Global Urbanization and Political Development of the World System*

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Section 1 *of this article ('Global Urbanization Dynamics: A Quantitative Analysis') presents a mathematical analysis of the long-term global urbanization dynamics and demonstrates that it could be described as a series of phase transitions between attraction basins. This makes it possible to suggest new approaches to the analysis of global social macroevolution.* ***Section 2*** *('Political Development of the World System') presents a three-stage model of the macroevolution of the World System statehood (early – developed – mature state) that, we believe, describes the main features of political macroevolution better than the two-stage model proposed by Claessen and Skalník (early – mature state). This model has been used as a basis for the analysis of changes in the development of political structures from the pre-state polities and the most primitive early states (and their analogues) till the modern supercomplex states. In this section we also analyze the relationship between the growth of the territory controlled by the World System states and the growth of the statehood complexity. Finally,* ***Section 3*** *('Urbanization and Political Development of the World System: A Comparative Analysis') attempts at the detection of the correlation between the global evolution of political structures and global urbanization processes. This study confirms the presence of a system of attraction basins and phase transitions within the World System macroevolutionary development field, as well as the presence of mathematically interpretable correlations and interrelations between the analyzed global processes – political, urbanizing, demographic, technological, and sociostructural.*

Keywords: *urbanization, urban population, macroevolution, World System, political development, early state, developed state, mature state.*

1. Global Urbanization Dynamics: A Quantitative Analysis

The available estimates of the World System[1] urban population up to 1990 may be plotted graphically in the following way (see Diagram 1.1).

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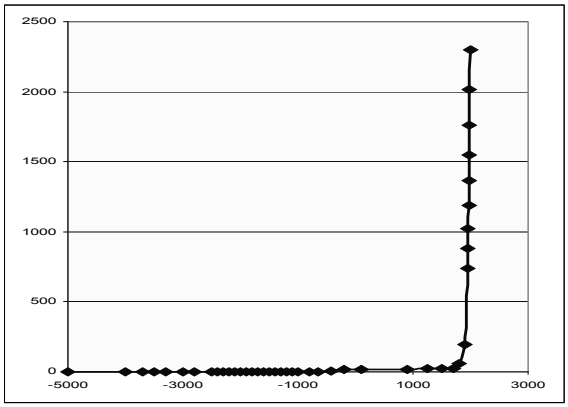
[1] We speak here about the system that originated in the early Holocene in the Middle East in direct connection with the start of the Agrarian ('Neolithic') revolution, and that eventually encompassed the whole world. Following Andre Gunder Frank (1990, 1993) we denote this system as 'the World System'. As we have previously shown (Korotayev, Malkov, and Khaltourina 2006a, 2006b), it was the World System development that produced the hyperbolic trend of the world's population growth. The presence of a hyperbolic trend itself indicates that the major part of the respective entity (*i.e.* the world population in our case) had a systemic unity; and we believe that the evidence for this unity is already available. Indeed, we have evidence for the systematic spread of major innovations (domesticated cereals, cattle, sheep, goats, horses, plow, wheel, copper, bronze, and later iron technology, and so on) throughout the whole North African – Eurasian Oikumene for a few millennia BCE (see, *e.g.*, Chubarov 1991, or Diamond 1999 for a synthesis of such evi-

Diagram 1.1. Dynamics of the World Urban Population (in millions), for cities with > 10,000 inhabitants (5000 BCE – 1990 CE)



Notes: Data sources: Modelski 2003; Gruebler 2006; UN Population Division 2012. Modelski provides his estimates of the world urban population (for cities with > 10,000 inhabitants) for the period till 1000 BCE, Gruebler's estimates cover the period between 900 and 1950 CE, whereas the UN's estimates cover the period after 1950. The estimates of the world urban population for the period between 1000 BCE and 900 CE were produced on the basis of Chandler's (1987) data on the world urban population living in large cities (with > 40,000 inhabitants).

As we have shown earlier (see, *e.g.*, Korotayev 2006a; Korotayev, Malkov, and Khaltourina 2006b; Grinin and Korotayev 2009a), the overall dynamics of the world urban population up to the 1990s is described mathematically in a rather accurate way by the following quadratic-hyperbolic equation:

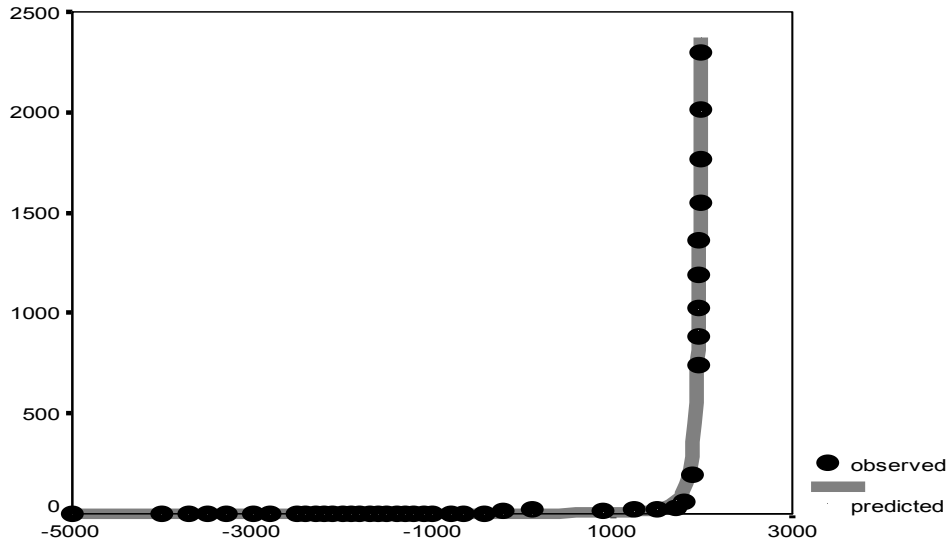
$$U_t = \frac{C}{(t_0 - t)^2}, \quad (1)$$

dence). As a result, the evolution of societies in this part of the world, already at that time, cannot be regarded as truly independent. Note, of course, that there would be no grounds to speak about the World System stretching from the Atlantic to the Pacific, even at the beginning of the 1st millennium CE, if we applied the 'bulk-good' criterion suggested by Wallerstein (1974, 1987, 2004), as there was no movement of bulk goods at all between, say, China and Europe at that time (as we have no reason to disagree with Wallerstein in his classification of the 1st century Chinese silk reaching Europe as a luxury rather than a bulk good). However, the 1st century CE (and even the 1st millennium BCE) World System definitely qualifies as such if we apply the 'softer' information-network criterion suggested by Chase-Dunn and Hall (1997). Note that at our level of analysis the presence of an information network covering the whole World System is a perfectly sufficient condition, which makes it possible to consider this system as a single evolving entity. Yet, in the 1st millennium BCE any bulk goods could hardly penetrate from the Pacific coast of Eurasia to its Atlantic coast. However, by that time the World System had achieved such a level of integration that iron metallurgy could spread through the whole of the World System within a few centuries. Another important point appears to be that even by the 1st century CE the World System had encompassed appreciably less than 90 per cent of all the inhabitable landmass. However, it appears much more important that already by the 1st century CE more than 90 per cent of the world population lived precisely in those parts of the world that were integral parts of the World System (the Mediterranean region, the Middle East, as well as South, Central, and East Asia) (see, *e.g.*, Durand 1977: 256), whereas almost the whole urban population of the world was concentrated just within the World System. A few millennia before, we would find another belt of societies strikingly similar in level and character of cultural complexity, stretching from the Balkans up to the Indus Valley outskirts, that also encompassed most of the world population of that time (Peregrine and Ember 2001a, 2001b; Peregrine 2003). Thus, already for many millennia the dynamics of the world population, the global urbanization, the world political centralization and so on reflect first of all the dynamics of population, urbanization, political centralization, *etc.*, of the World System that makes it possible to describe them by means of mathematical macromodels (see, *e.g.,* Korotayev 2005, 2007; Grinin and Korotayev 2009b).

where U_t is the world urban population at the moment t, whereas C and t_0 are constants, with t_0 corresponding to an absolute limit ('singularity' point) at which U would become infinite if the world urban population growth trend observed by the 1990s continued further.

Thus, for the period between 5000 BCE and 1990 CE the correlation between the dynamics generated by equation (1) and empirical estimates looks as follows (see Diagram 1.2).

Diagram 1.2. World Urban Population Dynamics (in millions), for cities with > 10,000 inhabitants (5000 BCE – 1990 CE): the correlation between the dynamics generated by the quadratic-hyperbolic model and empirical estimates



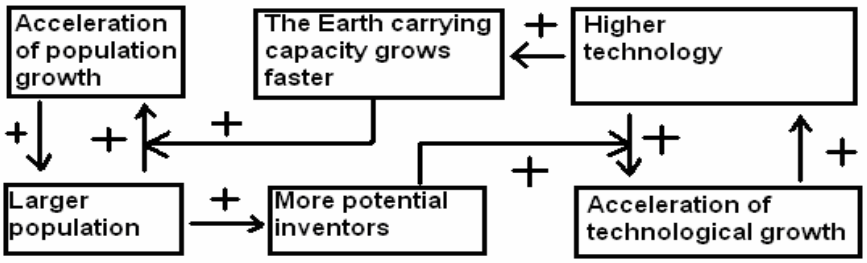
Notes: $R = 0.998$, $R^2 = 0.996$, $p << 0.0001$. Black markers correspond to empirical estimates by Modelski (2003), Gruebler (2006) and UN Population Division (2012). The solid grey curve was generated by the following equation:

$$U_t = \frac{7705000}{(2047 - t)^2}.$$

Parameters C (7705000) and t_0 (2047) have been calculated with the least squares method.

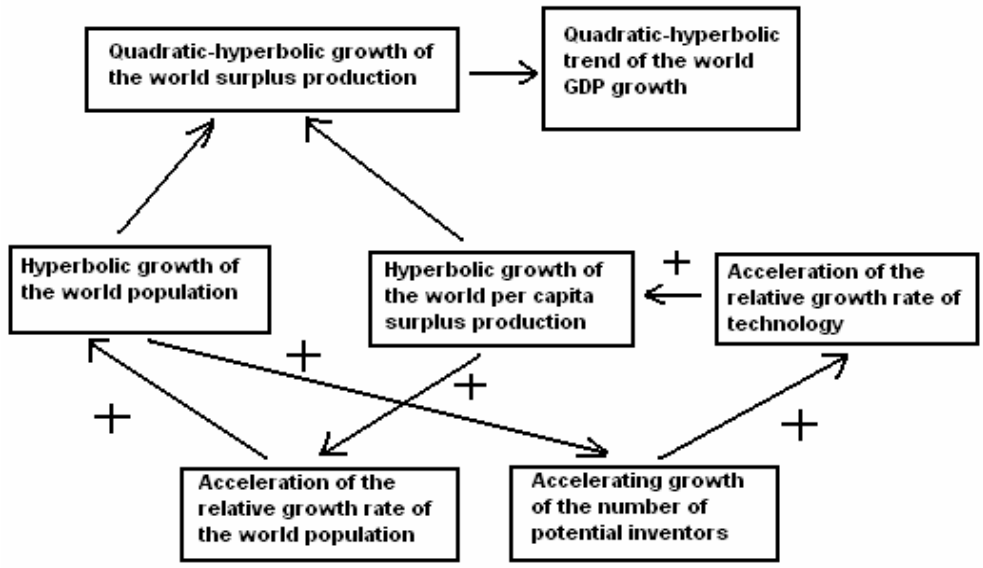
The observed very high level of correlation between the long-term macrodynamics of the world urban population and the dynamics generated by the quadratic-hyperbolic model does not seem coincidental at all and is accounted for by the presence of second-order nonlinear positive feedback loops between the world's demographic growth and the World System technological development that can be spelled out as follows: the more people – the more potential inventors – the faster technological growth – the faster growth of the Earth's carrying capacity – the faster population growth – with more people you also have more potential inventors – hence, faster technological growth, and so on (Kuznets 1960; Simon 1977, 1981, 2000; Grossman and Helpman 1991; Aghion and Howitt 1992, 1998; Jones 1995, 2003, 2005; Kremer 1993; Cohen, 1995; Komlos and Nefedov 2002; Podlazov, 2004; Tsirel 2004; Grinin and Korotayev 2009a, 2009b; Korotayev, Malkov, and Khaltourina 2006a, 2006b; Korotayev 2005, 2007, 2008, 2009; Markov and Korotayev 2007) (see Diagram 1.3).

Diagram 1.3. Block Scheme of the Nonlinear Second Order Positive Feedback between Technological Development and Demographic Growth



As our (both mathematical and empirical) analysis (see, *e.g.*, Korotayev, Malkov, and Khaltourina 2006a; Korotayev 2007, 2008, 2009) suggests, up to the 1970s the above-mentioned mechanism tended to lead not only to the hyperbolic growth of the World System population, but also to the hyperbolic growth of the per capita surplus[2] as well as to the quadratic-hyperbolic growth of the world GDP (see Diagram 1.4).

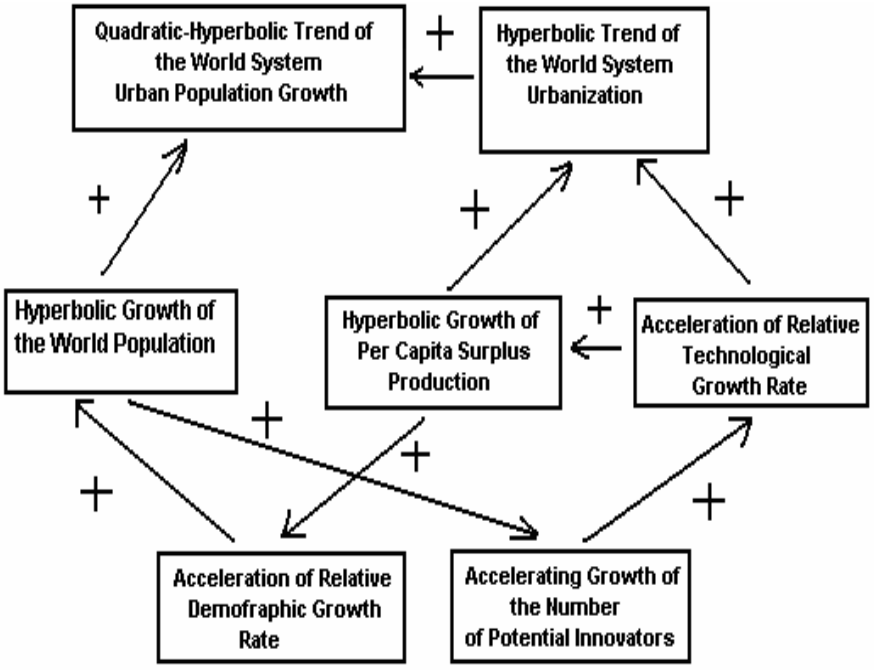
Diagram 1.4. Block Scheme of the Nonlinear Second Order Positive Feedback between Technological Development, Demographic and Economic Growth



Up to the 1970s – 1990s the trend towards the hyperbolic growth of the per capita surplus production (in conjunction with a hyperbolic acceleration of the technological growth) tended to result in the trend towards the hyperbolic growth in global urbanization (*i.e.* the hyperbolic growth of the urban population share in the total population of the world). In conjunction with the hyperbolic growth of the world's population this, naturally, also produced a long-term trend towards the quadratic-hyperbolic growth of the world urban population (see Diagram 1.5).

[2] That is, the product produced, per person, over the amount (m) minimally necessary to reproduce the population with a zero growth rate in the Malthusian system.

