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On the structure of the present-day convergence

Andrey Korotayev
Laboratory of Monitoring of Risks of Sociopolitical Destabilization, National Research University Higher School of Economics, Moscow, Russia and System Forecasting Center, Institute of Oriental Studies of the Russian Academy of Sciences, Moscow, Russia, and
Julia Zinkina
Laboratory of Monitoring of Risks of Sociopolitical Destabilization, National Research University Higher School of Economics, Moscow, Russia

Abstract

Purpose – A substantial number of researchers have investigated the global economic dynamics of this time to disprove unconditional convergence and refute its very idea, stating the phenomenon of conditional convergence instead. However, most respective papers limit their investigation period with the early or mid-2000s. In the authors' opinion, some of the global trends which revealed themselves particularly clearly in the second half of the 2000s call for a revision of the convergence issue. The paper aims to discuss these issues.

Design/methodology/approach – Several methodologies for measuring the global convergence/divergence trends exist in the economic literature. This paper seeks to contribute to the existing literature on unconditional β-convergence of the per capita incomes at the global level.

Findings – In the recent years, the gap between high-income and middle-income countries is decreasing especially rapidly. The gap between high-income and low-income countries, meanwhile, is decreasing at a much slower pace. At the same time, the gap between middle-income and low-income countries is actually widening. Indeed, in the early 1980s GDP per capita in the low-income countries was on average three times lower than in the middle-income countries, and this gap was totally overshadowed by the more than ten-time abyss between the middle-income and the high-income countries. Now, however, the GDP per capita in low-income countries lags behind the middle-income ones by more than five times, which is largely the same as the gap (rapidly contracting in the recent years) between the high-income and the middle-income countries. This clearly suggests that the configuration of the world system has experienced a very significant transformation in the recent 30 years.

Research limitations/implications – The research concentrates upon the dynamics of the gap in per capita income between the high-income, the middle-income, and the low-income countries.

Originality/value – This paper's originality/value lies in drawing attention to the specific changes in the structure of global convergence/divergence patterns and their implications for the low-income countries.

Keywords Innovation, Development, Classification, Convergence, Systems theory, Globalization, Technological innovation, Global studies, Low-income countries, Middle-income countries, Catch-up

Paper type Conceptual paper

Various aspects of convergence and the catch-up effect have attracted considerable scholarly attention, including the questions of unconditional (absolute) convergence vs conditional convergence; global convergence vs local or club-convergence;

This paper is an output of a research project implemented as part of the Basic Research Program at the National Research University Higher School of Economics (HSE) in 2014.

Campus-Wide Information Systems
Vol. 31 No. 2/3, 2014
pp. 139-152

1065-0741
DOI 10.1108/CWIS-11-2013-0064

σ-convergence vs β-convergence, etc. (for a systemic review see, e.g. Islam, 2003). This paper seeks to contribute to the existing literature on unconditional convergence of the per capita incomes at the global level. Indeed, basing on the tenets of the theory of convergence laid in the classic works of Gerschenkron (1952) and Solow (1956), one could regard the increasing globalization and world connectedness in the 1990s and the 2000s as sufficient grounds to expect convergence trends at the global level during this period. Contrary to such expectations, a substantial number of scientific papers investigated the global economic dynamics of this time to disprove unconditional convergence and refute its very idea, stating the phenomenon of conditional convergence instead (see the next sections). However, most of these papers limit their investigation period with the early or the mid-2000s. In our opinion, some of the global trends which revealed themselves particularly clearly in the second half of the 2000s call for a revision of the convergence issue. Indeed, "the recent wave of globalization has been spurred mainly by two factors: technological change – bringing about noticeable reductions in transport and information costs across countries; and policy decisions – pursuing tighter regional and supraregional integration schemes" (Villaverde and Maza, 2011, p. 952). Both these trends are likely to contribute to convergence, so in the current paper we pose two questions:

(1) whether any signs of unconditional convergence can be seen and, if so, what does its structure look like; and

(2) what impact the various recent global trends had upon the convergence trends.

Why should one expect to observe unconditional convergence?

The theory of convergence predominantly relies on the two classic works. First, in 1952 Alexander Gerschenkron in his "Economic Backwardness in Historical Perspective" essay showed that relative backwardness of a country can contribute to its development if supported by "adequate endowments of usable resources" and the absence of "great blocks to industrialization" (Gerschenkron, 1952, p. 6). Then, in 1956, Robert M. Solow published "A contribution to the theory of economic growth" pioneering the idea of the generality of unconditional convergence worldwide (Solow, 1956).

