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Leonid Grinin & Andrey Akorotayev, *Great Divergence and Great Convergence: A Global Perspective*, Springer, 2015, 251 pp, $99 Hardcover

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Abstract. The book, Great Divergence and Great Convergence: A Global Perspective, represents an insightful analysis of the processes associated with historical change, specifically those processes that have given rise to the current state of the world system. Uniquely, the authors suggest that continuity of process extends to both the Divergence and Convergence. Further, they suggest that the time depth of the origin of this process is much deeper than the traditional marker of the mid-17th Century and build a strong case for this assessment. Finally, Grinin and Korotayev make some predictions regarding the further effects of the process of convergence into the near future, predictions suggesting a significant reshuffling of world system organization and the rise of a global middle class.
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Book Review

In the early years of the 21st Century humanity faces both promise and also a precarious set of conditions, conditions which span the range of domains from environmental degradation, through socio-political upheaval, to economic downturn. Our sense of promise comes from the diversity of humanity currently present on the earth, the creativity and ingenuity endemic in that diversity, and the potential quality of life that has already been achieved for 60% or so of the global population, a quality of life that may be a real possibility for many more. This current status of the world system of course has a history and, as just mentioned, and a double-edged potential for the future as well as a complex presence.

Our present level of complexity, perhaps even hyper-complexity, depends ona mix of ingenuity, the availability of historically unique sources of energy, and a level of technological expertise and interconnectedness that is both without precedence and ultimately quite fragile. Inspecting this complexity more closely reveals however a trichotomy of existence. Unquestionably, there are at present those states that are hegemonic dominants, the U.S. and Western Europe, and linked to this group, Japan, Australia, and New Zealand. Then below this group are those countries with increasing hegemonic influence, specifically the BRICS states of Brazil, Russia, India, China, and South Africa, a group that constitutes two demographic giants, China and India, and has the lion's share of the earth's natural resources, and finally there is the remainder of the planet's 196 states, many in

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Africa and South East Asia, some on the rise, but the majority of this group still economically, politically, and socially vulnerable. Interestingly, the pattern of change that has brought the world system to its current state has been occurring for some time and has involved significant changes in the influence of groups of polities over the past thousand or so years, the most significant of which is the rise to dominance of the West over the last 200 years and the current resurgence of the East.

All of this poses a number of important questions for historians, economists, demographers, macro-sociologists, and interested scholars in general. How did we come to be in this current set of circumstances? What roles did, do, and will trends in economics, socio-political processes, demographic growth, technology, and culture play in creating the circumstances that were, are, and will be the states of the world system? What were the limits to the world-system as it evolved to its present state? What are the current limits on the system, and what limits will canalize its future trajectory?Over time was the developing state of the world system a consequence of processual continuity, or are there disjunctions within the time course of the development of the world system? If there are disjunctions or at least periods of rapid change in the trajectory of the world system, what is the nature of these periods of heightened change? How similar are they to the phase changes of the physical world, and what is the level of predictability that can be brought to bear on our understanding of their significance to the world system?And, clearly there are many more questions that could be specified.

Bringing academic focus to the development of the world system, the imprint of the depth of time on that development, the complexity of events occurring over that depth of time, the current status of the system, and its future potential trajectories requires skill, insight, intelligence, and creativity. To this end, Leonid Grinin and Andrey Korotayev have written a remarkable book, Great Divergence and Great Convergence: A Global Perspective, and represent an authorship team which is exceptionally well adapted to the task. Leonid Grinin is the author of over three hundred papers, well over twenty monographs,is the Director of the Volgograd Center for Social Research, is the Deputy Director of the Eurasian Center for Big History and System Forecasting, and has a breadth of experience in macrosocial and historical researchall of which make him very well equipped to the task of analysis of the world system changes over the last millennium. Andrey Korotayev also has a varied background with multiple interests ranging from social anthropology, to macrosocial dynamics, to the spectral analysis of Kondratief waves. He is the Head of the laboratory of Monitoring of the Risks of Sociopolitical Destabilization, is also a Senior Research Professor with both the Center for Big History and System Forecasting and the Institute for African Studies of the Russian Academy of Sciences. However, for me what sets him apart is his mastery of math modeling of macrosocial processes, a topic that will be dealt with in more detail later.

Grinin and Korotayev take the position that the roots of the Great Divergence are much deeper than the middle of the 18th Century and mark that beginning of the process toward divergence with a period of precondition initiated in the 12th and 13th Centuries when there was a clear medieval industrial revolution, reduced in scale from the industrial revolution of the 18th Century, and this revolution moved the West into a mode of convergence with the at the time far superior East. This process took over two centuries and involved improvements in technology and science which had the effect of elevating the environmental carrying capacity of the West. What followed then was a three phase transition in which the final phase is comparable to the traditional description of the Industrial Revolution and the motive force for the Great Divergence of the West over the East. The initial phase

of this process began in the Early Modern period extending from about 1450 CE to the1660's and characterized by significant epidemic impact, socio-political destabilization, and the second phase from the 1600's to approximately 1760 CE, which is characterized by agrarian innovation and proto-globalization.

