

Article

Evidence of Global Convergence: Perspectives for Economic and Territory Planning in Times of the COVID-19 Pandemic

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Abstract: Governments and international organizations have implemented efforts to promote the convergence of socioeconomic indicators between countries. The structural funds adopted by the European Union institutions are examples of policy instruments implemented to promote convergence in the GDP (gross domestic product) among the member states. Nonetheless, these policy measures are dependent on several internal and external factors, making these efforts vulnerable to exogenous shocks such as those associated with the global financial crisis and the COVID-19 pandemic. From this perspective, this research aims to analyze the convergence trends over the last few years and assess the respective implications of the pandemic on this framework. For that, statistical information from the World Bank for the GDP per capita was considered for the period 2006–2021 for all countries and organized for each group of levels of income and each world region. These data were analyzed through panel data approaches, considering the developments in convergence theory. The results show that the signs of convergence are different for each level of income and each region, highlighting the idea of clubs of convergence. On the other hand, the pandemic disturbed the trends of convergence verified worldwide, but nonetheless, it seems to be on a smaller scale than the global financial crisis. In any case, these findings should be confirmed in future research with more recent data.

Keywords: GDP per capita; panel data; sigma convergence; beta convergence



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1. Introduction

The convergence approaches may be divided into two groups, one related to absolute convergence and the other associated with conditional convergence. The principle of absolute convergence defends that countries and regions converge to the same “steady-state”, in processes where the poorer areas have lower capital/labor ratios and, in this way, may attract more investment because they have higher marginal productivity for the capital. In the long term, the differences between the growth rates disappear due to free trade and the mobility of the factors. In these frameworks, the technical progress and the input supply are exogenous and easily available [1]. These developments of absolute convergence are associated with the neoclassical theory and are consistent with the exogenous growth theory of Solow [2] of constant or decreasing returns to scale.

The neoclassical approach to absolute convergence analyzes sigma and beta convergence. The sigma concept assesses, through the coefficient of variation (ratio among the standard deviation and the mean), the dispersion of the variable considered (level of income per capita, for example) between the economies taken into account. The beta concept investigates the relationships between the growth rate of the variable analyzed and its initial level. There is convergence if this relation is negative [1]. The concept of beta convergence is associated, for example, with Barro and Sala-i-Martin [3], and it is a necessary condition but not sufficient to have sigma convergence [4].

More recently, the endogenous growth theory with the conditional convergence approach appeared, where regions and countries converge to different “steady-states” depending on the levels of human capital stock, innovation, and technological advance [5].

In these contexts, the economies with similar characteristics present similar convergence processes that are different from those verified for other regions and countries with distinct particularities, in frameworks called clubs of convergence by the theory [6,7].

These are scenarios completely different from those predicted by Keynesian theory [8–11] or the new economic geography [12]. For these theories, polarization and agglomeration phenomena are expected, respectively, through circular and cumulative processes and increasing returns to scale. In these cases, the richer countries and regions become richer, and the poorer ones become even poorer.

The current reality worldwide and the economic growth dynamics over the last decades show that there is a place for different approaches to providing explanations about the empirical evidence. The adequacy of each theoretical argument depends on the specific scenario taken into account.

Considering the framework described before and the need for more contributions about the influence of the level of income and the location of the countries on the interaction worldwide in times of external shocks (namely to support more adjusted international programs with financial support and policies of cohesion), this research intends to analyze the trends of convergence worldwide since 2006 and assess the impacts of the COVID-19 pandemic on respective tendencies. To achieve these objectives, data from the World Bank [13] for the GDP per capita were considered (this data set is available at the World Bank for those who wish to replicate the results of this research) and explored through panel data approaches and the procedures proposed by Islam [14] and Stata software [15–17].