Two fundamental convergence-driving forces can be derived from these works. First, developing nations can draw upon the skills, production methods, and technology of more advanced countries. "As low-income countries draw upon the more productive technologies of the leaders, we would expect to see convergence of countries toward the technological frontier" (Samuelson and Nordhaus, 2005, p. 584).

Second, diminishing returns (to capital, etc.) are weaker in the developing countries than in the developed ones. Thus, "the diminishing returns to capital [implied by the Solow model] has another important implication: Other things equal, it is easier for a country to grow fast if it starts out relatively poor. This effect of initial conditions on subsequent growth is sometimes called the catch-up effect. In poor countries, workers lack even the most rudimentary tools and, as a result, have low productivity. Small amounts of capital investment would substantially raise these workers' productivity. By contrast, workers in rich countries have large amounts of capital with which to work, and this partly explains their high productivity. Yet with the amount of capital per worker already so high, additional capital investment has a relatively small effect on productivity. Studies of international data on economic growth confirm this catch-up effect: Controlling for other variables such as the percentage of GDP devoted

to investments, poor countries tend to grow at faster rates than rich countries" (Mankiw, 2008, p. 258).

Additionally, Abel and Bernanke note that according to the Solow model, if the economy is open, the absolute convergence gets support of some additional economic forces. Since poorer countries have less capital per worker and therefore a higher marginal product of capital than the more affluent countries, investors from richer countries will be able to get greater profits by investing in poor countries. Therefore, foreign investment should provide a more rapid increase in capital stock in poor countries, even if the level of domestic savings in these countries is low (Abel and Bernanke, 2005, p. 234; for more detail see also Korotayev and de Munck, 2013; Korotayev *et al.*, 2011a, b, 2012).

Why should one not expect to observe unconditional convergence at the global level?

However, the 1990s and the 2000s saw a wave of works showing no evidence for absolute convergence and stating the idea of conditional convergence instead. Thus, Barro viewed 98 countries in the period 1960-1985 and refuted the hypothesis of absolute convergence, stating that "the hypothesis that poor countries tend to grow faster than rich countries seems to be inconsistent with the cross-country evidence" (Barro, 1991, p. 407). Mankiw *et al.* also studied a sample of 98 countries, proved the absence of absolute convergence in per capita income during the period 1960-1985, and introduced the notion of conditional convergence, stating that "the Solow model predicts convergence only after controlling for the determinants of the steady state" (Mankiw *et al.*, 1992, p. 422). Sala-i-Martin analyzed a set of 110 countries and only found evidence for conditional convergence, stating that "the cross-country distribution of world GDP between 1960 and 1990 did not shrink, and poor countries have not grown faster than rich ones. […] in our world there is no absolute β-convergence" (Sala-i-Martin, 1996, p. 1034).

The phenomenon of conditional convergence found further supporting evidence in numerous studies with different conditioning variables (see, e.g. Caggiano and Leonida, 2009; Petrakos and Artelaris, 2009; Romero-Avila, 2009; Owen *et al.*, 2009; Sadik, 2008; Frantzen, 2004; de la Fuente, 2003; Jones, 1997; Caselli *et al.*, 1996; Sala-i-Martin, 1996; King and Levine, 1993; Levine and Renelt, 1992; Barro, 1991; De Long and Summers, 1991).

Currently there seems to be unanimous agreement among the researchers over the absence of absolute convergence of per capita income across the world; rather, absolute divergence and conditional convergence were observed in various cross-country studies (see, e.g. Sadik, 2008; Epstein *et al.*, 2007; Seshanna and Decornez, 2003; Workie, 2003; Quah, 1996a, b, c; Lee *et al.*, 1997; Bianchi, 1997; Sachs *et al.*, 1995; Canova and Marcet, 1995; Durlauf and Johnson, 1995; Desdoigts, 1994; Paap and van Dijk, 1994).

Among the more recent works refuting the unconditional convergence hypothesis is the cross-country analysis of GDP per capita values between 1960 and 2000 by Acemoglu (2009); he maintains that "there is a slight but noticeable increase in inequality across nations," i.e., divergence rather than convergence (Acemoglu, 2009, p. 6). Some works view the phenomenon of convergence in particular economic sectors. Thus, Rodrik finds evidence for unconditional convergence in manufacturing across 118 countries, but notes that "despite strong convergence within manufacturing, aggregate convergence fails due to the small share of manufacturing employment in low-income countries and the slow pace of industrialization" (Rodrik, 2013, p. 165).