Diagram 1.5. Block Scheme of the Nonlinear Second Order Positive Feedback Generating the Trend towards the Quadratic-Hyperbolic Growth of the World System Urban Population



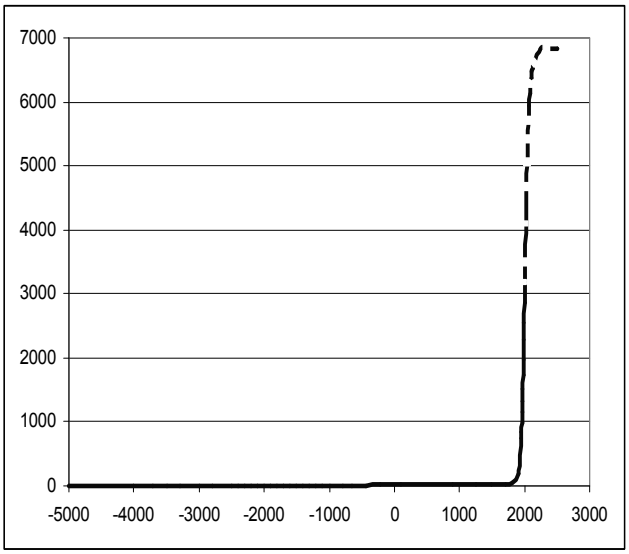
The best conformity of the dynamics generated by the quadratic-hyperbolic equation (1) to the empirical estimates of the world urban population is observed for the period prior to 1965. For this period, equation (1) describes more than 99.88 per cent of all the macrovariation of the variable in question ($R = 0.9994$, $R^2 = 0.9988$, with the following parameter values: $C = 2610000$ [in millions], $t_0 = 2010$). Incidentally, the above-mentioned parameter value ($t_0 = 2010$ [CE]) indicates that if the world urban population growth trend observed prior to the mid-1960s continued, the world urban population would become infinite already in 2010. That is why, it is hardly surprising that since the mid-1960s the World System started to withdraw from the blow-up regime with respect to the variable in question. Indeed, since the 1960s we observe a slow-down of the relative rate of the world urban population growth, and, according to the forecasts (see, *e.g.*, Gruebler 2006) in the forthcoming decades the slow-down of absolute rates of the world population growth will also start, resulting in the stabilization of the world urban population in the 22nd century at the level of about 7 billion (see Diagram 1.6).

The general macrodynamics of the World System urbanization can be described mathematically with the following differential equation (Korotayev 2006; Grinin and Korotayev 2009a, 2009b).

$$\frac{du}{dt} = aSu\ (u_{\lim} - u)\ , \tag{2}$$

where u is the share of the urban population, S is per capita surplus produced within the given level of the World System's technological development, a is a constant, and $u_{\lim}$ is the maximum possible proportion of the urban population (that may be estimated as being within 0.8–0.9, and can be regarded within the given context as the 'saturation level').

Diagram 1.6. World Urban Population Dynamics (in millions), for cities with > 10,000 inhabitants (5000 BCE – 2006 CE), with a forecast till 2350



Notes: Data sources: Modelski 2003; Gruebler 2006; UN Population Division 2012. The curve for 2006–2350 has been calculated on the basis of Gruebler's medium forecast for the dynamics of the global urbanization (*i.e.*, the proportion of urban population in the world's overall population) and our own forecast of the world population for this period (Korotayev, Malkov and Khaltourina 2006a).

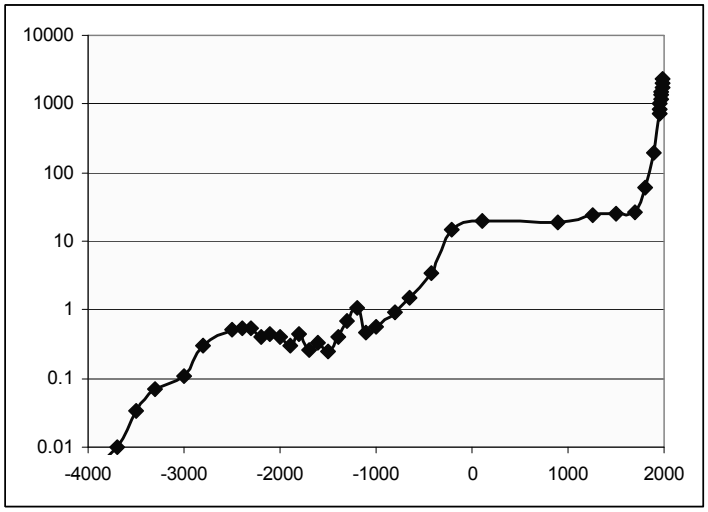
With low values of u (< 0.3) its dynamics is determined, first of all, by the hyperbolic growth of S.[3] As a result, the urbanization dynamics turn out to be also close to the hyperbolic dynamics, which, in conjunction with the hyperbolic growth of the World System population (that was naturally observed just for the period characterized by low values of global urbanization) led to the fact that the quadratic-hyperbolic equation describes very well the overall macrodynamics of the world urban population for this period. With higher values of the global urbanization index (u) the saturation effect is perceived more and more strongly, and as it approaches the saturation level the global urbanization growth rates begin to increasingly slow down, which is observed at present – a time when the World System has begun to withdraw from the blow-up regime.

One can hardly ignore that the history of global urbanization up to the 19th century looks (as seen in Diagrams 1.1–1.2 and 1.6) extremely 'dull', producing an impression of an almost perfect stagnation[4] followed by an explosive modern urban population growth. In reality, the latter just does not allow us to discern, in the diagrams above, the fact that many periods of the pre-modern world urban history were characterized by the dynamics that was comparatively not less dramatic. In fact, the impression of the pre-modern urban stagnation created by the diagrams above, could be regarded as an illusion (in the strict sense of this word) produced just by the quadratic-hyperbolic trend of the world urban population growth observed up to the mid-1960s. To see this it is sufficient to consider Diagram 1.1 in a logarithmic scale (see Diagram 1.7).

[3] For the systems of equations describing this hyperbolic growth generated by the second-order nonlinear positive feedback loops between the World System technological development and the world demographic growth see, *e.g.*, Korotayev, Malkov, and Khaltourina 2006a, 2006b.

[4] Whereas for the period prior to 1000 BCE this stagnation looks absolute.

Diagram 1.7. The World Urban Population Dynamics (in millions), for cities with > 10,000 inhabitants (5000 BCE – 1990 CE), logarithmic scale

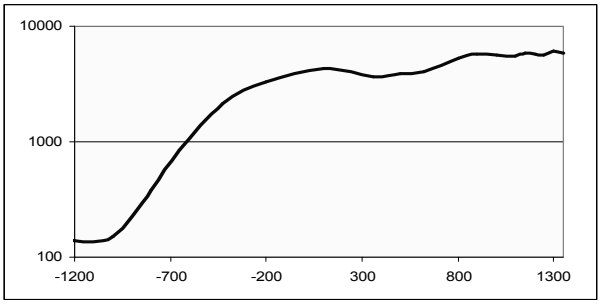


As we see, the structure of the curve of the World System urban population growth turns out to be much more complex than one would imagine at first glance at Diagrams 1.1–1.2 and 1.6. First of all, one can single out in a rather distinct way three periods of relatively fast world urban population growth: (A1) the second half of the 4th millennium BCE – the first half of the 3rd millennium BCE, (A2) the 1st millennium BCE and (A3) the 19th – 21st centuries CE. Moreover, one can see two periods of relatively slow growth of the world urban population: (B1) the mid-3rd millennium BCE – the late 2nd millennium BCE and (B2) the 1st – 18th centuries CE. As we shall see below, two other periods turn out to be essentially close to these epochs: Period (B0) immediately preceding the mid-4th millennium (when the world urban population did not grow simply because the cities had not appeared yet and no cities existed on the Earth), and Period (B3) that is expected to begin in the 22nd century, when, according to forecasts, the world urban population will again stop growing in any significant way (in connection with the World System urbanization reaching the saturation level and the stabilization of the world population) (see, *e.g.*, Gruebler 2006; Korotayev, Malkov, and Khaltourina 2006a, 2006b).

As one can see in Diagram 1.7, in Period B1 (from the mid-3rd millennium BCE to the early 1st millennium BCE) the world urban population fluctuated at the level reached by the end of the previous period (A1), whereas the trend dynamics carved its way with great difficulties through the dominant cyclical and stochastic dynamics (see, *e.g.*, Modelski 2003; Frank and Thompson 2005; Harper 2007). In Diagram 1.7 one could hardly discern the cyclical component of the world urban population dynamics during Period B2 (the 1st – 18th centuries CE), which is accounted for by the simple fact that the respective stretch of the diagram has been prepared on the basis of Gruebler's database that provides for this period a very small number of data points that is not sufficient for the detection of the cyclical component of the process under study. Within Period B2, this cyclical component will be more visible if we use Chandler's database, which provides much more data points for this period (Chandler 1987: 460–510) (see Diagram 1.8).[5]

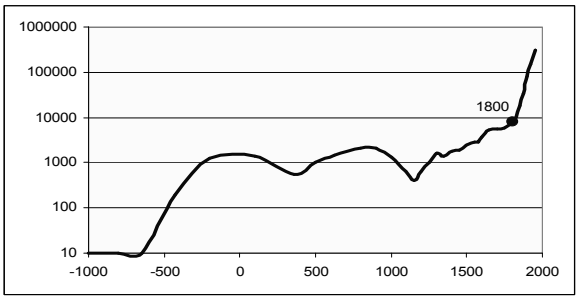
[5] This database consists of lists of the world largest cities for various time points with estimates of the respective cities' population at the respective moments of time. Chandler provides estimates for the following time points (numbers in brackets indicate the urban population in thousands, for cities with population not smaller than which the estimates are provided for the respective year; for example, number 20 in brackets after 800 BCE indicates that for 800 BCE Chandler's database provides estimates of the urban population for all the world cities with no less than 20 thousand

Diagram 1.8. Urban Population Dynamics (in thousands), for cities with not less than 40,000 inhabitants (1200 BCE – 1350 CE), logarithmic scale



As we see, in this diagram we can observe for Period B2 not only a distinct cyclical component,[6] but also a more distinct upward trend. This trend will be even more clearly seen if we plot Chandler's data on the population dynamics of megacity (> 200,000) inhabitants (which will also make it possible for us to consider the period after 1350) (see Diagram 1.9).

Diagram 1.9. World Urban Population Dynamics (in thousands), for cities with no less than 200,000 inhabitants (1000 BCE – 1950 CE), logarithmic scale

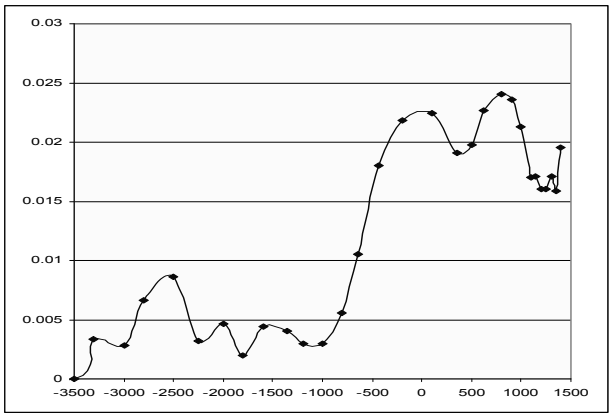


inhabitants) – 2250 BCE (20), 2000 BCE (20), 1800 BCE (20), 1600 BCE (20), 1360 BCE (20), 1200 BCE (20), 1000 BCE (20), 800 BCE (20), 650 BCE (30), 430 BCE (30), 200 BCE (30) and further for the following years CE: 100 (30), 361 (40), 500 (40), 622 (40), 800 (40), 900 (40), 1000 (40), 1100 (40), 1150 (40), 1200 (40), 1250 (40), 1300 (40), 1350 (40), 1400 (45), 1450 (45), 1500 (45), 1550 (50), 1575 (50), 1600 (60), 1650 (58), 1700 (60), 1750 (68), 1800 (20), 1825 (90), 1850 (116), 1875 (192), 1900 (30), 1914 (455), 1925 (200), 1950 (200) and 1970 (1930). The main problem with the use of Chandler's database within the context of the present study is that it turns out to be impossible to get data on the world urban population dynamics through the simple summation of the populations of the cities covered by Chandler for the respective years. Indeed, with such a simple summation we will obtain, for example, for 1825 a figure indicating the total urban population that lived in that year in cities with not less than 90 thousand inhabitants, for 1850 – for the cities with not less than 116 thousand inhabitants, for 1875 – for the cities with not less than 192 thousand inhabitants, for 1900 – for the cities with not less than 30 thousand inhabitants, for 1914 – for the cities with not less than 455 thousand inhabitants; and such a series of numbers will not supply us with any useful information. On the other hand, of course, if for one year we have at our disposal data on cities with > 80 thousand inhabitants, for a second – on cities with > 120 thousand, and for a third – on cities with > 100 thousand, we can trace the urban population dynamics for cities with > 120 thousand inhabitants. However, this does not solve the whole problem. Indeed, when we use Chandler's database with respect to the last centuries, we can only obtain a meaningful dynamic time series for the megacities (>200 thousand inhabitants). However, even with this approach we cannot obtain a general picture of the world urban population dynamics for the whole period covered by Chandler's database (that is, after 2250 BCE), as no such megacities existed before the mid 1st millennium BCE. The longest dynamic time series can be here obtained for the cities with no less than 40 thousand inhabitants (especially in conjunction with Modelski's database). However, in this case we cannot go beyond 1350 CE. Because of this, when using Chandler's database we will have to utilize the data on the total population of large cities (with no less than 40 thousand inhabitants) for the period between 3300 BCE and 1350 CE (in conjunction with Modelski's data on the period before 2250 BCE) and data on the total population of megacities (with no less than 200 thousand inhabitants each) for the period between 430 BCE and 1950 CE.

[6] In particular, after 1100, which is connected with the point that in Chandler's database after this year the interval between data points is reduced from 100 to 50 years.

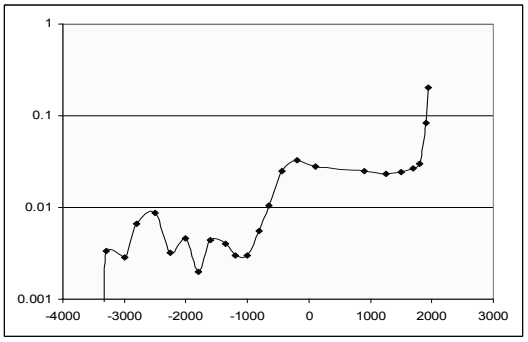
As we see, a steady upward trend can be traced here during several centuries before 1800. On the other hand, one should take into account the point that a relatively fast growth of the world urban population was observed during that period against the background of a hyperbolically accelerating growth of the world's overall population (see, *e.g.*, Korotayev, Malkov, and Khaltourina 2006a, 2006b). That is why we shall obtain a clearer picture of the global urbanization dynamics if we plot the estimates of the dynamics of the global urbanization index *per se*, that is the proportion of the urban population in the overall population of the world (see Diagram 1.10).

Diagram 1.10. Dynamics of the World Macro-urbanization Index (proportion of population living in large, > 40,000 inhabitants, cities) according to the estimates by Modelski and Chandler (3500 BCE – 1400 CE)



As has been mentioned above, Chandler's database does not make it possible to trace the world macro-urbanization dynamics after 1400.[7] That is why in order to obtain an overall picture of the global urbanization dynamics we shall have to rely with respect to Period B2 on Gruebler's estimates (by the way, let us recollect that because of a very small number of data points in this database the respective graphs do not reflect the cyclical component of the world macro-urbanization dynamics) (see Diagram 1.11).

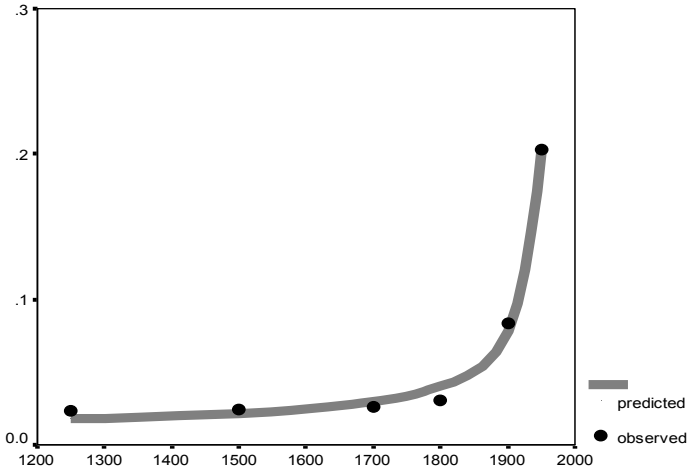
Diagram 1.11. Dynamics of the World Macro-urbanization (proportion of population living in large, > 40,000, cities in the overall population of the world) according to the databases of Modelski, Chandler, and Gruebler (4000 BCE – 1950 CE), logarithmic scale



[7] In fact, it produces a bit of a distorted picture already for 1400, as for this year it contains data on the cities with > 45 (and not 40) thousand inhabitants.