The following relevant published articles, among others, are suggested for further standardization and scholarship:

- Solow (1956) [2]: the base of the absolute convergence model;
- Barro and Sala-i-Martin (1991) [3]: associated with the concept of beta convergence;
- Sala-i-Martin (1996) [4]: relationship among sigma and beta convergence;
- Barro (1991) [5]: importance of the human capita for conditional convergence;
- Baumol (1986) [6] and Chatterji (1992) [7]: convergence clubs;
- Islam (1995) [14]: panel data models.

2. Literature Review

The COVID-19 pandemic impacted the trends of convergence in the European Union countries [18], as well as the global financial crisis. Over the period 2000–2019, the European Union's average convergence speed was 2.5% and the Eurozone's was 2.3% [19]. These signs of convergence were visible in the Bulgarian regions, for instance [20]. In general, the GDP per capita is the variable considered in the convergence analyses.

Nonetheless, the concepts associated with the convergence developments (beta convergence, for example) have also been taken into account by the researchers to assess the evolution of the following variables: homicide rates [21]; child stunting [22]; energy consumption per capita [23]; eco-innovation [24]; social conditions [25]; research and development expenditure [26]; population [27]; human well-being [28]; resource productivity [29]; rural sustainable development efficiency [30]; digital economy and society index [31]; religious diversity index [32]; per capita CO₂ emissions [33]; and carbon emission intensity [34].

Convergence is a complex process with, in some circumstances, bidirectional characteristics [35]. These processes are challenging worldwide [36], but they pose particular difficulties in African countries [37]. Often, the different countries converge at distinct speeds and follow diverse patterns, creating clubs of convergence [38], dependent on several factors [39]. This is also true for the regional convergence inside the countries [40], such as Poland [41] and the Russian Federation [42]. Regularly, there is convergence inside the clubs and divergence among clubs [43]. Fossil fuel endowments [44] and migration [45] are among the factors that may influence the convergence conditions.

The traditional concepts of convergence developments are sigma and beta convergence; however, recent contributions have brought new approaches [46], where spatial effects [47] and spatial autocorrelation [48] are included. In the convergence processes, the lower

and middle-income regions catch up with the high-income ones [49], because they grow faster [50]. These frameworks associated with the convergence have attracted the attention of the scientific community, including for assessments with information from the eighteenth century [51] and before [52].

The idea behind the convergence approaches is that there is a trend for countries and regions to converge at the same level of the variable considered. This is the opposite perspective of the theories associated with the divergence, where polarization [53–55] and agglomeration [56] of economic activity and population are expected through circular and cumulative phenomena and trends.

3. Material and Methods

Considering the objectives proposed, statistical information from the World Bank [13] was considered for the period 2006–2021. Some countries were removed because of a lack of data for the whole period or for some years. These data were analyzed through panel data methodologies, considering the concepts of sigma and beta convergence. The sigma concept was analyzed through the coefficient of variation, and the speed of convergence beta was found from the coefficient of convergence, considering the developments of Tondl [57], for example, where beta is calculated through the following equation:

$$\text{beta} = -\ln(1 - b)/T \quad (1)$$

In this equation, b is the coefficient of convergence, and T is the period.

The concepts of sigma and beta convergence have been considered in the scientific literature related to convergence theory. These approaches have also been taken into account in contributions related to divergence theory [58]. In this perspective, these concepts have been validated by the scientific community and have relevance for convergence assessments. Nonetheless, as mentioned before, there are other perspectives on the processes of economic growth [59,60], some of them related to polarization and agglomeration dynamics.

To better understand the processes of convergence and their respective catching-up tendencies worldwide, the statistical information was also organized for several groups by level of income and world regions. These groups were defined by the World Bank, considering the gross national income (GNI) per capita (U.S. dollars) to identify the income groups and regions taken into account for administrative purposes to form the groups of regions [13]. The list of countries considered by income is presented in Table A1. Summary statistics for these groups of countries by income are presented in Table A2. This approach allows for the investigation of the existence of clubs of convergence.