However, most of the papers cited above, including the most recent ones, commonly limit the time of their investigation with the early or the mid-2000s. In our opinion, some of the trends which revealed themselves particularly clearly in the global world in the second half of the 2000s call for a revision of the convergence issue. Moreover, it was not only the middle-income countries that expressed positive signs of fast growth, but also the least developed ones, many of them in Sub-Saharan Africa (SSA). The promising macroeconomic trends are minutely described in the latest *African Economic Outlook* "Since the 'lost' 1980s and early 1990s Africa's economic performance has improved significantly and the continent has started to catch-up. From 1996 to 2010, Africa's average annual GDP growth amounted to about to 5% and per capita GDP increased year by year by an average of 2.5%. As a result, in 2010 Africa's level of per capita income surpassed its 1995 level by 46%. The catching-up of African economies has been widespread with the exception of a few countries" (AfDB, OECD, UNDP, ECA, 2013, p. 22). Both the middle-income and the low-income countries generally did better during the global 2008-2009 financial economic crisis than their high-income counterparts (see, e.g. World Bank, 2013, NY.GDP.PCAP.PP.KD). So, all things considered, the latest years present particular interest in searching for unconditional convergence at the global level.

Two questions deserve attention:

(1) whether any signs of unconditional convergence can be seen and, if so, what does its structure look like; and

(2) what (if any) impact the globalization trends had upon the convergence trends.

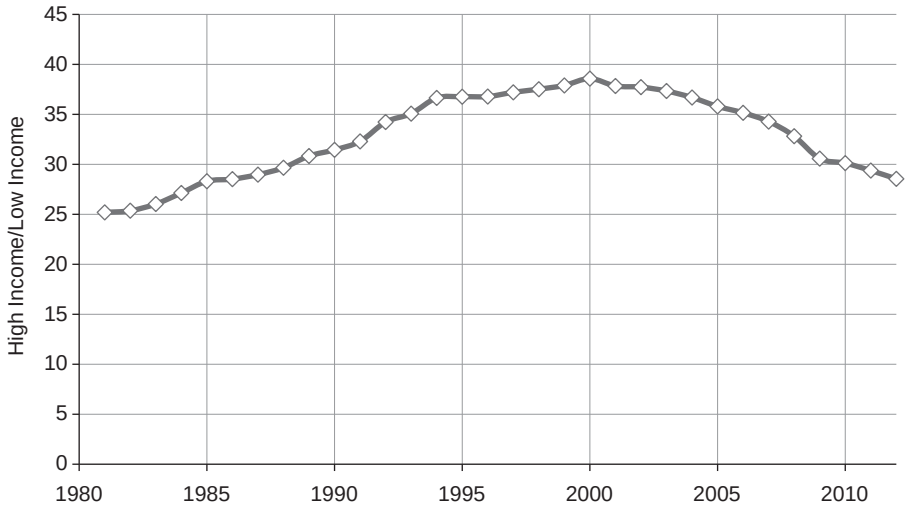
Any signs of unconditional convergence? Recent dynamics of the gap in per capita GDP

Let us first view the dynamics of the gap in GDP per capita between the high-income OECD countries and the low-income countries for the past three decades (see Figure 1).

One can see that the gap between the high-income OECD countries and the low-income countries kept growing until 2000. All in all, during the 1981-2000 this gap increased very significantly, from 25 times in 1981 to almost 40 times (however, one should note here that, though the gap was still widening in the late 1990s, it was at a much slower pace as compared to the previous years). In the 2000s the gap started to contract rather fast, decreasing from 40 to 30 times during only 12 years. Abstractly speaking, if this trend and pace are kept, the gap will essentially disappear in about 30 years – though, of course, there are strong doubts that the low-income countries ("the bottom billion" as coined by Collier, 2007) will manage to keep up the current fast pace of catching-up to the high-income countries in GDP per capita.

Let us now turn to the dynamics of the gap in GDP per capita between the high-income OECD countries and the middle-income countries in the past three decades (see Figure 2).

