in the conditions of the domination of private property. 12 of these cycles generated the étatist monarchy (and one of the cycles generated the étatist monarchy twice). 4 cycles did not change the social system, but the étatist monarchy appeared in the next cycles. Thus we see, that the outcome of a classical demographic cycle is étatist monarchy. It confirms our theoretical prediction and Alfred Sauvy's thesis. But it is necessary to note, that the struggle between private and state ownership in the Near East was in the far past, and it was completed by a victory of étatist monarchy. In China the social revolutions took place later, up to our time. It is a possible explanation, that the Chinese history began much later than the history of Near East and we have a smaller amount of cycles in China. In India the shortage of land was found for the first time in the 17th century and the problem of private property was not crucial before this time.

What was the destiny of étatist monarchy? Let's choose from sequences Ia.1-IV.1 cycles beginning with the letter B (and multiple cycles too).

II.3) BB(17)

III.3) BA_b(2)- A_bBA_bB(3)-BA_bB(4)---BA_b(8)--BA_b(13)

It turns out in China there were some cases of transformation of étatist monarchy to a society with private ownership both as a result of crisis', and as a result of the state decomposing in a phase of compression. But then in this or in the next cycle the compression lead to large peasants revolts and the étatist monarchy usually came back. In Near East the étatist monarchy was stable; it perished only as a result of conquests. Let's research outcomes of conquests. Let's choose from sequences Ia-IV cycles which are coming to an end by conquest.

- Ia.4) BA^c(2)-A^cBA^c(3)--BA^c(5)
 Ib.4) BC^c(9)---BC^c(16)---BC^c(21).
 II.4) A_bBA_b^c(5)-A_b^cBA_b^c(6)-A_c^cBC^c(7)-C^cBC^c(8)--BC^c(10)--BC^c(13)---BC^c(18)
 III.4) BC^c(5)--C^cBC^c(11)
 IV.4) B^cC^c(4).

5 cases are present, when étatist monarchy was transformed to a society with predominance of a private property. But these cases belong to a deep antiquity, to an epoch before the appearance of cavalry. After the appearance of cavalry there was a possibility of specialization of estates and the conquerors became the special estate of the warriors-cavaliers. 11 cases of transformation of étatist monarchy to estate monarchy are fixed and this evolution was the basic direction of transformation of étatist monarchy .

What was the destiny of estate monarchy? Let's choose from sequences Ia1-IV.1 cycles beginning with the letter C.

- Ib.5) C^cA_cC^c(12)-C^cA_cD^c(13)--C^cC(17)- CA_b(18)--C^cB(20).
 II.5) C^cBC^c(8)-C^cB(9)--C^cA_b(11)--C^cC(14)-CC(15)-CB(16)--C^cC(19)
 III.5) C^cBC(6)-CB(7)--C^cBC^c(11)-C^cB(12)
 IV.5) C^cBA_c(1).

We have 4 cases, when the estate monarchy is stable. The estate monarchy is transformed to a society with private property in 4 cases too. There is decomposing military estate and privatization of lands in these cases. At last, the estate monarchy is transformed to étatist monarchy in 9 cases. In these cases reforms or the revolutions, which even a position of estates, occur. Thus, the basic direction of the estate monarchy transformation is transformation to the étatist monarchy. Hence, we have circulation, a conquest transforms étatist monarchy to an estate monarchy, while reforms and the revolutions make an inverse transformation.

So, we see that the compression generates étatist monarchy. In the early period of Near East history invasion of barbarians blasted the étatist monarchy and brought back the society with private ownership, but in the next cycle the étatist monarchy revived. In the Middle Ages the barbarians became privileged military estate and transformed the étatist monarchy to the estate monarchy . But in the next cycle the compression led to the inverse transformation.

On the contrary, in China sometimes a decomposing of étatist monarchy can be seen and private property develops in a phase of compression. But then in this or in the next cycle the compression generated peasants revolts and the regeneration of étatist monarchy.

In India the demographic pressure began to determine the development only at the end of the fourth cycle. The external factors form a social system in conditions of a low pressure, and, in particular, we see, that the diffusion of étatist monarchy is possible by copying the orders of the potent military étatist societies.

In conclusion it is necessary to add, that the theory of demographic cycles shows the development of the pre-industrial society. The industrial and technical revolutions of the two last centuries meant sudden extension of ecological niche; similar to the Sung epoch, the logistic curve began to rise to a new level, and it's not clear yet, when the limitations, connected with the natural sources, will come. And what is more, the sinking birth rate during the so-called "demographic revolution" shows considerable changes in the scheme of the population growth. These changes make the theory of the demographic cycles doubtful. E. Le Roy Ladurie called Maltus the prophet of the past on the last page of his famous book – the theory by Maltus explains the past, but it can't explain the future.

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Notes

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¹ The graph is constructed on the basis of information kept in the books by M. Lee (Lee 1921, 436) and K. Chao (Chao 1986, 218-219).

² John Komlos, personal communication.

³ These papers can be found on a site <http://hist1.narod.ru>.

⁴ See: Lee M. (1921), p. 436; Krukov, M., Perelomov L., Sofronov M., Cheboksarov N. (1983), p. 41.

⁵ The graph is constructed on the basis of information kept in the books by M. Lee (Lee 1921, 436) and Krukov, M., Maljavin, V., Sofronov, M. (Krukov, Maljavin, Sofronov 1984, 54).

⁶ The graph is constructed on the basis of information kept in the works by I. Habib (Habib 1963, 83; Habib 1982, 373-379) and A. W. Heston (Heston 1977).