Following the contributions of Islam [14] and Tondl [57], the model taken into account in this study for panel data was the following:

$$\text{GDP per capita growth rate}_{it} = a - b \cdot \ln(\text{GDP per capita}_{it-1}) + u_{it} \quad (2)$$

In this equation, a is the constant, b is the coefficient of convergence, i represents the countries, and t is the number of years.

This approach to Islam was influenced by the model of Solow, where economic growth is influenced by the exogenous supply of inputs with constant or decreasing returns to scale. In fact, the existence of constant or decreasing returns to scale is relevant to explaining the processes of convergence between regions or countries.

To investigate potential statistical problems of cross-sectional independence, heteroscedasticity, and autocorrelation, the following tests were carried out: Pesaran's test of cross-sectional independence; the modified Wald test for groupwise heteroscedasticity; and the Wooldridge test for autocorrelation. To deal with these statistical problems, the correlated panel corrected standard errors (PCSEs) approach was used. This is an adjusted approach to carrying out regressions with panel data when the disturbances are heteroskedastic and contemporaneously correlated across panels [61]. This methodology is supported by the scientific literature [62–66], based on the study of Beck and Katz [67],

because with heteroscedasticity, cross-sectional dependence, and autocorrelation, the OLS (ordinary least squares) regressions are not efficient.

4. Sigma Convergence

The global financial crisis of 2007–2008 had an impact on sigma convergence worldwide (Figure 1). The signs of convergence reappeared consistently after 2013 and were only disturbed by the pandemic in 2021. This evidence of divergence caused by COVID-19 seems weaker compared to that promoted by the global financial crisis.

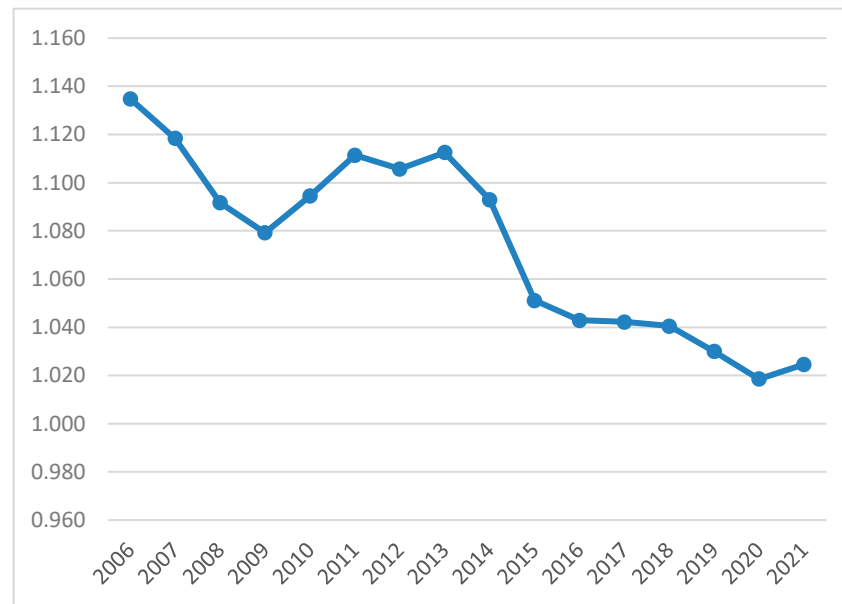


Figure 1. Sigma convergence (coefficient of variation), for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering all countries.

These findings reveal that the global financial crisis was more asymmetric than the COVID-19 pandemic, increasing the disparities between the countries. On the other hand, it seems that governments and international organizations learned from the impacts on the economy of the financial crisis and were better prepared to respond to pandemic shocks.

In any case, a true comparison of the Great Recession and COVID is not possible with the tools in this manuscript. This research should be updated in future studies to reflect this reality, either by adding more recent data or by adding.