Our analysis suggests some idea of the general picture of the long-term macro-urbanization of the world. During Period A1 we observe the formation of the first large cities, and the proportion of their population reached the level of decimals of one per cent of the world's overall population. During Period B1 this variable had fluctuated within this order of magnitude until, during Period A2, it moved to the further order of magnitude, to the level of more than one per cent. The variable in question had fluctuated within this order of magnitude during Period B2 until, during Period A3, it began to shift to the next (and, note, the last possible) order of magnitude, to the level of dozens per cent. It is also remarkable that for the 2nd millennium CE Gruebler's database indicates a clear hyperbolic trend of the world macro-urbanization described mathematically by model (2) (see Diagram 1.12).

Diagram 1.12. World Macro-urbanization Dynamics, 1250–1950 CE: the correlation between predictions of the hyperbolic model and empirical estimates



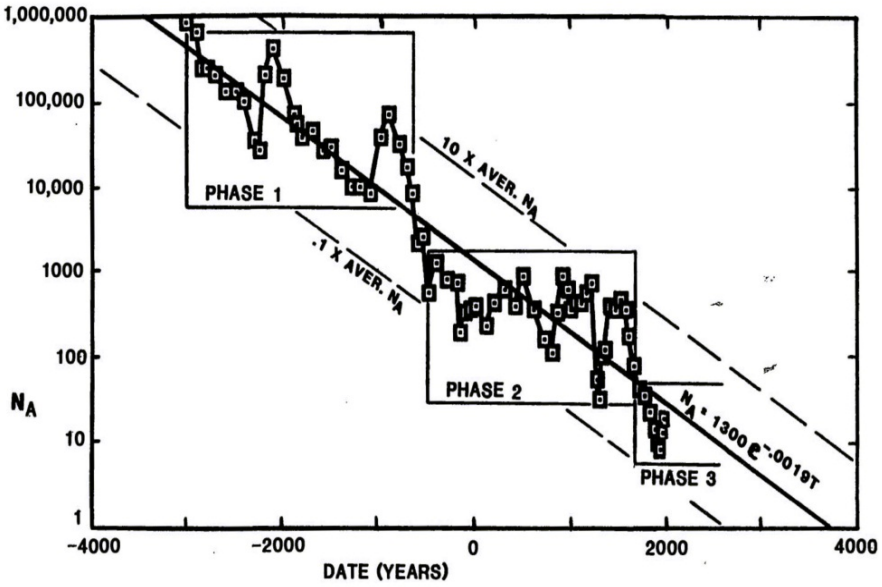
Notes: $R = 0.997$, $R^2 = 0.994$, $p < 0.0001$. The black markers correspond to Gruebler's (2006) empirical estimates. The solid grey curve has been generated by the following equation:

$$u_t = 0.01067 + \frac{5.203}{(1977 - t)}.$$

Parameters C (5.203), t_0 (1977) and the constant (0.01067) have been calculated with the least squares method.

Note that the detected global urbanization dynamics correlates rather well with the dynamics of the World System political organization (see *Section 2* of the present article). Note also that the above mentioned synchronous phase transitions to the new orders of magnitude of the global urbanization and new order of the World System political organization complexity coincide in time with phase transitions to higher orders of the World System political centralization that were detected by Taagepera and that took place, according to his calculations, during periods A1, A2 and A3. Taagepera estimates the World System political centralization dynamics using the indicator that he denotes as an 'effective number of polities' that is a reverse of the political centralization index (which has values between 0 and 1, where 1 corresponds to the maximum level of the world political centralization, that is the world unification within one polity). Thus, in Diagram 1.13 below, the downward trend corresponds to the GROWTH of political centralization of the world.

Diagram 1.13. Dynamics of the 'Effective Number of Polities' Calculated on the Basis of Territory Size Controlled by Various Polities (Taagepera 1997: 485, Fig. 4)



Similar phase transitions appear to be observed with respect to the world literacy macrodynamics. In fact, during Period A1 we observe the emergence of the first literate people whose share had reached the level of decimals of one per cent by the end of this period and fluctuated at this level during Period B1. During Period A2, the world literacy grew by an order of magnitude and reached the level of several percent of the world's total population, it fluctuated at this level during Period B2 till the late 18th century when Period A3 started. During that period the world literacy has reached the level of dozens per cent, and by the beginning of Period B3 (presumably in the 22nd century) it is likely to stabilize at the hundred-percent level (see, *e.g.*, Dyakonov 1994; Meliantsev 1996; Korotayev, Malkov, and Khaltourina 2006a).

In fact, the above-mentioned phase transitions can be regarded as different aspects of a series of unified phase transitions: Phase Transition A1 from medium complexity agrarian societies to complex agrarian ones, Phase Transition A2 from complex agrarian societies to supercomplex ones, and, finally, Phase Transition A3 from supercomplex agrarian societies to postindustrial ones (within this perspective, the period of industrial societies turns out to be a period of phase transition B2 – B3).

* * *

Thus, the World System history from the 6th millennium BCE can be described as a movement from Attraction Basin B0 (the one of medium complexity agrarian society) through Phase Transition A1 to Attraction Basin B1 (the one of complex agrarian society), and further through Phase Transition A2 to Attraction Basin B2 (the one of supercomplex agrarian society), and further through Phase Transition A3 to Attraction Basin B3 (the one of postindustrial society). Note that within this perspective, the industrial period turns out to be a period of phase transition from the preindustrial society to the postindustrial one.

2. Political Development of the World System

As the main evolving political unit of the World System is the state, it becomes necessary to begin this Section with a discussion of the relevant set of definitions regarding the evolutionary sequence of state types.[8]

When the development of statehood in the framework of the overall historical process is analyzed, two main stages are usually identified: the stage of the *early* state and the one of the *mature* state (see, *e.g.,* Claessen and Skalník 1978a, 1978b, 1978c; Claessen and van de Velde 1987, 1991; Skalník 1996; Shifferd 1987; Tymowski 1987). However, when we try to apply this scheme to the World System political development, it becomes evident that in no way is this scheme complete.

Firstly, if, according to the prevalent views, the first mature states appeared in ancient times (Egypt), or in the late 1st millennium BCE (China),[9] how could we classify the European states of the 18th and 19th centuries, let alone the contemporary states? Would they be also mature, or supermature?

Secondly, it is evident that the nineteenth century European states also differed in the most profound way from the complex politically centralized monarchies of the Antiquity and Middle Ages (which in their turn are qualitatively more complex than the early state) according to a number of other characteristics (in particular, with respect to the administration level and culture, the level of development of law, and the relationships between the state and society). This accounts for Max Weber's following statement: 'In fact, the State itself, in the sense of a political association with a rational, written constitution, rationally ordained law, and an administration bound to rational rules or laws, administered by trained officials, is known, in this combination of characteristics, only in the Occident, despite all other approaches to it' (Weber 1958: 15–16).[10]

Thirdly, it would be rather strange to assume that the industrial revolution of the 18th and 19th century did not lead to the radical transformation of the state organization, whereas the scheme *early state – mature state* does not reflect this transformation at all.

Thus, it is rather clear that Claessen and Skalník (1978b: 5) had reduced their scheme of the statehood development to the *pre-capitalist non-industrial* states only. Consequently, the second author of this article has suggested to significantly augment and amend the theory of the *early – mature* state (see Grinin 2006a, 2006c, 2006e, 2006g), and has come to the conclusion about the necessity to 'insert' between the early and mature state a stage of the *developed statehood.* Hence, we deal not with the two main stages of statehood development (the early states and the mature states), but with the following three stages:

a) **early states** are not sufficiently centralized yet and they politically organize societies with underdeveloped social, class (and, frequently, administrative-political) structures;

b) **developed states** are the formed centralized states of Late Antiquity, the Middle Ages, and the Early Modern period, which politically organize societies with distinct estate-class stratification;

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[8] Within the framework of this article *the state is defined as a category that denotes a system of specialized institutions, organs, and norms that support internal and external life of a society; an organization of power, administration, and order maintenance that possesses the following characteristics: (a) sovereignty (autonomy); (b) supremacy, legitimacy and reality of power within a certain territory and a certain circle of people; (c) has the capability to coerce people to fulfill its demands, as well as to change relations and norms.*

[9] For example, in the *Early State* (Claessen and Skalník 1978d) contributions dealing with Egypt and China (Janssen 1978: 213; Pokora 1978: 198–199) the period of the early state corresponds to the Ancient Kingdom (up to 2150 BCE), whereas for China it is regarded as the period preceding the formation of the Qin Empire (up to 221 BCE).

[10] Some scholars even believe that one can speak about the real states starting only from Early Modern Europe, after the 15th and 16th centuries (see, *e.g.*, Belkov 1995: 178–182). Vincent (1987) also prefers to speak about the *states* only after the 16th century. There are a number of other scholars who prefer to stick to the same position (see, *e.g.*, van der Vliet 2005).

c) **the mature states** of the capitalist epoch organize politically the societies where estates have disappeared, the bourgeois and working classes have formed, nations have developed, and representative democracy has proliferated.[11] To be more correct we should speak about Industrial, rather than capitalist period, as this group includes industrial socialist states. This has made it necessary to develop anew the statehood evolution theory and to suggest new formulations of the main characteristics of each of the stages of this evolutionary process (see Grinin 2006b, 2006e, 2006g, 2007d, 2008, 2009, 2011a; 2012: 83–135; Grinin and Korotayev 2006).

For each stage we can identify three phases: the *primitive, typical, and transitional states of each respective type.*[12] In the framework of this article the basic characteristics of statehood stages are identified on the basis of the middle phase of each stage (thus, respectively for *typical* early, *typical* developed, and *typical* mature states). The point is that at the first phase (the one of the *primitive* state of the respective type) the polity retains many elements of the previous state type, whereas in the third phase (the *transitional* phase) many of its institutions become 'overripe' and the first characteristics of a higher stage of the statehood development appear.

Main Differences between the Early, Developed, and Mature States

Early states differ greatly among themselves according to many characteristics, in particular with respect to the degree of their centralization, as well as the level of development of their administrative, taxation, and judicial systems. However, if we look for what differentiates them from the developed and mature states, we will find that the **early state** is always an **incomplete state** (both organizationally and socially). This 'incompleteness' is also relevant with respect to relationships between the state and the society. There were numerous versions of the early states, but within each of them some important elements of statehood were either absent, or significantly underdeveloped. In most cases this incompleteness was expressed in the most direct way, as most early states simply did not have any significant statehood attributes, or did not develop them to a sufficient degree. First of all, this is relevant with respect to such statehood attributes as *professional administration, control and repression apparatus, taxation, territorial division, as well as a sufficiently high degree of centralization and written law*. However, in some early states (such as, *e.g.,* the Incas state or the Early Kingdom in Egypt) a contrary disproportion is observed. Though the administrative apparatus and bureaucracy were rather powerful there, they were imposed upon societies that were underdeveloped socially and/or ethnically. Hence, in such cases it was the *society* that looked underdeveloped in comparison with the state.

The **developed state** is a state that has been **formed and completed, and centralized**, that has all the above mentioned attributes of statehood (among them the professional apparatus of administration and control, regular taxation and artificial territorial division). Thus, the statehood attributes that could be absent within the political system of the early

[11] Correspondingly **early, developed, and mature** states could be denoted as **simple, complex, and supercomplex**. Note that this terminology would correspond to the one suggested for the evolutionary typology of chiefdoms that are also subdivided into simple, complex, and supercomplex ones (see, *e.g.*, Korotayev *et al.* 2000; Kradin 2000). Note also that these three types of states are actually characterized by three different orders of magnitude of complexity as it is understood in Complexity Studies (see, *e.g.*, Lewin 1992; Waldrop 1992).

[12] In general, these names are given to the respective phases in accordance with the tradition of Claessen and Skalník (1978b: 22–23; 1978c: 640; Claessen 1978: 589) who identified the inchoate, typical, and transitional stages of the early state. However, there are certain problems when we deal with a regression from a developed to a primitive phase of certain types of statehood. For example, to denote the 18th century developed state in Egypt (after it had regressed from the typical developed statehood found there, *e.g.*, in the 16th, or 11th centuries) as 'inchoate' appears to be clearly misleading (see, *e.g.*, Grinin 2006h). Hence, the term 'primitive' seems to be more appropriate here.

state are necessarily present within the one of the developed state.[13] The developed state was a result of a long historical development and selection, due to which those states turn out to be more successful whose institutes are organically linked with the social structures of respective societies that are both grounded on the respective social order and support it. For example, in Russia such states with effective centralization developed on the basis of the formation of the estate society, estate monarchy, the alliance between the monarchs and nobility (and sometimes with cities). The developed state influences social processes in a much more purposeful and active way. It is not only tightly connected with the peculiarities of social and corporate structure of the society, but also constructs them in political and judicial institutes. In this respect, it can be regarded as an **estate-corporate** state. Naturally, different states reached the respective stage of their development in different times (see Table 1 for more detail).

The **mature state** is a result of capitalist development and the industrial revolution; hence, it has a qualitatively different production basis. Other differences between the mature state and its predecessors are also very significant. It is based on a formed or forming nation with all its peculiarities. Such a state is qualitatively more developed in organizational and legal respects, it always has a professional bureaucracy with definite characteristics (see, *e.g.*, Weber 1947: 333–334), and a clear mechanism of power transmission and rotation. It is also natural that the mature state has qualitatively more developed and specialized institutions of administration and control. The mature state was also gradually transformed from an estate-class state into a purely class one; and in its final stages it evolves into a social state. Thus, **in the Antiquity and Middle Ages there were no mature states, but only early and developed ones**. The first mature states could only appear in the late 17th and 18th centuries.

The above-mentioned evolutionary types of states differ among themselves by a number of other characteristics. In particular, it appears necessary to pay attention to these differences with respect to the interaction between *centralized power, the elite, and the commoners ('population').* This important by itself point acquires a special theoretical significance, because the interaction model of *state – elite – commoners* is used rather productively in the demographic-structural theory that analyzes the dynamics of internal processes in preindustrial and early industrial societies, as well as the interaction between the elements of this structure in the situation of population growth and the resource deficits produced by this growth (see, *e.g.*, Goldstone 1991; Turchin 2003, 2005a; Korotayev and Khaltourina 2006; Grinin and Korotayev 2012).

In the present article, the model of interaction for the triangle CENTER – ELITE – COMMONERS (PEOPLE) within each evolutionary type of state can be only presented as short descriptions of the most typical situations (for more details see Grinin 2007d).[14] These schemes look as follows.

In **the early state** we frequently observe a situation where the elites, basing themselves on their resources (lands, clients, military force) or their special position (as recognized representatives of certain lineages or dynasties, heads of tribal formations and so on), control, in some way or another, a very large or even the most part of the territory of

[13] Naturally, the notion of *'developed'* state is rather conventional. It can only be regarded as developed in comparison with the less complex ('early') state, whereas it appears underdeveloped when compared with the more complex ('mature') statehood. Thus, the Russian state in the age of Ivan the Terrible appears rather developed when compared with the Muscovy Princedom of Ivan Kalita and his successors. However, it does not stand any comparison even with Peter the Great's empire. However, the state of Peter I looks rather primitive in comparison with, say, the Russian Empire in the late 19th century. To denote the three stages of the statehood evolution one may also use the terminology (mentioned in Footnote 12 above) suggested by the second author of this article: the simple (early) state – the complex (developed) state – the supercomplex (mature) state. However, this terminology also has its own limitations.

[14] The analysis of other (far less typical) models of the interaction between the center, the elites, and the populace in the early, developed, and mature states goes beyond the scope of the present article.

a respective country. The commoners find themselves under the jurisdiction and effective control of the elites and they are required to perform state duties. A considerable part of the commoner population (especially serfs, slaves and so on) finds themselves altogether out of the state's jurisdiction. Within such situations the center turns out to be actually an aggregate of the forces of the elites (both regional elites and the ones represented in the capital). Frequently the center cannot organize the main functions of the state without elites, because the state does not possess yet the necessary apparatus, or this apparatus is rather weak. Thus, *the interrelations between the commoner population and the center are mediated by the elites to a very considerable degree.* As a result, the elites take control of the territorial-functional institutions, in particular the fixation of duties, tax collection, judiciary, organization of military forces and defense, land distribution (this frequently combines with the elites' immunity and autonomy as a sort of payment for the performance of such functions). We can mention as examples of such early states the feudal states of Europe, such as the Frankish state in the 8^{th} – 10^{th} centuries, England (both before the Norman conquest and some time after it), German states in the 10^{th} – 15^{th} centuries, Kievan Rus and Muscovy up to the age of Ivan III. This is typical for many ancient and medieval states outside Europe (*e.g.,* for Mesopotamia after Hammurabi, for the Hittite Kingdom, for Chou China, considerable parts of the Japanese history, and so on).[15]

In **the developed state** the elites are significantly more integrated in the state system, thus they are much more connected to the center. In comparison with the early state, the developed state possesses a considerably larger and much more sophisticated administration apparatus. However, it is only represented systematically in the center, whereas at the periphery it is rather fragmentary. That is why here the elites still act as a component of the regional state apparatus, especially with respect to the military functions, but also frequently with regards to general administration, taxation, judiciary, religious subsystem and so on. In particular, large landowners frequently performed taxation, judiciary and administrative functions; the taxes were collected by tax-farmers and the police functions would be performed by representatives of special social groups (*e.g.,* in the Ottoman provinces they were performed by the Janissaries [see, *e.g.*, Kimche 1968: 455]).