Thus, the gap between the high-income and middle-income countries kept growing up to 1990, approaching the value of 10 (which means that the GDP per capita in the high-income countries exceeded that in the middle-income countries by an order of magnitude). After 1990 one can observe a rather pronounced trend for a decline in this gap. However, during the 1990s the gap was declining rather slowly, going down from the value of 9.25 to 8.7 in ten years. In the 2000s the gap continued declining at a much accelerated pace, going down from 8.7 to 5.4 during 12 years (2000-2012). If this pace



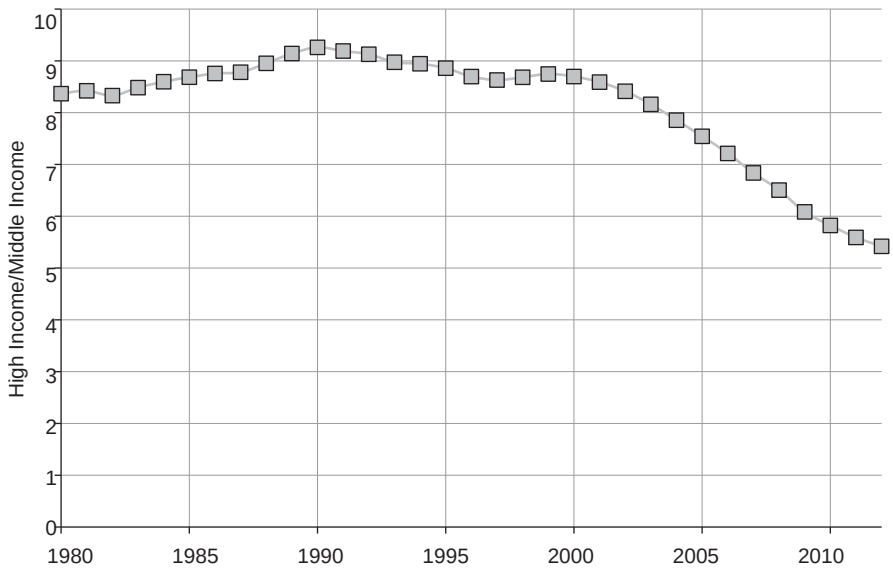
Notes: From here on we use 2005 constant international dollars, PPP. The figures on the *Y*-axis scale denote by how many times the average GDP per capita in the high-income OECD countries exceeded the one in the low-income countries for a given year. Thus, the value of 25 for 1981 means that in 1981 the GDP per capita was 25 times higher in the high-income OECD countries than in the low-income countries. Calculations made on the basis of the data presented by: World Bank (2013, NY.GDP.PCAP.PP.KD.)
According to the World Bank classification, high-income OECD countries include Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Rep.; Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, USA.

According to the World Bank classification, the low-income countries include Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, the Democratic Republic of Congo, Dem. Rep.; Eritrea, Ethiopia, the Gambia, Guinea, Guinea-Bissau, Haiti, Kenya, North Korea, Kyrgyzstan, Liberia, Madagascar, Malawi, Mali, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sierra Leone, Somalia, South Sudan, Tajikistan, Tanzania, Togo, Uganda, Zimbabwe

Figure 1.
The dynamics of the gap in GDP per capita (by how many times) between the high-income OECD countries and the low-income countries, 1981-2012

is kept in the nearest decades, the gap between the high-income OECD countries and the middle-income countries will essentially disappear in just 15-20 years. However, such a bright prospect of the middle-income countries fully converging to the high-income ones is very doubtful with a view to the prospect of the "Reindustrialization of the West," on the one hand, and the "middle income trap" awaiting the middle-income countries, on the other. As defined by Aiyar *et al.*, the "middle-income trap" is "the phenomenon of hitherto rapidly growing economies stagnating at middle-income levels and failing to graduate into the ranks of high-income countries" (Aiyar *et al.*, 2013, p. 3). For a detailed description of the factors and mechanisms of the middle income trap (see, e.g. Kharas and Kohli, 2011).

Finally, let us view the dynamics of the gap in GDP per capita between the middle-income countries and the low-income countries in the past three decades (see Figure 3).