The COVID-19 pandemic had similarly implications on the sigma convergence (Table 1) between the low and lower middle income countries (nonetheless here there are also signs of divergence in 2007, 2008, 2010, 2016 and 2017), the low and upper middle countries (in this case the evidence of divergence began in 2020 and there are also signs of divergence in 2007, 2008, 2012, 2017 and 2018), and among the low and high income nations (there is also evidence of divergence in 2010, 2011, 2012, and 2013). The impacts of the pandemic need to be confirmed in future research with more data, namely more recent statistical information. The lower middle-income nations presented signs of divergence in 2007, 2008, 2010, 2016, 2017, and 2021. There is also evidence of divergence among the lower- and upper-middle income countries in 2007, 2008, 2012, 2017, 2018, and 2021 and between the lower middle- and high-income nations in 2010, 2011, 2012, 2013, and 2021. In the upper middle-income countries, the signs of divergence are visible in 2007, 2008, 2012, 2017, 2018, 2020, and 2021. In the high-income nations, this evidence of divergence is present in 2009, 2010, 2011, 2012, 2013, and 2021 (with some signs in 2017). Among the upper middle- and high-income countries, the divergence appears in 2010, 2011, 2013, and 2021. These findings highlight that the different income groups have distinct dynamics with consequences for convergence patterns. These results call for adjusted policies and may be

considered support for policymakers and decision-makers. One of the greater challenges will be promoting convergence between low- and high-income countries (this is also visible in Figure 2).

Table 1. Sigma convergence (coefficient of variation), for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering each group of levels of income.

Level of Income	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Mean
Low	0.553	0.549	0.537	0.503	0.493	0.509	0.467	0.469	0.467	0.462	0.460	0.448	0.426	0.407	0.399	0.398	0.472
Low and lower middle	0.759	0.777	0.780	0.774	0.782	0.776	0.764	0.745	0.728	0.716	0.725	0.729	0.728	0.718	0.700	0.706	0.744
Low and upper middle	0.753	0.758	0.761	0.746	0.731	0.708	0.733	0.709	0.695	0.688	0.679	0.688	0.690	0.686	0.688	0.702	0.713
Low and high	0.830	0.822	0.806	0.806	0.828	0.847	0.851	0.862	0.843	0.799	0.792	0.792	0.791	0.782	0.772	0.776	0.812
Lower middle	0.613	0.631	0.634	0.629	0.638	0.629	0.615	0.592	0.572	0.556	0.563	0.566	0.563	0.551	0.535	0.537	0.589
Lower and upper middle	0.688	0.696	0.700	0.677	0.664	0.638	0.660	0.633	0.614	0.603	0.592	0.599	0.601	0.594	0.588	0.608	0.635
Lower middle and high	0.999	0.988	0.969	0.960	0.979	0.996	0.997	1.006	0.985	0.941	0.931	0.931	0.930	0.920	0.906	0.915	0.960
Upper middle	0.445	0.449	0.453	0.438	0.418	0.387	0.419	0.386	0.367	0.356	0.343	0.354	0.356	0.349	0.359	0.370	0.391
Upper middle and high	0.776	0.760	0.736	0.731	0.749	0.769	0.765	0.773	0.755	0.712	0.705	0.704	0.702	0.692	0.685	0.685	0.731
High	0.521	0.511	0.493	0.495	0.522	0.544	0.550	0.562	0.541	0.487	0.478	0.478	0.477	0.464	0.454	0.457	0.502

Note: The coefficient of variation is ratio among the standard deviation and the mean.