This point does not contradict the idea that the developed state is more organically connected with the society than the early one does. Within the developed state the relations between the center and the commoners are *both direct and indirect,* that is, they are partly mediated by the elites, but partly these relations are conducted directly through the formal and official *local* state apparatus. In the meantime the commoners rely more and more on the center as a possible protector against the arbitrariness of the local elites, which is much less typical for the early state.

In **the mature state** its administrative-bureaucratic apparatus becomes quite systemic and complete, which makes it possible for the center to conduct its interaction with the commoner population directly. In the mature state it appears more accurate to speak about the interrelations between the elites, the populace, and the *state* (rather than the *center*). We observe the relationships between the state and the elite becoming *civil.* This means that the elites (*i.e.,* large-scale landowners, businessmen, financiers, as well as the intellectuals' elite) stop performing the direct functions of the state structures, these functions are now performed almost entirely by the formal, official state organs; that is, the elites can be regarded as a part of the civil society, no longer as a part of the state. However, the elites' privileges and status are still protected by the state. All these contribute to the formation of

[15] Even in the early states with a relatively strong center we observe frequently a situation described by Claessen and Oosten (1996): 'The ruler and the elite in the centre favour centralization and the establishment and maintenance of centralized power, while local elites favour decentralization. In practice these efforts are frequently characterized by the pursuit of a "balance of power" policy and competition for important offices, rather than by the dominance by the central ruler over the dignitaries of the state'.

civil society. *The relationships between the state and the populace are direct and immediate* both through the state apparatus (*e.g.,* through taxation or judicial organs), and through the participation of the populace in elections.

Summing up it may be said that in the early state the center only unites (quite weakly) the territories and populations through the mediation of the elites that provide most of the direct interaction with the populace; in the developed state the center directly or indirectly integrates the elites into the state apparatus, limits the elites' influence on the populace, establishes some direct relations with the populace; the mature state (with the help of a rather sophisticated administrative apparatus and elaborated legal system that it possesses) eliminates the administrative-territorial control of the elites over the populace, transforms the elites into a part of the civil society, and establishes systematic direct links between the state and the populace.

Political Evolution of the World System

As is well known, within the World System the first states appeared in the 4th and early 3rd millennia BCE (see, *e.g.*, Vinogradov 2000: 150–151; Baines and Yoffee 1998: 199; Wright 1977: 386; 1998), though the dates differ depending on various historical and archaeological reconstructions; of course, they also depend on the definition of the state used by different scholars. During the subsequent millennium and a half, the main trend of the World System political evolution was connected with the transformation of non-state polities into the states or their parts (for more detail see the next section of this article).

Within our systems of definitions, the first developed state (New Kingdom Egypt) appeared in the 16th century BCE.[16] However, its formation was preceded (as appears to also have been observed with respect to the early states) by the formation of the developed state analogue a few centuries before (see Table 1 below). The point is that with time some early states achieved such a high level of administrative development that, to a certain degree, they could be considered analogues (however, incomplete) of the developed states. We mean such polities as the Third Dynasty of Ur state and the kingdom of Hammurabi in Mesopotamia. In addition to them the first complete analogues developed (*e.g.,* Middle Kingdom Egypt). Thus the first rise of the developed state and their analogues took place around the late 3rd millennium and the first half of the 2nd millennium BCE, which corresponds to the first peak of World System urban population growth that is observed more or less in the same period (see the next section of the present article).

However, for more than a millennium the early states remained absolutely dominant, whereas the forming developed state analogues turned out to be rather unstable. A new and much more steady rise of the developed states was observed in the middle and second half of the 1st millennium BCE. Furthermore, by the early 1st millennium CE developed states and their analogues controlled a substantial proportion of the World System territory (and also the majority of the World System population lived just within this territory), as the developed states and their analogues included the largest polities of this period (the Achemenid Empire, the Ptolemaic and Seleucid states, the Qin and Han empires in China, the Roman, and later Byzantine, Empire, as well as the Sassanid Empire in Iran). As we shall see in the next section of this article, the growth of the number of developed states and the expansion of the territory under their control correlate rather logically with

[16] Egypt possessed a few features that made it possible for the developed state to appear there earlier than in other countries (though partial analogues of the developed state appeared in Mesopotamia already in the late third millennium BCE). Firstly, this is the position of the Egyptian mainland as a narrow strip along one navigable river, the Nile. Secondly, this is a very high level of its ethnic and cultural homogeneity. Thirdly, this is a rather long period of absence of any significant external threat (and the case of Egypt differed much from Mesopotamia). Fourthly, this is the presence of a strong ideology of royal power. Fifthly, this is the weakness of trade and money circulation, which strengthened the redistributive role of the state for a rather long period of time; however, later this point hindered significantly the further development.

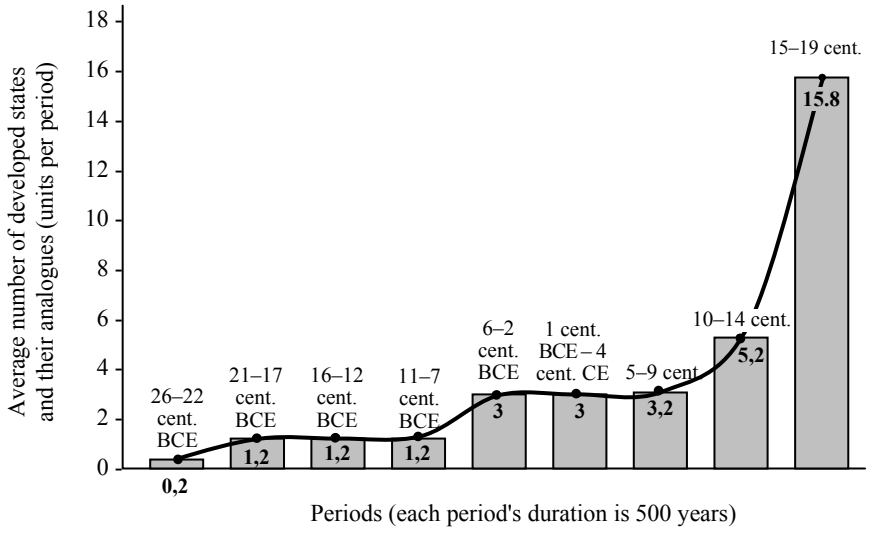
the radical growth of the World System urban population observed within precisely the same period.

During the whole 1st millennium CE the number of developed states and their analogues fluctuated significantly in connection with the rather well known complex and dramatic events of world history (the fall of the West Roman Empire, the Great Migration, Arab conquests *etc.*). However, in general their number remained rather small, whereas the territory under their control sometimes decreased significantly. The same can be observed with respect to the world urban population and urbanization rates. All this is rather congruent with those theories that maintain that the 1st millennium CE is a period of deep qualitative transformation of the World System and the whole historical process; the first millennium CE was a period of preparation for a new qualitative (and quantitative) breakthrough in the field of technologies and production as a whole (for more details see Grinin 2003b, 2003c, 2006d).[17]

A new qualitative breakthrough (or what the first author refers to as 'the transition to a new production principle) can be dated to the mid-15th century, though some its signs can be discerned in the 13th and 14th centuries (see Grinin 2003b, 2003c, 2006d for more details). Taking into consideration the expected time lag, this correlates rather well with a significant acceleration of the world urban population growth observed in the late 15th and 16th centuries. The same dynamics can be traced with respect to the number of developed states and the territory controlled by them (see the following section in the present article).

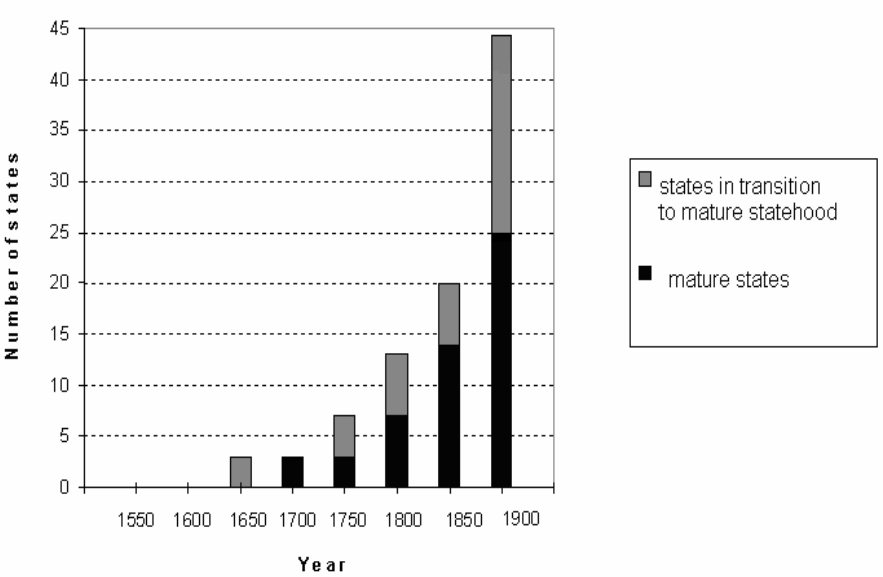
The subsequent growth in urbanization (caused by the transition to industrial production) led not only to the 'victory' of the developed states over the early ones, but also to the formation of a new evolutionary type of state: the mature state, which was tightly connected to industrialization and industrial economy. The first such states developed in the late 17th century. Yet, already by the 19th century they had become dominant in Europe and the New World (see Diagram 2.1). Finally, by the end of the 20th century this type of state was prevalent everywhere, except possibly certain parts of Tropical Africa and Oceania.

Diagram 2.1. Growth of the Number of Developed States



[17] We mean the so-called early industrial revolutions of the first half of the 2nd millennium CE; see, *e.g.*, Bernal 1965; Johnson 1955; Islamov, Freidzon 1986: 84; Gurevich 1969: 68; see also Dmitriev 1992: 140–141.

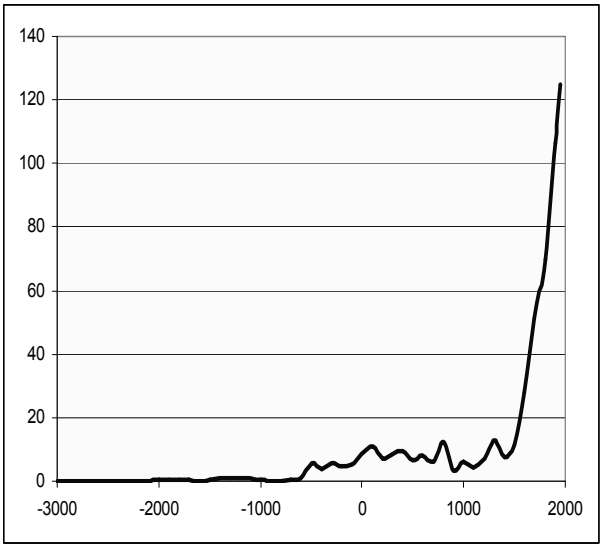
Diagram 2.2. Dynamics of the Mature States' Number (1500–1900 CE)



Dynamics of the Territory Controlled by Developed and Mature States and their Analogues

A general picture of this dynamics up to 1950 can be presented as follows (see Diagram 2.3).

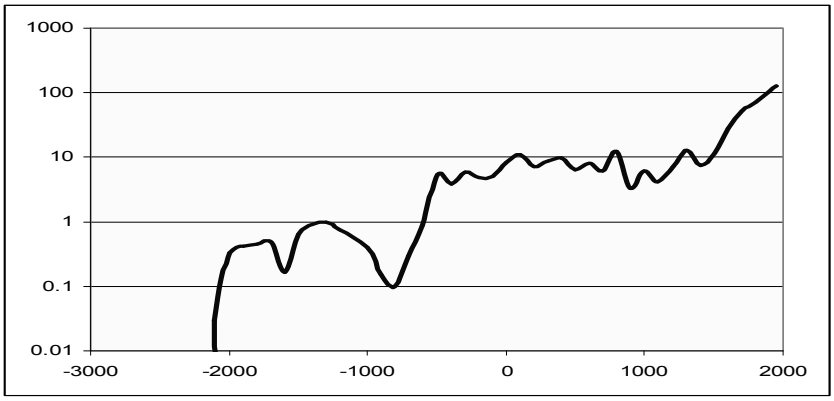
Diagram 2.3. Dynamics of Territory Controlled by the Developed and Mature States and Their Analogues (millions km^2), till 1950



Note: The dynamics of territory controlled by developed and mature states (and their analogues) have been determined on the basis of Tables 1 and 2 in Grinin and Korotayev 2006; Korotayev and Grinin 2006 in conjunction with Taagepera's database (Taagepera 1968, 1978a, 1978b, 1979, 1997), the *Open History* database (http://www. openhistory.net), as well as the *Atlas of World History* (O'Brien 1999).

To start a preliminary analysis of the fine structure of this dynamics (that will be continued in the next section of this article) it makes sense to consider this dynamics in logarithmic scale (see Diagram 2.4).

Diagram 2.4. Dynamics of the Size of Territory Controlled by Developed and Mature States and Their Analogues (in millions of square kilometers), till 1950 CE, logarithmic scale



As we can see, this diagram detects essentially the same system of attractors and phase transitions that was found in the previous section of this article with respect to the global urbanization dynamics. A more detailed study of the relationship between the dynamics of the two variables will be performed in the next section.

3. The Urbanization and Political Development of the World System: A Comparative Quantitative Analysis

Because the relationship between urbanization and the evolution of statehood is a rather voluminous subject, we shall only consider a few aspects of this relationship.[18] First of all, it appears necessary to note that the very formation of the state is connected with urbanization directly, or indirectly.[19] Among factors contributing both to state formation and urbanization, the following appear to have been especially important: a) population growth (see, *e.g.*, Claessen and van de Velde 1985; Chase-Dunn and Hall 1994; Fried 1967a, 1967b; Service 1975; Korotayev, Malkov, and Khaltourina 2006a, 2006b; Grinin 2007d); b) development of trade (Ekholm 1977; Webb 1975);[20] and c) growth of wealth.[21]

It also appears necessary to note that the 'urban' way of the early state formation was one of the most important ones (for more detail see Grinin 2007d). Urbanization was con-

[18] This issue has been also considered in some previous publications by the second author of this article (see, *e.g.*, Grinin 1999, 2006b, 2007d).

[19] The factors of state formation are very numerous (for more detail see Grinin 2007d) and their analysis goes beyond the scope of this article.

[20] The role of transit and external trade in the development of many early states was very important. Many of them, like medieval Ghana, were (to use Kubbel's expression) 'huge foreign trade superstructures' (Kubbel 1990: 72). The state monopolization of the trade sources, exotic imports, and trade duties was a very important accumulation source within such states, according to Chase-Dunn and Hall (1997: 236).

[21] For example, Dyakonov maintains that in the late 4th millennium BCE 'the Sumerians began to get fabulous (by the standards of that time) yields from their fields. The well-being of the communities grew fast; the concentration of the population of each canal area around its cult center grew simultaneously. Thus, the settlement pattern changed sharply – it seems that it was safer for the people to keep together: wealth appeared, it could be robbed, and it made sense to defend it'. As a result, the resettlement of inhabitants of small villages to the area around the wall of a central temple became a characteristic process of that period (Dyakonov 1983: 110).

nected with the concentration of people as a result of the compulsory merger of a few settlements due, usually, to pressure from a military threat. Such a situation was typical for many regions: for Ancient Greece (Gluskina 1983: 36; see also Frolov 1986: 44; Andreev 1979: 20–21), Mesopotamia, in particular in the late 4th millennium and the 3rd millennium BCE (Dyakonov 2000a, 1: 46), a number of African regions; for example, in South-East Madagascar in the 17th century a few small states of the Betsileo originated in this way (Kottak 1980; Claessen 2000, 2004). In Greece this process was called *synoikismos*.