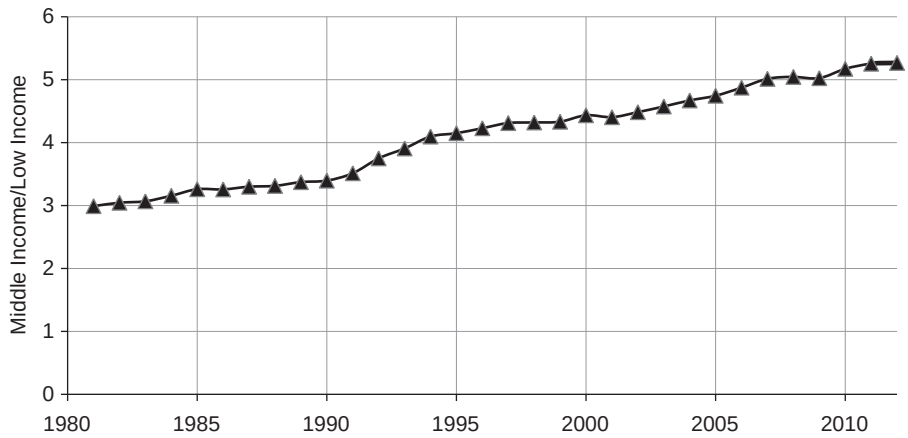


Notes: The figures on the *Y*-axis scale denote by how many times the GDP per capita in the high-income OECD countries exceeded that in the middle-income countries for a given year. Thus, the value of 9 for 1993 means that in 1993 the GDP per capita was 9 times higher in the high-income OECD countries than in the middle-income countries. Calculations made on the basis of the data presented by: World Bank (2013, NY.GDP.PCAP.PP.KD.).

According to the World Bank classification, the middle-income countries include Albania, Algeria,American Samoa, Angola, Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Belarus,Belize, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon,Cape Verde, Chile, China, Colombia, Congo, Rep.; Costa Rica, Cote d'Ivoire, Cuba, Djibouti,Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Gabon, Georgia,Ghana,Grenada, Guatemala, Guyana, Honduras, India, Indonesia, Iran, Islamic Rep.; Iraq,Jamaica,Jordan, Kazakhstan, Kiribati, Kosovo, Lao PDR, Latvia, Lebanon, Lesotho, Libya,Lithuania,Macedonia, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Micronesia,Moldova,Mongolia, Montenegro, Morocco, Namibia, Nicaragua, Nigeria, Pakistan,Palau, Panama,Papua New Guinea, Paraguay, Peru, Philippines, Romania, Russian Federation, Samoa,Sao Tome and Principe, Senegal, Serbia, Seychelles, Solomon Islands, South Africa,South Sudan, Sri Lanka, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname,Swaziland, Syrian Arab Republic, Thailand, Timor-Leste, Tonga, Tunisia, Turkey, Turkmenistan, Tuvalu, Ukraine, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, West Bank and Gaza, Yemen, Zambia

Figure 2.
The dynamics of the gap in GDP per capita (by how many times) between the high-income OECD countries and the middle-income countries, 1981-2012

Some important observations can be made at this point. Indeed, both the middle-income (since about 1990) and the low-income (since about 2000) countries seem to have been converging to the high-income countries in the latest years (as compared to the divergence trend observed in the previous decades). Notably, the change from divergence to convergence trend first occurred in the middle-income countries, and then (ten years later) in the low-income ones. However, at the same time the low-income countries have been diverging from the middle-income countries for the whole period of the latest three decades. Thus, the gap between these two groups of countries has been



Notes: The figures on the *Y*-axis denote by how many times the GDP per capita in the middle-income countries exceeded that in the low-income countries for a given year. Thus, the value of 4 for 1994 means that in 1994 the GDP per capita was 4 times higher in the middle-income countries than in the low-income countries. Calculations made on the basis of the data presented by: World Bank (2013, NY.GDP.PCAP.PP.KD.)

Figure 3.
The dynamics of the gap in GDP per capita (by how many times) between the middle-income countries and the low-income countries, 1981-2012

stably growing for the latest 30 years; the GDP per capita in the middle-income countries exceeded that in the low-income countries by three times in 1981; now this gap is by more than five times.

Thus, the general pattern of convergence and divergence between the high-income, the middle-income, and the low-income countries during the last 30 years looks as follows (see Figure 4).