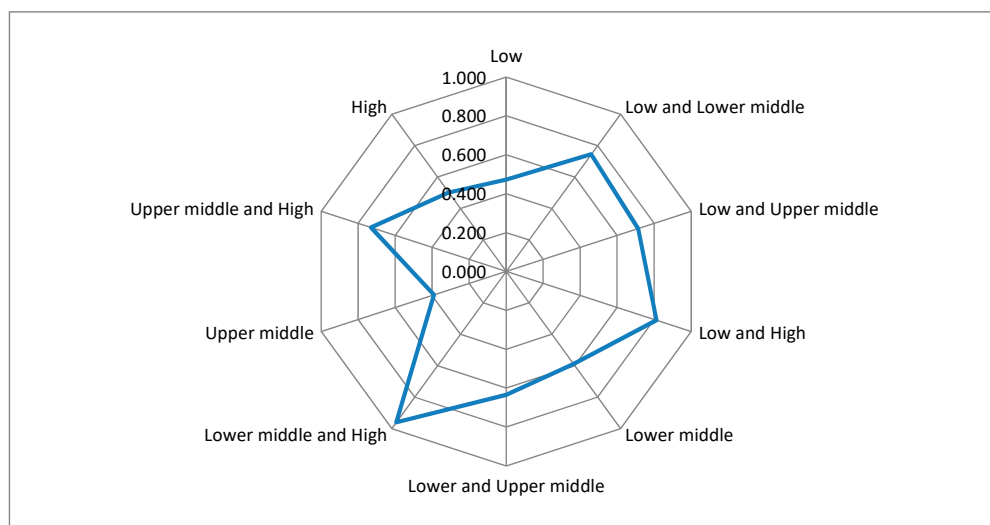


Figure 2. The average coefficient of variation, for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering each group of levels of income.

The average coefficient of variation is higher between the low- and high-income countries and among the lower middle- and high-income nations (Figure 2), showing greater dispersion in these cases. The lower average values for the coefficient of variation appear in low, upper middle, and high-income nations.

There is evidence of divergence in 2021 for the following world regions (Table 2): East Asia and the Pacific; East Asia and the Pacific and Europe and Central Asia; East Asia and the Pacific and Latin America and the Caribbean; East Asia and the Pacific and the Middle East and North Africa; East Asia and the Pacific and North America; East Asia and the Pacific and South Asia; and East Asia and the Pacific and Sub-Saharan Africa. In Europe and Central Asia, and between this region and the other world regions, signs of divergence appeared in 2020 (which extended to 2021 only in Europe, Central Asia, and Sub-Saharan Africa). The divergence appeared already in 2019 for Latin America

and the Caribbean countries, for the Middle East and North Africa nations, and among these regions and other world regions. This divergence disappeared in 2021, except in the following cases that presented signs of convergence in 2020: Latin America and the Caribbean; Latin America and the Caribbean and South Asia; and Latin America and the Caribbean and Sub-Saharan Africa. There is not any evidence of convergence in the Middle East, North Africa, or sub-Saharan Africa. There are similarly signs of divergence in 2021 for the following regions: North America; North America and Sub-Saharan Africa; South Asia; South Asia and Sub-Saharan Africa; and Sub-Saharan Africa.

Table 2. Sigma convergence (coefficient of variation), for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering each world region.