Population concentration contributed in a rather significant way both to the urbanization and state formation process and development.[22] In particular, the density of contacts within a polity is a very important factor of state formation (Grinin 2001–2006; 2007d). And, as this density is higher in urban than rural societies, the politogenetic processes within them have certain peculiarities in comparison with those societies that lack cities.

Thus, state formation is connected rather tightly with city formation even though the correlation between the presence of the state and the presence of the cities is still far from a hundred percent, though it is quite high as some scholars, for example, Adams (1966) believed. Adams, in fact, considered the presence of cities a necessary characteristic of the state. Of course, this relationship is not coincidental as economic, social, and many political processes (including the ones involving the institution of the state itself) of the state are intertwined with urbanization processes; to some extent they are based on it. On the other hand, the state influences urbanization processes. The state is a complex integrative institution that concentrates the development of many relationships within itself. Similarly, the city also implies a complex concentration consisting of geographical, social, political, and sacral, resources and assets. 'The city is a direct territorial concentration of a multiplicity of heterogeneous forms of human activities' (Akhiezer 1995: 23).

Thus, most factors of politogenesis and state formation are connected with urbanization. The development of religion and the rulers' sacralization is inevitably connected with the development of temple systems, temple cities, or cities that acted as centers of religious life. The immense role of the war in the formation of the state is very well known (Ambrosino 1995; Carneiro 1970, 1978; Southall 2000), and it is not coincidental that fortress cities were a predominant type of cities in the period in question. On the other hand, military devastation was one of the most important causes for the destruction and death of cities and the decline of a city's population. The formation of elite played a pivotal role in these processes, but the elites tended to concentrate just in cities. It is also quite clear that the processes of social stratification and class formation proceeded in many ancient agricultural societies under a considerable influence of the 'urban revolution' (Alekshin 1986: 22).

The state is impossible without centralized power (see, *e.g.*, Claessen 1978: 586–588; Claessen and Oosten 1996: 2; Claessen and van de Velde 1987: 16; Ember and Ember 1999: 158, 380; Fortes and Evans-Pritchard 1987/1940; Haas 2001: 235; Spencer 2000: 157, *etc*.; see also Grinin 2001–2006, 2003a, 2004a). So we believe that the relationship between urbanization and the evolution of statehood is especially transparent with respect to the formation and development (as well as the influence on social life) of the central settlement of the state (*i.e.,* its capital [see below for more detail]). Most frequently centralized power is geographically materialized as the main settlement of a country, its capital (though there were some exceptions like the empire of Charlemagne that lacked a real capital city [Devis 2005: 221]). The role of centralized power is especially significant in large developed states. It is difficult to overestimate the role of such gigantic urban centers as Rome, Constantinople/Istanbul, Moscow and so on in the life of their respective empires; and it is important to note that the population density of those cities was exceptionally high.

[22] The population concentration leads to the spatial structurization of settlements, to which modern archaeologists pay so much attention (see, *e.g.*, Adams 1986). And the higher the demographic density, the more pronounced the structurization (including the spatial structurization) (Girenko 1991: 91).

It is also necessary to note that the vector of the state's activities largely determines the process of urbanization: its intensity and direction, as well as the concrete transformations of concrete cities. By 'concrete transformation' we mean the construction of fortresses, the destruction of cities during wars, the creation of cities as base stations or trade factories in conquered territories (as was done, *e.g.,* by Alexander the Great), as well as with colonization activities (as was typical for the Phoenicians, Greeks, Genoese, *etc.*). Sometimes the destruction of and enemies' cities and deportation of their population fed the growth of the victors' capitals, as this happened, for example, in the 14th century with Samarkand (where craftsmen from conquered cities were deported by Timur *en mass*).

In a number of early and developed states, political changes were connected with the transfer of the capital from one city to another, or the construction of a new capital. For example, in Japan in 639 CE the capital was transferred by Emperor Jomei (Paskov 1987: 34); Sargon the Great made a previously unimportant town Akkad his capital (Dyakonov 2000b: 57). Andrew the Pious established his capital in the Vladimir-Suzdal Principality in a new town, Vladimir-na-Klyazme (Rybakov 1966: 617). One can easily recollect cases when capitals were erected 'at a blank space', as happened, for example, during the formation of the Golden Horde. As an example from the history of the developed states one may mention the transfer by the pharaoh-reformer Akhenaten of the Egyptian capital to the newly-built Akhetaten ('Horizon of Aten') named after the newly introduced single deity Aten (see, *e.g.*, Trigger 2001: 78; Vinogradov 2000a: 377–382). Another famous example is the erection of the new Russian capital Saint Petersburg by Peter the Great.

The processes of the growth and development of capitals (as well as urbanization on the whole) could be also affected by such political factors as the struggle against separatism and other activities aimed at strengthening centralized power. For example, for these purposes the center tried to attract the nobility to the capital, and sometimes their representatives (or children) were kept in the capital as honorable hostages to insure the loyalty of their parents and relatives; some ancient Chinese states of the Zhou period (Pokora 1978: 203) or Benin (Bondarenko 2001: 222–223) could be mentioned here as examples. However, such phenomena could be found not only among early states, but also among developed ones. For example, Qin Shi Huangdi, the founder of the first centralized Chinese empire, deported 120 thousand families of hereditary aristocracy, high-ranked officials and rich merchants to his capital Xianyang during the first year of the country's unification, 221 BCE (Perelomov 1962: 154). In the 17th – 19th centuries the *Shōgun* government of Japan had to look constantly after the activities of the *daimyo* (the local rulers) and to keep them as hostages in the capital (Galperin 1958; Guber *et al.* 1982; Saburo 1972: 142; Kuznetsov *et al.* 1988: 110–112). On the other hand, in Ottoman Egypt, the *mamluk bey*s and other member of the top echelon of the Egyptian elite were 'virtual hostages of the capital', as they were afraid to leave Cairo for long because of the constant intrigues and acute competition among the *mamluk* houses (Kimche 1968: 457). In addition, their obligatory participation in the *divan*s (governmental councils) demanded their presence in the capital. In Russia, Peter the Great in order to develop the new capital demanded from the top echelon of the elite to build houses in Saint Petersburg and to spend their considerable periods of time.

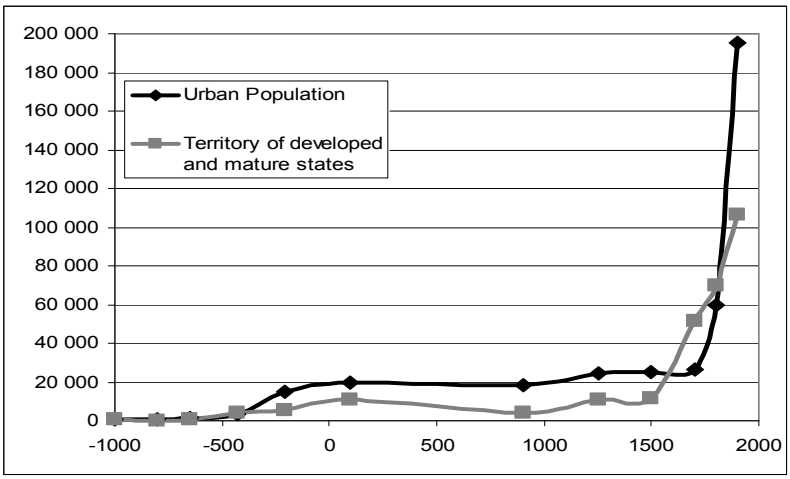
On the other hand, the development of cities is a necessary condition for the formation and growth of developed states (for more detail see Grinin 2006d, 2007d). In particular, the developed statehood implies some regional economic specialization, that is, the beginning formation of a unified economic organism in the respective country. For example, the formation of the 'all-Russian market' began in the second half of the 17th century (Chromov 1988: 148–152), whereas in China 'the economic specialization of individual cities, areas and regions had become clear by the 16th century' (Simonovskaya, Lapina 1987: 119). In Japan in the 17th century we find some definite specialization of regions, in particular with respect to

some industrial crops – indigo, cotton, flax, sugar-cane and so on – which tended to be cultivated in particular regions (Galperin 1958: 27). There was also some regional division of labor with respect to industrial products: various textiles, metal and lacquer products, paper, ceramics, porcelain, and so on. Osaka hosted not only the central market of the country, but also a rice exchange center which bought rice from local and regional farmers and gave credits against security of future crops (Kuznetsov *et al.* 1988: 115). In Britain, the unified national market had already formed by the 16th century and it developed actively throughout the whole century (Vinokurova 1993: 48; Lavrovsky and Barg 1958: 72). Naturally, such specialization influenced the dynamics of urban development.

Industrialization is a necessary condition for mature state development. Naturally, industrialization is intrinsically connected with vigorous urbanization processes including, among other things, the development of cities with more than one million inhabitants and internal migrations to cities from the countryside (see, *e.g.*, Bessonov 1999; Dmitrievskaya 1999). In addition to this, mature statehood is intrinsically connected with nationhood, whereas the latter is impossible without the effective exchange of information and commodities, without a deep division of labor within a society, without a unified economic space.

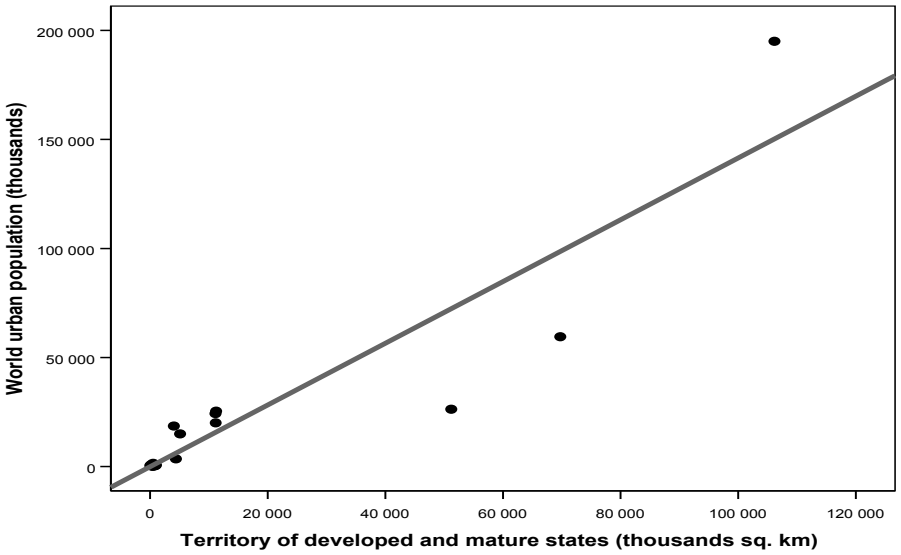
Let us consider now the relationship between the size of the territory controlled by the developed and mature states and their analogues, on the one hand, and the world urban population, on the other (see Diagrams 3.1 and 3.2).

Diagram 3.1. Dynamics of World Urban Population (thousands) and the Size of the Territory Controlled by the Developed and Mature States and Their Analogues (thousands km^2), 1000 BCE – 1900 CE



Notes: Data on urban population for cities with > 10,000 inhabitants. *Data sources*: for the city population (for all the diagrams used in this article) – see *Section 1* of this article. The dynamics of the size of the territory controlled by the developed and mature states and their analogues have been calculated on the basis of Tables 2.1 and 2.2 in Grinin and Korotayev 2006; Korotayev and Grinin 2006; Taagepera's database (Taagepera 1968, 1978a, 1978b, 1979, 1997), the database *Historical Atlas of Eurasia* (http://www.openhistory.net), and the *Atlas of the World History* (O'Brien 1999) for all the diagrams of the present article.

Diagram 3.2. Correlation between World Urban Population (thousands) and the Size of the Territory Controlled by the Developed and Mature States and Their Analogues (thousands km^2), 2100 BCE – 1900 CE (scatter plot with fitted regression line)



Note: $r = +0{,}916$; $p << 0.0001$.

As we see, we do observe a really strong positive correlation between the two variables in question. However, the relationship between them is in no way identical with a simple linear relationship, which is especially clear if we consider the dynamics of the respective variables in a logarithmic scale (see Diagrams 3.3 and 3.4).

Diagram 3.3. Dynamics of World Urban Population (thousands) and the Size of the Territory Controlled by the Developed and Mature States and Their Analogues (thousands km^2), till 1900 CE, logarithmic scale

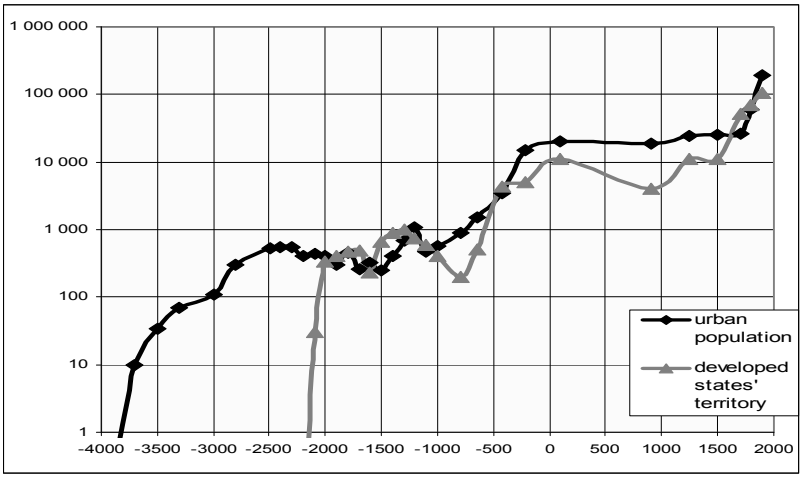
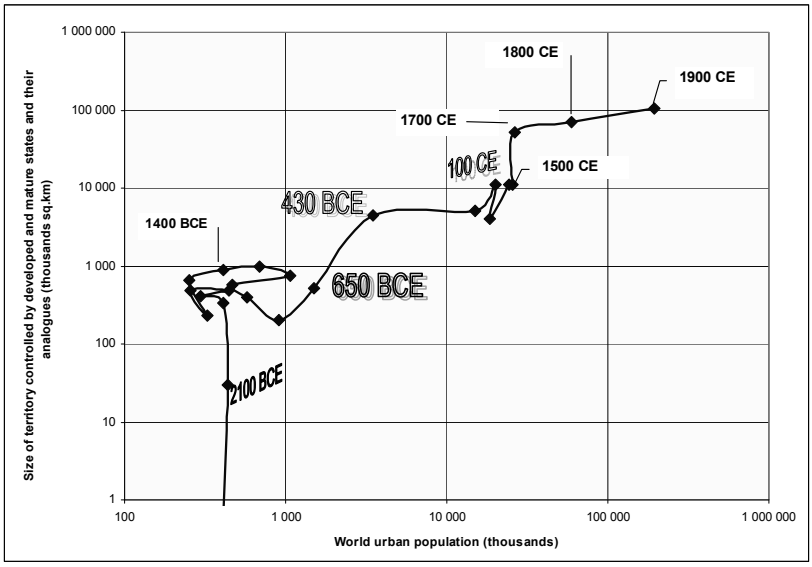


Diagram 3.4. Correlation between the World's Urban Population (thousands) and the Size of the Territory Controlled by the Developed and Mature States and their Analogues (thousands km^2), 2100 BCE – 1900 CE, phase portrait in logarithmic scale



As we see, the formation of the first cities and the first phase of fast growth of the world urban population were observed in the 4th and early 3rd millennia BCE well before the formation of the first developed states and were connected with the development of early states and their analogues. However, already the formation of the first developed state (in Egypt in the mid-2nd millennium BCE) affected the World System urban population dynamics in a rather significant way. Indeed, after the millennial stagnation of the world urban population at the 300–500 thousand level, in the third quarter of the 2nd millennium we observe a period of relatively fast growth of the world urban population that, according to Modelski's (2003) estimates, in the 13th century exceeded (for the first time in human history) one million. Note that this was, to a very considerable degree precisely due to the growth of Egyptian cities. It was in Egypt where the largest world cities were localized in the second half of the 2nd millennium BCE.[23] On the other hand, the decline of the developed Egyptian state in the late 2nd millennium BCE contributed in the most significant way to the decline of the world's urban population that was observed at this time.