Our finding is quite concordant with some of the results presented in previous publications. Thus, Ho (2006) studies the threshold effects of per capita income on the convergence behavior of growth rates among 121 economies during the sample period 1960-2000. Convergence appears to be insignificant in the lowest-income regimes, but is significantly found beyond such regimes. Ho finds the income threshold (which the country needs to overcome in order to start converging) to be about $1,150. Malamud and Assane (2013) investigate the SSA (which make up the majority of the lowest-income group viewed by Ho and the low-income group investigated in this paper) vs rest of the world growth difference and find that SSA countries converge more slowly, if at all, than rest of world countries over the period 1965-2000. Our results seem to be well consistent with the findings stated in both papers.

Possible explanations of the trends

Let us now turn to analyzing the forces and factors behind the specific pattern of the dynamics of per capita income gaps between the high-income, middle-income, and low-income countries revealed above. Naturally, no comprehensive explanation (or even attempt at making one) for the complex structure of convergence trends could possibly be made in a single paper. So below we will try to outline only some of the main economic forces that are likely to have contributed to the specific convergence-divergence pattern of the latest years. Let us start from the two fundamental convergence-driving forces proposed by Gerschenkron and Solow

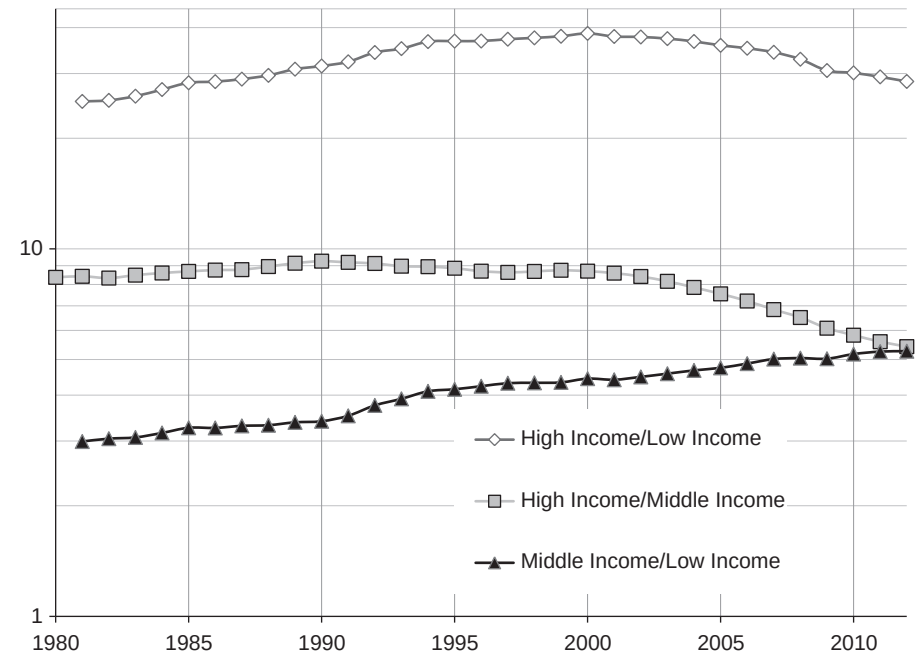


Figure 4.
The dynamics of the gap in GDP per capita (by how many times) between the high-income, the middle-income, and the low-income countries, logarithmic scale, 1980-2012

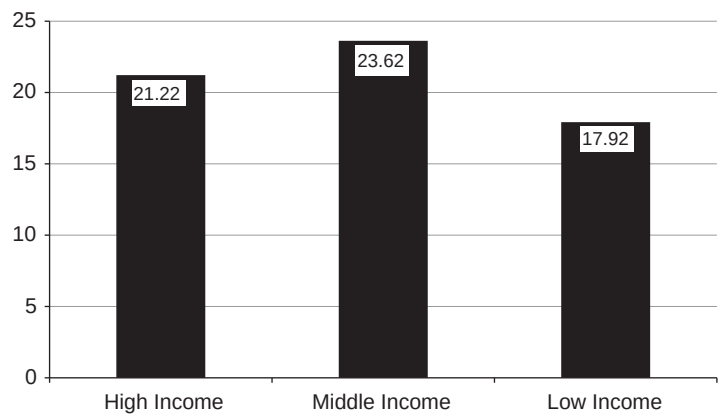
(as quoted above) namely technological diffusion from the more advanced countries to the developing ones, and weaker diminishing returns in the developing countries.