In their discussion of the influence of the Early Modern Period on the Great Divergence Grinin and Korotayev recognize the multifaceted processes of this time and coin the term, *catching up divergence*, to very accurately describe specific changes within this mosaic of processes that led to western convergence with the East. The implication of this term is that, while the West in the totality of comparison with the East was clearly behind, the actual convergence of the West with the East was brought about by the evolved superiority of the West in specific areas which brought about the ultimate and complete divergence. Examples of these changed or evolved areas are improved techniques in metal cutting, improvements in water wheel technology, and significant changes in military technology to name just three. These improvements all fall within the context of improved efficiency of labor, and there were also improvements in the efficient use of "biological energy", explicitly "in industry, in commerce, in accounting, and in other areas". The authors make the point by asking how many hours of human labor were saved by the invention of the printing press. In these specific areas of divergence then, the convergence of the West with the East was brought about. One further point, toward the end of this Early Modern Period the rapid increase in wealth of the West due to the acquisition of precious metals from the New World, which both increased the flow of goods from the East and also helped develop an incipient middle class in the West.

The period from 1600 CE to 1760 CE was uniquely characterized by in particular three factors, the role of the periphery in the West versus the non-role of the periphery in the East, the adoption of an isolationist policy by the East, particularly China and Japan, and an increased rate of both western invention and innovation and the diffusion of those inventions and innovations in the West. Along with these changes, the further increase in agricultural technology released rural workers who could then increase the ranks of the urbanized. It is interesting that while this process had begun in the Early Modern Period, it also fueled invention and innovation by increasing the number of small urbanized areas, a process in which localized invention could then spread through the connectedness of this web of partially autonomous urban areas. This pattern is reminiscent of the structure of a meta-population of organisms and how mutation originating in one local population might spread through the remainder of the population via gene flow. In this case, the flow of ideas and material inventions and innovations are analogous to the flow of genetic material.

The traditional view of the beginning of the Industrial Revolution actually represents the beginning of the final phase of this process of divergence as represented by Grinin and Korotayev, and while the steam engine reigns supreme as the quintessential mechanism associated with the Industrial Revolution, in fact the processes of continual mechanization, the continual expansion of machine application, and the freedom from direct reliance on water power which allowed the location of factories away from water sources ultimately focused on making labor more and more efficient. It has been calculated that four million British laborers with the aid of steam could produce the labor of six hundred million laborers without the aid of steam.

During the final phase of the Great Divergence the authors recognize two somewhat separate divergence trajectories, that of Britain and Western Europe and that of the United States. They show quite graphically between 1880 and 1910 that the divergence experienced by the United States was effectively exponential with

respect to any improvement in the East, while Britain was almost linear in its increase. Also, China, Japan, Turkey, and Egypt did manage to improve, they did not have the success of the West, and only Japan was able to make significant steps toward catching up with the West. It is suggested that chief among the inhibitory factors for China was its immense population and the burden that the magnitude of this population placed on change. It effectively extinguished change in light of the fact that because human labor was so abundant there was no motivation to invent and innovate.

There are two other factors that are mentioned having a profound effect on the final stages of divergence. They are the establishment of legal protection for intellectual property, in other words, the establishment of patent law, which was particularly well developed in England, and the process of globalization which continues even today and is also part-and-parcel of the Great Convergence. Globalization of course began with the Age of Discovery, was motivated by advanced naval technology, and supplied the Old(er) World with trade routes which spread materials, genes, ideas, and in some instances, disease. Regarding this last, one has only to consider the impact of food goods, specifically the potato, which initially was a nutritional opportunity which became a nutritional necessity, and was exceeded by a fungal potato blight causing significant famine in Europe, specifically in Ireland. Syphillus, TB, and smallpox also come to mind as diseases spread by trade.

While globalization was a key factor in the end game and near-end game of the Great Divergence, it also set the stage for the Great Convergence, the convergence of the East with the West, and the overriding model used by Grinin and Korotayev to explain the Great Divergence incorporates this. Ecological succession is a process by which each successional stage sets the conditions for the establishment of the next successional stage, and much like ecological succession Grinin and Korotayev describe the collective processes associated with the Great Divergence as setting the stage for each phase of the divergence and also the convergence that the world system now is in. It is their skillful use of data and their creative insight that brings this overall pattern to the fore.