In general, with respect to the dynamics of the territory controlled by developed and mature states and their analogues, we find the same system of attractors and phase transitions that was found earlier (see *Section 1* of this article) with respect to the world's urban population, literacy, and political centralization. With respect to this variable[24] we also ob-

[23] In the meantime this was also connected with the growth of the area of early states and the general strengthening of those states as a result of the development of bronze metallurgy (*e.g.,* in Achaean Greece, West Asia [Urartu, Mitanni, Assyria], and China). Thus, we observe close links between the development of new technologies, on the one hand, and statehood and urban expansion, on the other. We also observe close links between the development of the early state and urban growth. However, the fact that the largest world cities were concentrated in the third quarter of the 2nd millennium precisely in the first developed state, in Egypt, suggests that the links between urbanization and statehood acquired new characteristics manifested in the correlation between the formation of megacities and the developed state. Note that the formation of the mature state also correlated with the formation of megacities with an order of magnitude higher population than the one found in the megacities in developed states.

[24] In other words, the size of the territory controlled by developed and mature states and their analogues.

serve a phase transition in the 1st millennium BCE, as a result of which the size of the territory controlled by the developed states and their analogues grew by an order of magnitude up to around 10 million km^2, and had found itself in a new basin of attraction, within which it fluctuated till the phase transition of the Modern Age.

On the other hand, notwithstanding all the impressive synchrony of the phase transitions with respect to all the above mentioned indicators of the World System development, it is impossible to ignore a few important time lags during the phase transition of the 1st millennium BCE the surge in the size of territory controlled by the developed states (and, in general, the transition from the early to developed statehood at the scale of the World System) lagged behind the phase transition in the dynamics of the World System urban population and urbanization.

This lag can be interpreted as evidence for the fact that the economic development of the World System at this time temporarily advanced beyond the World System's political development.[25] Consequently, the transition of a number of early states to developed statehood (or its analogues) can be considered as dragging the level of political development up to the level of socio-economic subsystems that had advanced beyond the political ones with respect to their complexity. We believe that the formation of both early statehood and of developed/mature statehood implies a certain basis without which its development becomes impossible.[26]

In the meantime one should take into account the following points that account for the lag in the growth of developed states and also account for the advance of economic subsystems over political subsystems during the 1st millennium BCE.

1. The growth of developed statehood (and its analogues) is only an (advanced) component of the whole politogenesis process of the respective period. Political change (as well as the change in other World System characteristics) occurred unevenly. Some societies develop early statehood whereas others move to the chiefdom level of political organization (about multilinear and uneven development of medium-complex and complex political systems see Grinin 2009, 2011b, 2012; Grinin and Korotayev 2009c, 2011). In the period in question a very substantial part of the World System (especially at its periphery) had no statehood at all. Further growth toward developed statehood became possible only after the formation of early statehood in stateless parts of the World System (*e.g.,* in most areas of Europe). However, for a long period of time this was not possible due to the lack of some necessary technologies (first of all, the development of iron technology).

2. However, the slow down of political development was not total. On the one hand, between the 16th and 7th centuries BCE we do not observe the formation of newly developed states; on the other hand, that was a period when a large number of new early states and their analogues were formed (see, *e.g.*, Grinin *et al.* 2004c, 2006g). It is important that within the World System of the 2nd and 1st millennia BCE, early statehood could not develop without being based on urbanization, trade and crafts.

On the one hand, this led to the lag between urbanization and developed statehood in the world. On the other hand, the transition of the early states to the developed statehood could not take place due to the underdevelopment of crafts and markets. One of the most important factors was the absence of true money whose presence would have enormously facilitated the formation of trade connections throughout very large territories. Another (and even more important) factor was the absence or underdevelopment of new technologies (both military and non-military) – in the first place, of iron metallurgy.

[25] Note that within the theory developed by the second author of this article, the economic-technological component of the World System is denoted as the *production principle*, whereas its political component is denoted as the *type of political organization of societies* (Grinin 2003a, 2006a, 2006e, 2007d).

[26] As was noted above, in most cases such an economic basis was either directly connected with the city formation, growth, and concentration (and the urbanization process as a whole), or it was connected with such processes that contribute to the urbanization in some way or another, or depend on it.

Naturally, it appears necessary to take into account the fact that the transition to iron metallurgy did not lead automatically to the transition to developed (and even early) statehood, because this transition can only take place when a number of conditions are present.[27] However, without iron metallurgy the expansion of developed statehood was strongly hindered; consequently, at this time, the formation of developed statehood was only observed under exceptional circumstances.

As was mentioned in *Section 2* of this article, the first states emerged within the World System (as well as, naturally, in the world in general) in the 4th and early 3rd millennia BCE (see, *e.g.*, Vinogradov 2000b: 150–151; Dyakonov 2000a: 45–56; Baines and Yoffee 1998: 199; Wright 1977: 386; 1998; Lamberg-Karlovski 1990: 7). They appeared on the basis of intensive irrigated agriculture. Thus, there are certain grounds to connect state formation with the finalization of the agricultural revolution. However, an important theoretical clarification is necessary at this point, which is important for the explanation of the above-mentioned time lag between the World System phase transition along the urbanization dimension and along the dimension of the expansion of developed statehood. We believe that the agrarian revolution is one of three major production revolutions (in addition to the industrial and information-scientific revolutions). These revolutions were the most important technological and economic benchmarks of the World System development. However, at the World System level each of these revolutions occurred in two phases (for more detail see Grinin 2006a, 2007a, 2007b, 2007c; 2012: 15–45). As regards the agrarian revolution, its first phase was connected with the transition to primitive (hoe) extensive agriculture and primitive herding, whereas its second phase involved the transition to irrigated or non-irrigated plow agriculture. In general, the second phase of the agrarian revolution may be regarded as the transition to the intensive and/or partly labor-economizing agriculture, that is, to the agricultural systems that radically increased the productivity of land and/or the productivity of labor in the land cultivation during critically important ('busy') seasons of the year. For the sake of brevity this second phase of the agricultural revolution will be denoted below simply as 'intensive'.

Note that the gap between these two phases occupied a few millennia (between the 8th and 4th millennia BCE). Primary state formation should be connected with the second ('intensive') phase of the agrarian revolution.[28] However, a theoretically important point is that in the areas of large subtropical/tropical rivers and soft soils the transition to irrigated agriculture (that formed the economic basis for the development of states and civilizations) did not generally need any specialized new tools and materials (*e.g.,* metals). What is more, the tools themselves sometimes remained rather primitive. In such cases the most important component of the second phase of agricultural revolution was connected not with the tools, but with irrigation techniques, improved domesticates, agronomic know-how that made it possible to bring fertile lands under cultivation, or to increase significantly the productivity of land. On the other hand, in the 4th millennium BCE (or even a few centuries earlier) new tools (as well as the beginning of the economic use of a new energy source) still in the form of primitive scratch-plows and the use of oxen (with the help of yokes) for plowing and transportation (see, *e.g.*, Chubarov 1991; Krasnov 1975; Shnirelman 1988). Of course, this was a very significant technological advance. However,

[27] Including new administrative and political technologies, a certain level of social and ethnic development, elaborated law and court system, property relations, developed ideologies, strong economic links and so on. Thus, although iron items started to be used occasionally rather early (*e.g.,* among the Hittites), among other things for military purposes, this was not sufficient for the transition to the developed statehood.

[28] Ernst Gellner (1984: 115) believes that a large gap between beginning of food production and state formation is 'specifically disastrous' for those theories that connect the state formation and the agricultural revolution. Note that the above discussed point eliminates this objection.

it appears necessary to emphasize that the primary state formation was not strongly connected either with the invention of the plow, or the use of the energy of the draft animals.[29]

However, natural environment with soft and fertile soils liable for irrigation and where productive agriculture (that is able to support supercomplex political structures) is possible without metal tools are rather limited. And what was possible in some Near Eastern areas on the basis of simple predominantly non-metallic tools (the formation of civilizations, cities, early, and later developed, states and their analogues) was simply impossible in most other areas of Asia, Europe, and Africa. In most of these areas the formation of supercomplex political structures became possible only after a qualitatively new level of technological development had been achieved (in particular, after the introduction of the iron metallurgy). Thus, the spread of civilization, urbanization, and statehood to many territories was hindered by the lack of iron metallurgy (and some other technologies). These technologies were invented in the late 2nd and 1st millennia BCE, and diffused throughout the World System in the 1st millennium BCE (note that they only reached many of its peripheral parts in the second half of this millennium).[30]

Only the introduction of plows with iron ploughshares in conjunction with effective draft animals and harnesses made it possible to carry out the second phase of the agrarian revolution in most parts of Eurasia. The new civilization only proliferated to most parts of the Old World with the invention of iron metallurgy; for example, in Sub-Saharan Africa civilizations only developed after the introduction of the hoes with iron working parts which, using Satton's (1982: 131) expression, led to prosperity (see also Shinny 1982; Kubbel 1982; Sellnow 1981). Effective agriculture only occurred in the Ganges Valley with the introduction of iron tools (Sharma 1987: 363).

In most parts of Eurasia the second phase of the agrarian revolution was connected with the introduction of iron tools, heavy plows (or light plows with iron ploughshares), as well as effective harness for draft animals.[31] The very principle of plow agriculture was borrowed by Europeans from West Asia, but in Europe the plow was significantly improved. This version of the second phase of the agricultural revolution was prevalent in Eurasia and North Africa in the areas of non-irrigated agriculture.

Yet, when these technologies (and with them the early statehood and its analogues) spread to new territories, the above mentioned lag between urbanization and developed statehood was temporarily amplified. According to the theory proposed by the second author of this article (see *Section 2* of this article), developed statehood can only appear within a territory that has been prepared for this historically, culturally, and economically; and such a preparation needs a considerable period of time. Objectively, the urban growth prepared the formation of developed statehood and its proliferation to new territories,

[29] The fact that states and civilizations existed for many centuries supports this statement. *In principle*, in specific environments the state formation and primary urbanization could take place without metal tools and draft animals, on the basis of various irrigation and agricultural selection techniques (*e.g.*, Kuzmischev 1985: 126).

[30] Occasional iron production was already known in the 3rd millennium BCE, however, more or less effective technologies of low-quality steel production were developed in the mid-2nd century BCE, most likely in Asia Minor (see, *e.g.*, Chubarov 1991: 109). The iron metallurgy got some development within the Hittite state that kept its monopoly over it; however, this technology remained rather primitive. The breakdown of the Hittite Kingdom led to the end of this monopoly and to the beginning of the diffusion of the iron metallurgy throughout the World System (Grakov 1977: 17; Giorgadze 2000: 122–123; Dyakonov 2004: 400). In the early 1st millennium BCE (and especially in the first half of this millennium) the iron metallurgy already diffused rather widely throughout the Middle East and Europe (Chubarov 1991: 109, 114; Grakov 1977: 21; Kolosovskaya and Shkunaev 1988: 211–212; Devis 2005: 61; Zlatkovskaya 1971: 47). In particular, Greece became a major iron producer within the East Mediterranean region already in the 10th century BCE (Andreev 1988: 221).

[31] There were other versions. For example, in pre-colonial Tropical Africa we observe the combination of iron metallurgy and extensive hoe agriculture. However, the latter slowed down the statehood development in a rather significant way.

whereas cities, serving as economic and political centers, created a network that was necessary for a new phase transition that involved the rise of the World System to a qualitatively new level of complexity.

Let us return now to an earlier period when the proliferation of developed states lagged behind the formation of new early states and their analogues (*i.e.* between the 2nd millennium BCE and the first half of the 1st millennium BCE). Already in the Bronze Age, in the late 3rd millennium BCE we observe in the Near East a complex model of cultural interaction between societies stretching from the Mediterranean to the Indus Valley, and the Central Asia to the Persian Gulf (see, *e.g.*, Lamberg-Karlovski 1990: 12). As a result, we observe the formation of cities, early states, and their analogues in territories that were adjacent to the centers of first Near Eastern civilizations (and first developed states and their analogues) on the basis of soils that were relatively easy to cultivate, copper and bronze metallurgy, international division of labor, trade and so on. However, the formation of developed states in these territories was still highly problematic without wide proliferation of iron metallurgy, military modernization (based on iron), and other technological and economic improvements.

It appears necessary at this point to answer the following question: why during this period did a developed state appear in Egypt (and its analogues – in Mesopotamia)? One has to mention here, first of all, the extremely high productivity of agriculture that tended to result in very high population densities, implying the need for a mode of administration relying more on bureaucratic processes rather than on a military apparatus.[32] A different situation was observed in the World System semi-periphery and periphery, neither of which possessed such productive agricultural resources. In these areas the military component of the state played a more important role. Consequently, developed states (and their analogues) could only appear when there was a new productive basis that required a greater economic consolidation of the respective territories. Other versions of developed states could appear either on the basis of profitable trade and the creation of considerable wealth in non-agricultural sector (that made it possible to import food resources in considerable quantities as it was observed in Athens), or on the basis of considerable technological improvements in agriculture that could make it as productive as it was in Egypt and Mesopotamia in the 3rd and 2nd millennia. In most places this only became possible after the introduction of iron instruments in agriculture, crafts, and military sector (that was accompanied by a considerable number of other technological and strategic innovations), as well as vigorous development of trade (that also implied a qualitative development of money and credit instruments) and sea transportation.[33]

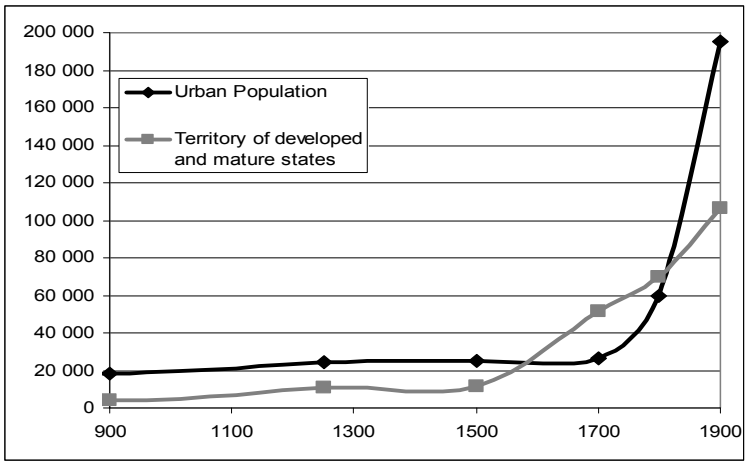
Thus, in the 2nd millennium BCE and the first half of the 1st millennium BCE the potential of economic and military-technological basis for the formation of new developed states without iron metallurgy and other new technologies turns out to have been entirely exhausted, whereas it took the new technologies a considerable time to diffuse throughout the World System; this seems to partly account for the developed statehood formation (and diffusion) lagging behind the global urbanization processes.

During the Modern Age phase transition, the rapid increase in the size of territory controlled by developed (and mature) states had begun a considerable time before the start of an equally rapid and impetuous growth in the world's urban population. This increase in territory and urban population growth becomes especially clear if we consider the dynamics of these variables within the 2nd millennium CE (see Diagram 3.5).

[32] A significant role was also played by the special geographic position in the large river valleys (with respect to Egypt see *Section 2* of this article).

[33] As was mentioned above, this process also implied the development of new administrative-political technologies, social, ethnic, and ideological relations.

Diagram 3.5. Dynamics of the World Urban Population (thousands) and the Size of the Territory Controlled by the Developed and Mature States and Their Analogues (thousands km^2), 100–1900 CE



As we can see, during Phase Transition A3 the impetuous growth of the territory controlled by developed states had begun two centuries before a comparably impetuous growth in the world urban population began. The impetuous growth of this territory in the 16th – 18th centuries was connected, first of all, with the formation of the developed statehood in the Ottoman Empire, Mughal India, and Russia, the restoration of the developed statehood in Iran, as well as with a vigorous territorial expansion of the developed states of Asia (Qing China, Mughal India, Sefevid Iran, the Ottoman Empire), as well as the expansion of Russia (that put under its control immense territories in Siberia) and a few West European states (note that some of them were already transforming into mature states) that began an active overseas expansion (which we will consider in more detail below).

This lag needs special comments as it is connected with some specific features of developed states. On the one hand, these states create solid political and non-political links within the respective societies (for more detail, see Grinin 2006d, 2006f, 2007d); within these networks an especially important role was played by large cities, and especially capitals whose population could be very high for agrarian societies. For example, Istanbul, by 1500 the largest city in Europe, had 'achieved the size of the largest city in East Asia (Beijing) by 1550' (Chase-Dunn and Manning 2002: 387), with a population between 400–500 thousand (Petrosyan 1990: 72–73, 103). Note, however, that the population of the largest world cities of the 8th and 9th centuries, Chang'an and Baghdad, appear to have been even larger (Modelski 2003: 150–151, 184).