As regards technological diffusion, it is likely to be particularly fast in the middle-income countries, as they have a sufficient amount of well-qualified workforce (including labor force with professional technical education) which is necessary for successful practical implementation of the adopted technologies. Indeed, a number of studies show that in order to benefit from international technology transfers, the capacity to learn and the investment required to apply technologies to local production processes play an important role (see, e.g. Nabin *et al.*, 2013; Hoekman *et al.*, 2005).

Let us now briefly view the possible influence of another major convergence-driving factor, namely higher marginal product of capital and greater profit to investment in the developing countries as compared to the more affluent countries. Abel and Bernanke took this principle implied in the Solow model as a basis to expect a more rapid increase in capital stock in poor countries (Abel and Bernanke, 2005, p. 234).

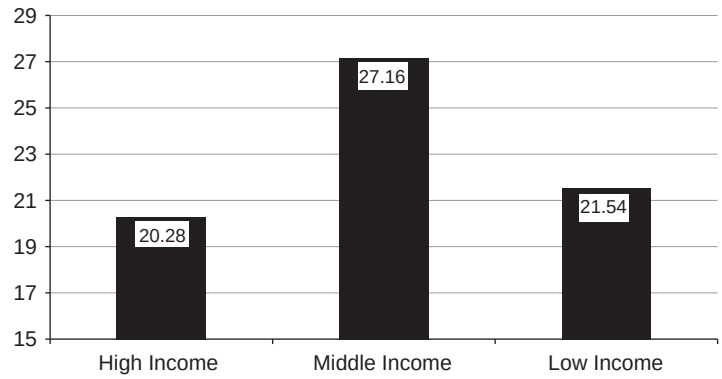
Indeed, already in 1998 the proportion of investment in GDP was much higher in the middle-income countries than in the high-income ones (notably, this proportion was the lowest in the low-income countries – see Figure 5). By 2008, the proportion of investment in GDP remarkably dropped in the high-income countries and simultaneously grew in the low-income ones; so the low-income countries actually outpaced their high-income counterparts in this indicator. However, the middle-income countries experienced the greatest increase in the proportion of investment in GDP during the same period and by 2008 far outpaced both the high-income and the low-income countries (see Figure 6).

The influx of investment into the developing countries contributes to convergence in various ways. Generally, it has a significantly positive direct effect on growth of income



Note: Calculated on the data from World Bank (2013, NE.GDI.FTOT.ZS.)

Figure 5.
Proportion of investments in GDP (percent), 1998



Note: Calculated on the data from World Bank (2013, NE.GDI.FTOT.ZS.)

Figure 6.
Proportion of investments in GDP (percent), 2008

per capita (e.g. Alfaro *et al.*, 2004; Blonigen and Wang, 2005; Borensztein *et al.*, 1998). Moreover, FDI has a significantly positive direct effect on TFP growth, which is extremely important, as more than half of the cross-country variation in both income per capita and its growth results from differences in TFP and its growth, respectively (for a detailed review see Woo, 2009).

This taken into account, the particularly high-economic growth rates in the middle-income countries are clearly not coincidental.

Possible global implications of the convergence-divergence pattern

Thus, the structure of convergence-divergence pattern in the recent years is rather complex. The gap between the high-income and the middle-income countries has been decreasing rapidly. This fact is particularly noteworthy when taking into account that the middle-income countries currently accommodate about 70 percent of the world population (about five billion people). If the current pace persists in the nearest decades, the prospects for these 70 percent look truly bright, as the gap between the high-income OECD countries and the middle-income countries will essentially

disappear in just 15-20 years. However, such an over-optimistic view about the middle-income countries fully converging to the high-income ones is very doubtful due to the prospect of the "Reindustrialization of the West (or possibly, just the USA based on cheap energy coming from shale oil," on the one hand, and the "middle-income trap" awaiting the middle-income countries, on the other. Indeed, a number of Latin American countries were the first to experience stagnation at middle-income levels and failure to move further into the ranks of high-income countries (note that exactly such stagnation could easily be caused by too weak democratically legitimated institutions which seems a necessity to further growth according to some economic thought (see, e.g. Acemoglu, 2009). A number of works reveal the same threat to be currently looming large for many developing countries in other regions, notably in Asia (including China) (see, e.g. Grinin and Korotayev, 2010; Kohli and Mukherjee, 2011; Cai, 2012; Kharas and Kohli, 2011; Aiyar *et al.*, 2013).