The current state of the world system according to a variety of scholars clearly exhibits the characteristics of a divergent system. This position is supported by a diversity of data ranging from that based on cross-sectional studies of the distribution of world GDP to changes in imperfect capital mobility to evidence of international per capita output. The book makes the point, however, that the evidence of similar patterns of both changing shares in the world system GDP and changing rates of population growth imply a system wide behavior and one that represents a process of convergence. Further, using data sets that compare the "West with the Rest" initially over extended periods of time but with reduced time spans to show the magnified effects of change, the authors demonstrate very clearly that convergence is in fact occurring between the West and the rest of the world since the 1960's.

The world system is then treated as a tripartite system in which astute graphical comparisons are made between the first world, the second world, and the third world. While this terminology has its roots in the cold war period, its functional worth becomes clear when it is demonstrated that the second world, i.e. those countries previously within the Soviet domain, very clearly had a significant economic downturn in the 1990's shortly after the collapse of the Soviet Union, which as a consequence actually had the effect of causing a relative convergence between the first and third worlds. These graphical comparisons are done using both GDP percentages and a scale based on the status of the high income countries at 2000 CE.

In turn, when the world system is divided into high, middle, and low income countries, the evidence for convergence is parsed out more clearly. This point is further strengthened in a statistical addendum in which through temporal comparisons it is shown that it is the middle income countries that have converged significantly with the high income countries. Further, the high income countries, the so-called golden billion, are increasing in population, as are middle income countries due to both a positive rate of growth and the movement of some low income countries into the middle income category. This condition may well have a short lifespan in that while the low income countries are contributing relatively little to the process [?] and their collective numbers are declining for the moment, but due to a combination of deficient education, relatively high and increasing birth rate, and a reduced economic output the future of the low income countries is not particularly rosy. The authors warn of a potential dampening of the current convergence process.

The formal portion of the book closes with a forecast into the near future and suggests that the near-term will be characterized by three factors: a. The world system will be subject to changing rules with respect to the functioning of its component states and will also become more flexible in response to perturbations. b. States will align and realign as their needs and context continually change. c. The sovereignty of individual states will become reduced as the sovereignty of alliances and blocks of states and also of supranational organizations increases. This near-future will be relatively unstable as states, groups of states, and other institutional entities jostle for position and as, while the hegemony of the U.S. will continue to decline, there is no one state capable of meeting all the characteristics of a dominant hegemon and adopting that role. Consequently, the U.S. will continue as world hegemon for the near-time but will do so with reduced influence.

Changes in world system disposition will be a consequence of both changes in external state relationships and changes within individual states. Uneven development of individual states, ethnic changes within countries, perhaps a consequence of current and future patterns of migration as well as endemic changes within any given state, and changing levels of activity within the world system will all contribute ultimately to a new world system configuration. Also involved will be the process of globalization; during this near-term phase economic globalization will lead but will be followed by political and socio-cultural globalization as well.

Of particular interest is the role that technological innovation will play as the Great Convergence moves past the present. First, the authors suggest that the current information technology paradigm is nearly exhausted, but they see no chance for a new paradigm emerging until 2030 due to the current level of convergence, i.e. the actual process of convergence must proceed and is a prerequisite for further paradigmatic inventiveness to both occur and spread. This is due both to the time required for the diffusion of ideas but also because new paradigms won't be accepted until old paradigms have completely equilibrated. While the book is less than sanguine about the stability of the near future in light of the Great Convergence, the reader is left with a sense of promise, because during this period of continuing convergence the world system middle class will grow and represents the potential for the development of "panhuman ideas" and new possibilities for globalization and the reconfiguration of the world system.

A further comment is necessary here to discuss the appendices, particularly Appendix B. Both appendices are exceptionally functional, but a comment is due specifically on the mathematical models represented in Appendix B. The math is due to the efforts of Andrey Korotayev, is a development, or rather, and expansion, of a previous model developed by Andrey in 2006. He is a pre-eminent math modeler of processes that are specifically associated with macrosociology, devises

elegant, simple models that help to clarify thought, and whose models are designed to emphasize conceptual understanding and have very clear worth of prediction. For those who use mathematical models and for those who appreciate the clarity and focus that math models bring to the study of any problem, Appendix B will be of great value in understanding the process of convergence.

This book is recommended to anyone interested in understanding the present state and context of the world system should find Great Divergence and Great Convergence: A Global Perspective a very valuable read and a continual source of insight and information. The specific aspects of this book that set it far apart from a simple narrative of change over time are the emphasis on continuous process, the multifaceted characteristics of that process, the threshold nature of some aspects of change, the breadth and depth of supporting data including the graphical representation of that data, and the melding of historical insight with the clarity of both verbal and mathematical models. Beyond this, the duo of authors have both the complementary and supplementary knowledge and expertise to present the topics covered in a very professional way. This book will make a valuable contribution to world system analysis in general and the specifics of the Great Divergence and Great Convergence.