On the other hand, one should not forget that the developed states of this period were predominantly agrarian. That is why the leaders of such states were frequently interested in the creation of cities as military centers and outposts (as was done, *e.g.,* by the Russian state during its southward expansion to the steppe region) and were not always interested in the further extensive growth of their urban populations, especially in capitals where unruly elements of the swelling urban population could threaten state stability. In addition to this, developed states usually have a high military potential that makes it possible for them to undertake vigorous expansion to underdeveloped peripheries. However, such expansion frequently involves underpopulated territories (as, *e.g.*, with the Russian expansion into Siberia, or the Qing expansion to Eastern Turkestan and Tibet); these territories, it goes almost without saying, were usually either underurbanized, or totally unurbanized.

The most important point is that in those states the main product was still agricultural produce. According to Neomalthusian models, the population of such states tended to their carrying capacity. Their political-demographic dynamics characterized by the so-called 'secular cycles'[34] that include recovery phases, phases of relative overpopulation, and phases of political-demographic collapses that resulted in state breakdowns and precipitous population declines (see, *e.g.*, Goldstone 1991; Turchin 2003, 2005a, 2005b; Turchin and Korotayev 2006; Nefedov 2004; Korotayev, Malkov, and Khaltourina 2006a, 2006b; Korotayev and Khaltourina 2006; Korotayev *et al.* 2011; Grinin and Korotayev 2012). The second author of this article has come to the conclusion that though the carrying capacity was always limited, the above-mentioned distinct secular cycles were typical exactly for the developed states (and much less typical for the early states [Grinin 2006c]). This is accounted for by the fact that, in contrast to early states, developed states are normally able to support order within large territories, as well as economic development, trade, and monetary circulation for long periods of time. This makes it possible for the respective populations to approach rather closely the carrying capacity ceiling.

These political-demographic cycles produce an ambivalent influence on urban population dynamics. On the one hand, during the relative overpopulation phases, a considerable part of rural population tends to be pushed from the countryside to the cities, which stimulates urban growth. As has been shown by Nefedov (2004) with respect to China, relative overpopulation led to land shortage, and to the loss of their land by considerable number of peasants. However, only some peasants who lost their lands became tenants. Indeed, it does not make sense for a landlord to rent out his land in plots barely sufficient to provide subsistence for a tenant and his family. As the standard rent rate in China was 50 per cent, such plots would be at least twice as large. Hence, if two poor peasants having minimum size plots each have to sell their land, only one of them will be able to accommodate himself in his village as a tenant. The other will have to accommodate himself in some other ways. One of the possibilities was to find alternative employment in the non-agricultural sector, *e.g.*, in cities. As was suggested by Nefedov, the very process described above would in fact tend to create new possibilities for such employment, as landowners were more likely than poor farmers to buy goods produced in cities. This is confirmed by historical data indicating that the fastest growth of cities (and, hence, overall sociocultural complexity) tends to occur during the last phases of political-demographic cycles (see, *e.g.*, Nefedov 2004; Korotayev, Malkov, and Khaltourina 2006b: 86). On the other hand, in the supercomplex agrarian societies during the recovery growth phases (or in cases of significant growth of carrying capacity) the overall demographic growth rates were much faster than the rates of the urban population growth. Preindustrial cities (and especially the large ones) were characterized by the commoner mortality rates that were much higher than the ones observed in rural areas, whereas the average life expectancies in the cities were significantly lower than in the countryside. In fact, in many large preindustrial cities mortality rates exceeded fertility rates, in such cities the natural population growth rates were negative, and their demographic reproduction took place due to the population influx from the countryside (see, *e.g.*, McNeill 1976; Storey 1985: 520; Lee and Wang 1999; Diamond 1999; Maddison 2001: 34). Consequently, when the rural populations had acceptable levels of life (which was observed during recovery phases, or when important technological innovations raised the carrying capacity sharply) the rural populations tended not to move to the cities, and the proportion of the city-dwellers in the overall population tended to decline (as was observed, *e.g.,* in Russia, or China in the 18th century [Nefedov 2005: 188; Korotayev, Malkov, and Khaltourina 2006b]).

The proliferation of developed statehood was an important component of the phase transition of the 1st millennium BCE and contributed in a rather significant way to the surge in the world's urbanization to qualitatively higher levels. Indeed, developed state-

[34] As these cycles last for one-two centuries, Turchin (2003, 2005b) suggested to denote them as 'secular cycles'.

hood makes it possible to sustain, within a given territory, a higher population (thus, it actually increases carrying capacity [Turchin 2003: 120–122]). Developed urbanization also 'allows' the population to approach rather closely the carrying capacity ceiling, which, as was noted above, within the conditions of supercomplex agrarian societies stimulates urbanization. As a result, developed states are typically characterized by such values of both the overall urban population and urbanization level (*i.e.,* the urban population proportion within the overall population) that are significantly higher than those typical for the early states.

On the other hand, the 'secular' political-demographic cycles typical for developed states create, to a considerable degree, an 'attractor effect'. Indeed, at those cycle phases when a rather fast overall population growth was observed, cities grew relatively slowly, whereas urban growth acceleration was normally observed within those cycle phases when the overall population growth rates declined. Of course, the results of such urban growth differed dramatically from the one observed during the phase transition periods when urbanization growth was observed against the background of accelerating overall population growth rates (which, in fact, produces just the phase transition effect). In addition, during political-demographic collapses the urban population declined in an especially dramatic way; all these taken together produce precisely the effect of 'wandering' around the B2 attractor, the attractor of supercomplex agrarian society (that is typically organized politically just as the developed state).

In general, during the 16th – 18th centuries, developed states could not secure such an urban growth that would match the extent of their territorial expansion. It is also entirely clear that at this time a solid basis for a phase-transition type of urban growth could only be created by a new, industrial, production principle, and not by the old craft-agrarian one. As its formation and proliferation took a considerable period of time, urbanization was bound to lag behind the territorial growth of the mature states. However, it should be taken into account that the accelerating growth of both the overall and urban population within the developed states (even when it was not accompanied by a significant increase in the proportion of the urban population to the overall population), as well as the creation of a considerable number of new cities created a solid basis for the forthcoming industrialization phase and the concomitant explosive urbanization.

The growth of the developed states' territory was observed not only with respect to the Asian states, but also the European ones (first of all, with respect to Russia, Spain, Portugal, Austria, the Netherlands, and England). Note that in the last case this expansion is directly connected with the beginning of the transition to the industrial principle of production (Grinin 2003a, 2006e). And already the first phases of this transition led to a rather significant progress precisely in those spheres (such as seafaring and military technologies) that contributed to the acceleration of territorial expansion of developed (let alone mature) states.

Notwithstanding all the apparent asynchronicity of the two processes in question, they were tightly interconnected. For example, the European colonial expansion played a critically important role in the introduction of New World domesticates to the Old World agricultural systems and the processes of primary accumulation of capital. These processes directly prepared the World System to agricultural modernization and the industrial revolution that began in the late 18th century. Precisely the combined actions of agricultural modernization and the industrial revolution led to the explosive growth of the world urban population during Phase Transition A3.[35]

The tight interconnectedness of the dynamics of developed statehood and the urbanization of the World System looks especially salient if we consider the population dynamics

[35] Rather large cities occasionally developed also in the New World. For example, in the 16th century in Bolivia a rather large city, Villa Imperial de Potosi formed as a center of silver amalgamation industries (according to some estimates, its population at its peak could reach 120 thousand [Baks 1986: 123]).

of megacities (*i.e.* cities with more than 200 thousand inhabitants each) (see Diagrams 3.6 and 3.7).[36]

Diagram 3.6. Dynamics of the World Megacities' Population (hundreds) and the Territory of the Developed and Mature States and Their Analogues (thousands km^2), till 1900 CE

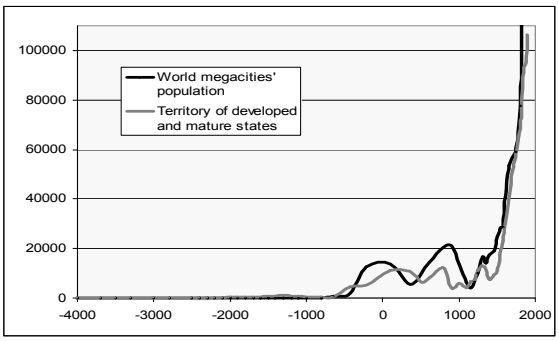
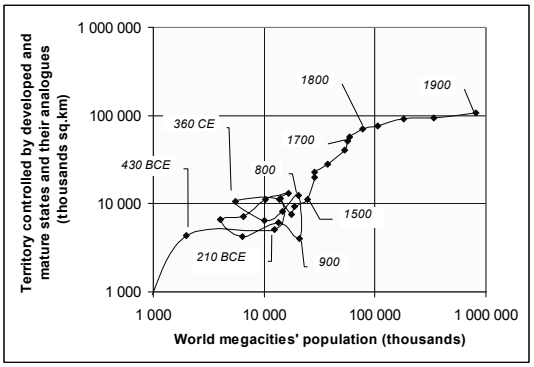


Diagram 3.7. Correlation between the World Megacities' Population (hundreds) and the Territory of the Developed and Mature States and Their Analogues (thousands km^2), 2100 BCE – 1900 CE, phase portrait in double logarithmic scale



As we see, the synchronism of the phase transitions is expressed here even more clearly. Cities with more than 200 thousand inhabitants first appear in the second half of the 1st millennium BCE quite simultaneously with the impetuous growth of territory controlled by the developed states that was observed in precisely the same period of time. Stabilization of the size of this territory at a level around 10 million km^2 in the early 1st millennium CE was accompanied by the stabilization of the World System's[37] megacities' population at a level around 1 million. Thus, both variables found themselves simultaneously in the attraction basin of the supercomplex agrarian society (B2). What is more, they started their movement from this basin of attraction in a rather simultaneous way, in the second half of the 15th century (to a considerable extent in connection with the beginning of the World System transition to the industrial production principle [see, *e.g.*, Grinin 2003b; 2007d]).

[36] Note that, due to the fact that in this case we have a considerable number of data points at our disposal, we can observe better the cyclical and stochastic components of the dynamics of the variables in question during the era of supercomplex agrarian societies, that is, their fluctuations around Attractor B2.

[37] Note that all the world megacities (*i.e.,* the cities with more than 200 thousand inhabitants) were always situated just within the World System.

We believe this synchronicity is not coincidental at all. The point is that the preindustrial megacities were, to a considerable degree, a creation of the developed statehood.

Developed statehood is generally impossible without megacities that act as its core (for more detail see Grinin 2007d). On the other hand, these were just the large developed states that could support the megacities' reproduction in the preindustrial epoch. What is more, such states naturally created megacities. Indeed, the formation of developed statehood implied growth of the administrative apparatus complexity (including, naturally, the complexity of the central administrative apparatus) by an order of magnitude.

Hence, the capital of a large developed preindustrial state had to accommodate this complex central apparatus, which implied the presence in such a capital of not only a very large number of administrators and auxiliary technical staff, but also of an even larger number of craftsmen, merchants and service providers who were necessary to support the functioning of the former. As was mentioned above, such capitals tended to concentrate a substantial part of nobility (including even those of its members who were not at the state service) and military. In addition to this, developed statehood implies that the system of resource accumulation and redistribution through the administrative center is also more developed by an order of magnitude than in the early states, which led to a sharp increase in resource concentration levels within such centers. Especially high levels of resource concentration were observed in the administrative centers of the largest developed states, which attracted considerable numbers of people even if they were not engaged directly in serving the needs of the central administrative apparatus of such a state. Against this background it does not appear coincidental at all that the majority of megacities registered by Chandler's database prior to 1801 were nothing else but capitals of large developed/mature states-'empires'. Note also that in general, out of 152 megacities (with more than 200 thousand inhabitants) registered by Chandler's database prior to 1801, 134 megacities (*i.e.* more than 88 %) were situated within the territory controlled by developed/mature states and their analogues (Chandler 1987: 461–485), which can be considered as additional evidence supporting the statement that the preindustrial megacites were created up to a very considerable degree just by the developed statehood.

Let us consider now the correlation between the dynamics of territory controlled by developed/mature states and the world's megaurbanization dynamics (*i.e.,* the dynamics of the world megacities' population as a proportion of the total population of the world) (see Diagrams 3.8–3.10).

Diagram 3.8. Dynamics of World Megaurbanization (proportion of megacities' population in the total population of the world, ‰) an the Territory Controlled by Developed/Mature States and Their Analogues (millions km^2), till 1950

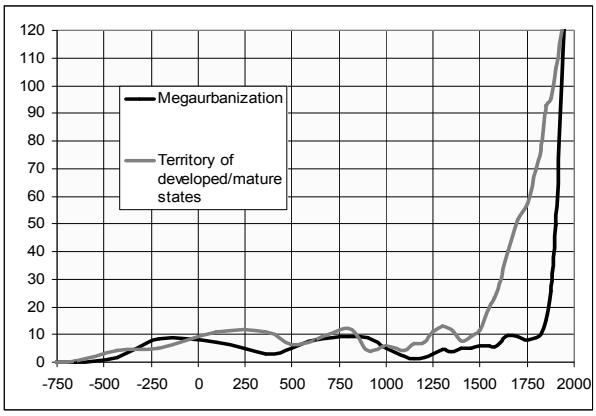


Diagram 3.9. Dynamics of World Megaurbanization (proportion of megacities' population in the total population of the world, ‰) an the Territory Controlled by Developed/Mature States and Their Analogues (millions km^2), 1250–1950 CE

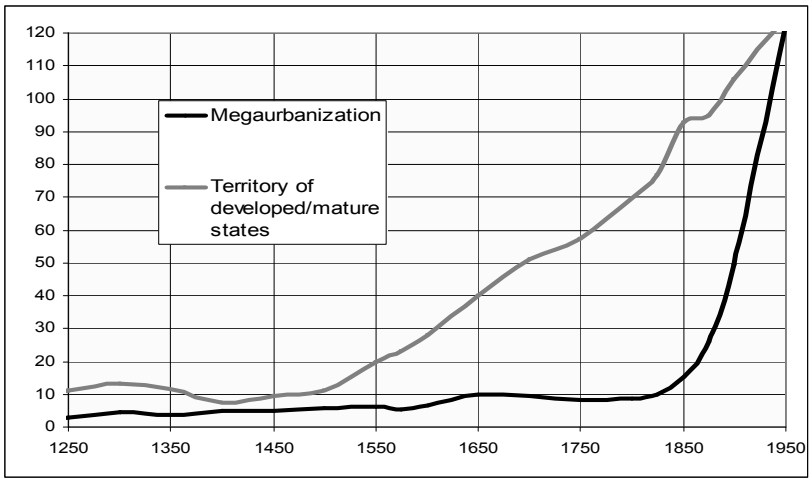
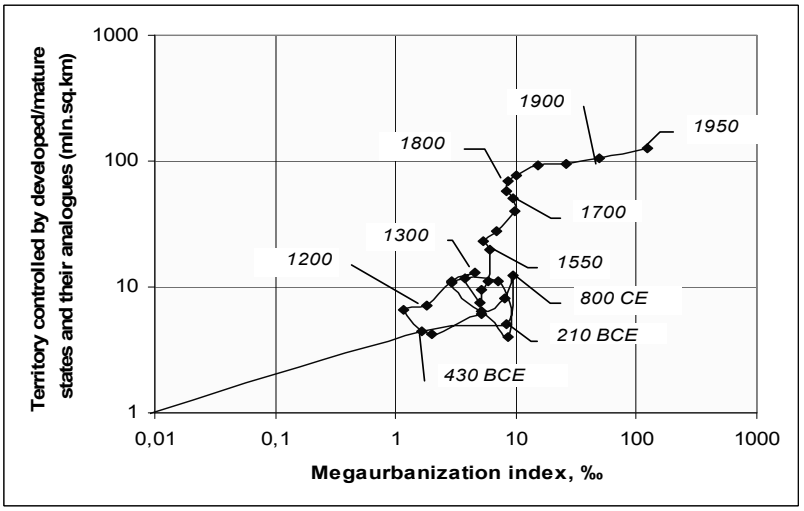


Diagram 3.10. Dynamics of World Megaurbanization (proportion of megacities' population in the total population of the world, ‰) and the Territory Controlled by Developed/Mature States and Their Analogues (millions km^2), till 1950, phase portrait in double logarithmic scale



As we see, the sharp increase in the territory controlled by developed states observed in the second half of the 1st millennium BCE was quite predictably accompanied by the formation of the first megacities. By the end of this millennium the world's megaurbanization rate had approached 1 % (or 10 ‰), whereas the developed states' territory had reached 10 million km^2. After this the respective variables remained around this level for about a millennium and a half. The World System found itself within the supercomplex agrarian society attraction basin. The territory of the developed states started its movement from this basin of

attraction in the late 15th century, that is, 300 years before the megaurbanization. This does not contradict the fact that the megacities' overall population started growing rather rapidly simultaneously with the start of the impetuous growth of the developed states' territory in the late 15th century. Let us recollect that those processes took place against the background of the hyperbolic growth of the World System's population (Korotayev, Malkov, and Khaltourina 2006a). As a result, even though the world megacities' population grew by 215 % between 1500 and 1800, its proportion in the overall population of the world (*i.e.* the World System urbanization) increased by less than 50 %. Thus, by the early 19th century with respect to its megaurbanization rate, the World System still remained within the attraction basin of the supercomplex agrarian society, which it only left and began its unequivocal movement (= phase transition) towards the next attractor in the 19th century.