The gap between the high-income and the low-income countries has also been decreasing lately, but at a much slower pace. Meanwhile, the gap between the middle-income and the low-income countries has been growing steadily. This latter gap was about three times in the early 1980s and looked insignificant as compared to the colossal gap (by almost ten times) between the high-income and the middle-income countries. The current picture is remarkably different: the low-income countries lag behind the middle-income by more than five times, which is almost equal to the gap between the middle-income and the high-income countries.

As regards the low-income countries, we would like to emphasize that their total population does not exceed one billion people. (World Bank, 2013, SP.POP.TOTL), which is less than the total population of the high-income countries. In other words, "the bottom billion" is currently less than "the golden billion." This means that when looking at the convergence and divergence processes through the prism of the population numbers in the converging/diverging countries, we are bound to state that currently the convergence processes clearly prevail over the divergence processes (much more people live in the converging countries than in the diverging ones). However, this disposition could very likely dramatically change in the coming decades, as the population growth rate in the "bottom billion" is much higher than in the rest of the world. Indeed, the African populations have recently been growing more rapidly than the non-African developing world had grown at its peak, and that the ratio of young dependents to the working-age population had exceeded historical developing-country norms by 1970, and remains above these through 2000 (Ndulu *et al.*, 2007, p. 106). A decade of economic successes was barely enough to bring many countries just to the WHO recommended level of per capita food consumption; however, if the fertility decline fails to accelerate and population continues rocketing up, sustaining this level (let alone surpassing it and starting to catch-up, which is utterly necessary for improving the living standards of the majority of population) is likely to become "mission impossible."

Conclusion

Our analysis reveals a rather significant re-configuration of the world system in the latest 30 years. It is namely the middle-income countries that demonstrated the highest economic growth rates after 1990 (and even more so after 2000). This is quite explicable, as in the modern world namely the middle-income countries generally have the best opportunities for achieving high-economic growth rates. Indeed, the workforce in such countries is still rather cheap (as compared to the high-income ones), but already benefits

from rather high levels of education and health system, which greatly increases the quality of the workforce (as compared to the low-income countries). The low-income countries, on the other hand, are lagging behind in terms of education (especially secondary and tertiary education) and still experience extremely high population growth rates, which increases the age-dependency ratio and decreases the economic growth rates. While the middle-income countries have been converging to the high-income ones, the low-income countries have actually been diverging from the middle-income ones. This is a rather threatening trend which requires specific international attention to removing the growth obstacles in the low-income countries (among other things, increasing the education level and the quality of the workforce, as well as bringing down the extreme population growth rates). This is especially true regarding the type of developmental cooperation with those low-income countries that should shift away from a philosophy of power relations (dictate of the stronger) toward a philosophy of cooperation and mutual esteem, and understanding of the real needs of poor countries. This particularly underlines the urge for another global political structure.

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About the authors

Dr Andrey Korotayev (born in Moscow) attended the Moscow State University, where he received a BA degree in 1984 and an MA in 1989. He earned a PhD in 1993 at the Manchester University, and in 1998 a Doctor of Sciences degree at the Russian Academy of Sciences. He is currently the Head of the Laboratory of Monitoring of the Risks of Sociopolitical Destabilization of the National Research University Higher School of Economics and a Senior Research Professor at the Center for Big History and System Forecasting of the Institute of Oriental Studies as well as in the Institute for African Studies of the Russian Academy of Sciences. In addition, he is a Senior Research Professor of the Laboratory of Political Demography and Macrosocial Dynamics of the Russian Academy of National Economy and Civil Administration, as well as a Full Professor of the Faculty of Global Studies of the Moscow State University. He is co-editor of the journals *Social Evolution & History* and *Journal of Globalization Studies*, as well as *History & Mathematics and Evolution almanac*. Together with Askar Akayev and George Malinetsky he is a coordinator of the Russian Academy of Sciences Program "System Analysis and Mathematical Modeling of World Dynamics." Korotayev is a laureate of the Russian Science Support Foundation in "The Best Economists of the Russian Academy of Sciences" nomination (2006). In 2012 he was awarded with the Gold Kondratieff Medal by the International N.D. Kondratieff Foundation. Dr Andrey Korotayev is the corresponding author and can be contacted at: akorotayev@gmail.com

Dr Julia Zinkina has her PhD in History and works as a Research Fellow at the Laboratory for Monitoring Sociopolitical Destabilization Risks, Higher School of Economics, and Institute for African Studies (Russian Academy of Sciences), Moscow, Russia.