This is quite explicable, because the second phase of the industrial revolution (the actual industrial breakthrough) had only begun, and by that time it had embraced only one country – England (see, *e.g.*, Knowles 1937; Dietz 1927; Henderson 1961; Phyllys 1965; Cipolla 1976; Stearns 1993, 1998; Lieberman 1972); hence, it had not proliferated sufficiently. In the meantime, the World System could only reach a qualitatively higher level of megaurbanization through adopting a new economic basis, whereas the development of this basis had not reached a necessary volume by the early 19th century. It somehow resembles the situation of the 2nd millennium BCE when the territories where the developed states could appear with the available (at that time) limited technological basis had been exhausted; similarly the potential of the megacities' development on the old supercomplex agricultural technological basis had been almost entirely exhausted by the 19th century and the further megaurbanization breakthrough became only possible through the World System transition to a new production principle, the industrial one.

Note that a similar picture is observed with respect to the overall global urbanization dynamics (*i.e.* for the dynamics of the proportion of population living in cities with more than 10,000 inhabitants in the total population of the world) (see Diagrams 3.11–3.12).

Diagram 3.11. Global Urbanization Dynamics (= dynamics of proportion of population of cities with > 10,000 inhabitants in the total population of the world, %) and Dynamics of Territory Controlled by Developed/Mature States and Their Analogues (millions km^2), till 1950

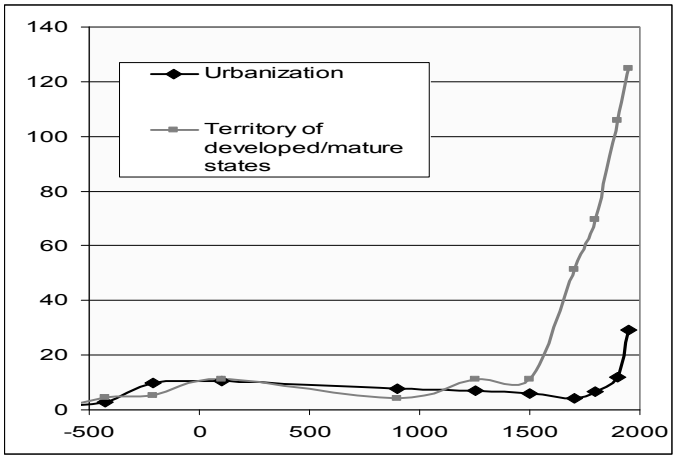
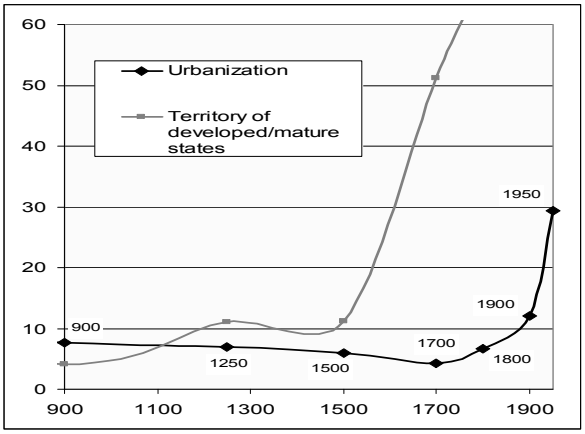


Diagram 3.12. Global Urbanization Dynamics (= dynamics of proportion of population of cities with > 10,000 inhabitants in the total population of the world, %) and Dynamics of Territory Controlled by Developed/Mature States and Their Analogues (millions km^2), 900–1950 CE



We would consider as a correlate to the urbanization explosion of the 19th and 20th centuries in the sphere of political development, not the growth of the territory controlled by the developed/mature states, but, instead, the wave of the formation, proliferation, and strengthening of the mature state that was observed in these centuries and that in the 20th century engulfed almost the whole of our planet. As regards the territory controlled by the developed and mature states, already in the late 19th century it came rather close to the saturation point (corresponding just to the territory of all the inhabitable landmass of our planet), which quite predictably led to a certain slowdown in the rate of increase in the value of the respective variable.

Finally, we would like to stress that, from our point of view, *urbanization, on the one hand, and the growth of developed and mature statehood, on the other, are not just mutually connected and do not just influence each other (as was shown above) – but they are two different aspects of one process, the process of the World System development.* That is why it makes sense to conclude this article with a consideration of their interrelationships in the framework of the general process of the development of the World System as a whole. The World System is an extremely wide suprasocietal system that unites a very large number of societies with various links that at the early stages of their development were mostly information (and only partly technological diffusion) links. However, at later stages we observe the growth of the importance of political-military and economic links. Incidentally, the latter is connected with the development of new communication technologies. Consequently, the transition of the World System through each new stage of its evolution was connected with the development of the world's economy, trade, diffusion of new technologies and so on, and all this taken together led to new waves of city growth. We can observe the following general regularities of World System development:

a) The very transition of it from one stage to another was prepared every time by such phenomena of its political and urban organization that were not systemic for an earlier stage of its development. And this is quite explicable, as new phenomena must develop within an earlier stage creating a new core for the diffusion of new systemic characteristics. Among other things this accounts for a considerable time lag between the formation of the first developed states and the proliferation of the developed statehood throughout

the World System. In some areas (as in Egypt and Mesopotamia) a lead in the development of the political system relative to the overall level of World System development was possible; however, the further political development needed a considerable change of the World System as a whole.

b) The World System transition to a new stage produces a cumulative effect of the diffusion (through borrowing, modernization, forced transformation and so on) of new phenomena to those territories that failed to develop such phenomena independently.

c) The development of political and urban systems mutually reinforced each other, whereas for some period the lead belonged to the political development, while in the other periods it belonged to the development of the urban systems.

The first stage of the World System corresponds to the period of the World System formation and the developments of the first cities and complex polities on its basis; it ends with Phase Transition A1 to the complex agrarian systems. It appears logical to connect it with the first phase of the agrarian revolution and the diffusion of its results. It corresponds approximately to the period between the 10th and 4th millennia BCE inclucive.[38] At the end of this period we observe the formation of the first states and a whole system of cities, whereas we find a rather complex urban society in the Near East (see, *e.g.*, Lamberg-Karlovski 1990: 4). However, a real proliferation of both cities and statehood (as well as its analogues) is observed during the next stage.

The second stage of the World System development corresponds to the second phase of the agrarian revolution, or to the attraction basin of complex agrarian society (B1) and the beginning of Phase Transition A2 to the supercomplex agrarian society (the 3rd millennium – the first half of the 1st millennium BCE). During Phase Transition A1 we observed the transition to intensive irrigation agriculture that provided a basis for the formation of the first states and the growth of cities. The processes of the new states and cities' formation (as well as processes of their disintegration, which created the attractor effect) continued

[38] Naturally, we are speaking about the most advanced areas of the Near East for whom we date the first phase of the agrarian revolution to the period between the 10th/9th and 6th millennia BCE (see Grinin 2006e, 2006g). It is quite clear that for other regions, these dates are quite different, but this is not important for us in the present context, as these areas were outside of the nascent World System during the period in question. What is more important looks as follows. We know the first stage of the World System development worst of all (at least due to the total absence of written sources for the period in question). Hence, this stage has been singled out just preliminarily. In reality, we appear to deal here with a few (or, at least, two) stages, that could be subdivided into substages. Indeed, there are certain grounds to suppose that the history of this period of the World System development (whose duration exceeds the one of all the other periods taken together) had a rather complex structure. For example, one could suggest a distinction of the stage of the World System genesis (roughly the 10th – 6th millennia BCE). As was mentioned above, it could be connected with the first phase of the agrarian revolution in the Near East. The second stage (roughly the 6th – 4th millennia BCE) is connected with the wide diffusion of the agrarian revolution achievements, the pronounced expansion of the area of the agrarian production principle, the production diversification, significant growth of sociocultural complexity, increase in the quality and density of the World System links. It may be considered as the stage of the finalization of the World System formation. On the other hand, within the period between the 10th and 4th millennia BCE one can tentatively detect a certain system of attractors and phase transitions. First of all, in the 10th and 9th millennia BCE in the core of the nascent World System (within the Fertile Crescent) we are dealing with the phase transition from the intensive foraging societies to the simple agrarian ones (for the region in question the period of simple agrarian societies roughly corresponds to the Pre-Pottery Neolithic period) that took place (see, *e.g.*, Shnirelman 1986: 251; Diamond 1999: 131–136; Kuijt 2000; C. Ember, M. Ember, and Peregrine 2002: 164–165). However, already the World System protourban agrarian cultures of the 6th – 4th millennia could be hardly called 'simple' – as has been convincingly shown by Berezkin (1995, 2000). We rather deal here with medium-complexity agrarian societies the transition to which (very roughly corresponding to the transition from the Pre-Pottery Neolithic to the Pottery one) in the World System core areas appears to have taken place in the 7th and 6th millennia, when we observe the formation of a number of 'protocities' (`Ain Ghazal, Beisamoun, Beida, Abu Hureira, Çatal Hüyük) with the estimated population of around 2000 (or more) each, which is by an order of magnitude higher than the settlement size typical for simple agrarian societies (see, *e.g.*, Murdock 1967; note that this is why we prefer to denote those cultures that are typical for Attraction Basin B1 as 'complex agrarian societies', whereas the ones typical for Attraction Basin B3 we denote as 'supercomplex agrarian societies'). Note also that if the hypothesis on the presence of the above described system of attraction basins and phase transitions of the World System in the 10th – 4th millennia BCE is confirmed, it will demand the reconsideration of not only the periods of its development, but also of the designations of its attraction basins and phase transitions.

during the whole of the B1 period. At the end of this stage, during Phase Transition A2, the agrarian revolution was finalized through the diffusion of effective plow agrarian technologies employing iron tools. As a result we observe the proliferation of economic links throughout very large parts of the World System, the extension of those links, and the formation of large areas of intensive growth. New political structures were developed, including the formation of the first really large-scale empires.

In the 2nd millennium BCE the first developed states appeared. However, their productive basis was restricted to a few river valleys which had a very fecund and thus special ecological environment.

The third stage of the World System development is a period of the agrarian civilizations' maturity, which correspond to the end of Phase Transition A2 and the attraction basin of the supercomplex agrarian society (B2). This is a period starting in the second half of the 1st millennium BCE and ending in the first half of the 2nd millennium CE. At the beginning of this stage the proliferation of developed statehood eliminated its lagging behind urbanization, and we see that in the process of Phase Transition A2 (in the 1st millennium BCE) it acquired a solid territorial basis and a considerable degree of stability. Indeed, notwithstanding the breakdowns that a number of developed states experienced within Attraction Basin B2, during the respective period (the 1st millennium CE and the first half of the 2nd millennium CE) the overall territory (and population) controlled by the developed states remained within the same order of magnitude. This generally suggests a state of relative stability of the World System, notwithstanding all the dramatic perturbations that were observed in its various constituent parts. As a result the World System fluctuated in the vicinity of Attractor B2 up to Phase Transition A3.

However, at the end of this period we observe important changes in urban development in cities of the World System. In the first half of the 2nd century CE this is clearly manifested in the appearance of a very large number of new cities in Europe (both in its West and East) and a rather intensive overall urban growth in this part of the World System. It should be noted that in many parts of Europe cities developed as autonomous settlements specializing in crafts and trade, and this played an important role in the further development of the World System. However, the cities grew not only in Europe, but also, for example, in Central Asia; a long-term trend towards urban growth can be traced in the 10th – 16th centuries in China;[39] cities appeared and grew in many areas that were integrated in the World System during the period in question – in Japan, South-East Asia, at the East African coast, in the African regions immediately South of the Sahara, and so on (see, *e.g.*, Chandler 1987; Wilkinson 1993). A system of land trade routs (that effectively connected most constituent parts of the World System) was established throughout the territory of the Mongol States. At the end of the period, in the 13th – 15th centuries for the first time after the breakdown of the Roman Empire, we observe the formation of developed states (that played a very significant role in the subsequent development of the World System) in Europe. Protoforms of a new type of economy were formed in a belt stretching from Northern Italy through Southern Germany to the Netherlands (see, *e.g.*, Bernal 1965; Wallerstein 1974).

The fourth stage of the World System development is a period from the 15th century up to the early 18th century, which corresponds to the final period of the World System development within the attraction basin of the supercomplex agrarian society (B2), the period of the completion of accumulation of those conditions that were necessary for the start of Phase Transition A3. This stage is connected with the start (the first phase) of the Industrial Revolution and the great geographic discoveries that gave a powerful impetus to World

[39] On the other hand, it is necessary to note the absence of any significant urban growth (even as a trend) during the whole period in question in some most ancient World System centers, for example, in Egypt and Levant (Bolshakov 2001).

System development. First of all, the World System experienced a radical territorial expansion; secondly, it transformed into what Wallerstein (1974, 1980, 1987, 1988, 2004) denotes as the capitalist world-system, as its constituent parts started to be connected more and more with the bulk commodity exchanges. During this period the main World System changes were directly connected not so much with the growth of the cities as base stations and communication network nodes within the old borders of the World Systems, but rather with sea-born expansion to new lands, which became only possible through the development of ship-building and navigation technologies.

During this period urban growth appears to have been connected, first of all, with political processes, especially with the above mentioned proliferation and strengthening of developed statehood (*i.e.,* the formation of developed capitals, growth of regional megacities, and so on). Urban growth was also connected with the formation of a developed statehood and the strengthening of internal markets; whereas the Modern Age formation of developed statehood also implied a certain industrial development in connection with the so-called 'Military Revolution' of the 16th and 17th centuries (see, *e.g.*, Duffy 1980; Downing 1992).

At the end of this period we observe the formation of the first mature states and the first industrial zones.

The fifth stage of the World System development corresponds to the first part of Phase Transition A3 and is directly connected with the second phase of the Industrial Revolution (*i.e.* with the industrial breakthrough of the 18th and 19th centuries), but especially with the development of transportation and communication technologies that raised by orders of magnitude the degree of the World System integration, which became integrated by powerful and constant currents of commodities, information, and services that stand in sharp contrast with previous discontinuous and fragmentary technological diffusion waves. The World System became firmly integrated by the international division of labor. The second phase of the Industrial Revolution was indissolubly connected not only with the growth of cities, but also with a radical growth of the degree of urbanization (*i.e.* the proportion of city-dwellers in the overall population), because during this period industries developed mostly within cities. This situation was accompanied by (and in part a result of) the growth in the productivity of labor in agriculture (up to a very considerable degree due to the introduction of urban industrial products – various agricultural tools, machines, mineral fertilizers, pesticides and so on). This increase in the growth of the productivity of agricultural labor pushed the excess population into the cities where the representatives of this excess tended to find that it was possible to get jobs there just because of the impetuous growth of the urban industries and accompanying service sectors that demanded more and more working hands whom, however, the new economy managed to feed quite successfully precisely due to the growth of agricultural productivity. Naturally, on the one hand, such developments led to a vigorous increase in global urbanization that against the background of the hyperbolic growth of the world population led to an explosive, quadratic-hyperbolic growth of the world urban population (see *Section 1*), and explosive growth in the number of megacities and their sizes; on the other hand, these developments also contributed to the radical transformation of statehood and its phase transition to a new level in its development – to mature statehood. In its turn the transition from developed to mature statehood contributed to the amplification of the global urbanization processes.

The sixth stage of the World System development is connected with the information-scientific revolution of the second half of the 20th century (which corresponds to the second stage of Phase Transition A3); however, consideration of this period, as well as of **the seventh stage of the World System development** (corresponding to the epoch of the World System entering Attraction Basin A3) goes beyond the scope of this article.

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