World Region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Mean
East Asia & Pacific	1.301	1.320	1.302	1.292	1.356	1.419	1.438	1.468	1.421	1.276	1.253	1.277	1.284	1.249	1.112	1.164	1.308
East Asia & Pacific and Europe & Central Asia	0.903	0.902	0.881	0.881	0.902	0.920	0.928	0.942	0.919	0.858	0.849	0.850	0.845	0.826	0.792	0.803	0.875
East Asia & Pacific and Latin America & Caribbean	1.087	1.091	1.064	1.050	1.100	1.152	1.169	1.196	1.158	1.042	1.026	1.051	1.060	1.037	0.940	0.964	1.074
East Asia & Pacific and Middle East & North Africa	1.160	1.137	1.112	1.099	1.151	1.219	1.213	1.238	1.212	1.117	1.095	1.097	1.100	1.082	1.010	1.038	1.130
East Asia & Pacific and North America	1.217	1.227	1.211	1.196	1.229	1.267	1.277	1.299	1.261	1.151	1.133	1.153	1.156	1.130	1.035	1.074	1.189
East Asia & Pacific and South Asia	1.396	1.412	1.389	1.377	1.443	1.508	1.527	1.557	1.505	1.352	1.325	1.348	1.353	1.315	1.180	1.225	1.388
East Asia & Pacific and Sub-Saharan Africa	1.667	1.687	1.663	1.651	1.735	1.813	1.837	1.876	1.823	1.662	1.643	1.680	1.696	1.660	1.494	1.554	1.696
Europe & Central Asia	0.709	0.700	0.677	0.678	0.674	0.658	0.652	0.646	0.641	0.641	0.640	0.626	0.615	0.605	0.622	0.617	0.650
Europe & Central Asia and Latin America & Caribbean	0.803	0.794	0.769	0.759	0.750	0.734	0.724	0.715	0.710	0.713	0.714	0.708	0.703	0.699	0.727	0.720	0.734
Europe & Central Asia and Middle East & North Africa	0.773	0.746	0.719	0.716	0.723	0.731	0.717	0.714	0.708	0.703	0.696	0.676	0.666	0.660	0.680	0.675	0.706
Europe & Central Asia and North America	0.713	0.703	0.681	0.680	0.673	0.655	0.645	0.639	0.630	0.629	0.627	0.616	0.605	0.595	0.608	0.603	0.644
Europe & Central Asia and South Asia	0.816	0.807	0.783	0.782	0.775	0.759	0.751	0.744	0.737	0.737	0.735	0.722	0.711	0.701	0.722	0.715	0.750
Europe & Central Asia and Sub-Saharan Africa	1.149	1.143	1.121	1.114	1.108	1.092	1.082	1.075	1.070	1.075	1.078	1.072	1.066	1.061	1.078	1.080	1.092
Latin America & Caribbean	0.857	0.832	0.797	0.753	0.715	0.696	0.683	0.671	0.662	0.660	0.657	0.658	0.662	0.668	0.664	0.648	0.705

Table 2. Cont.

World Region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Mean
Latin America & Caribbean and Middle East & North Africa	0.972	0.913	0.873	0.848	0.862	0.890	0.869	0.861	0.849	0.838	0.824	0.800	0.796	0.797	0.830	0.816	0.852
Latin America & Caribbean and North America	0.963	0.948	0.914	0.885	0.858	0.832	0.804	0.791	0.773	0.771	0.769	0.779	0.777	0.780	0.800	0.788	0.827
Latin America & Caribbean and South Asia	0.946	0.918	0.883	0.835	0.794	0.774	0.760	0.746	0.736	0.731	0.725	0.723	0.724	0.727	0.723	0.707	0.778
Latin America & Caribbean and Sub-Saharan Africa	1.217	1.197	1.170	1.122	1.079	1.062	1.051	1.037	1.028	1.027	1.026	1.028	1.034	1.039	1.019	1.018	1.072
Middle East & North Africa	0.965	0.901	0.865	0.846	0.883	0.954	0.908	0.916	0.917	0.903	0.881	0.842	0.836	0.842	0.873	0.867	0.887
Middle East & North Africa and North America	0.877	0.843	0.817	0.798	0.813	0.855	0.812	0.817	0.814	0.805	0.790	0.768	0.763	0.768	0.789	0.786	0.807
Middle East & North Africa and South Asia	1.192	1.119	1.077	1.054	1.087	1.147	1.104	1.106	1.097	1.080	1.054	1.011	0.999	0.999	1.041	1.027	1.075
Middle East & North Africa and Sub-Saharan Africa	1.652	1.566	1.522	1.495	1.531	1.584	1.550	1.545	1.530	1.521	1.504	1.469	1.464	1.465	1.491	1.499	1.524
North America	0.406	0.417	0.404	0.388	0.365	0.337	0.295	0.284	0.250	0.251	0.252	0.269	0.256	0.254	0.247	0.253	0.308
North America and South Asia	1.410	1.400	1.374	1.349	1.318	1.285	1.246	1.231	1.200	1.193	1.179	1.179	1.164	1.154	1.185	1.169	1.252
North America and Sub-Saharan Africa	1.997	1.987	1.952	1.909	1.875	1.832	1.780	1.763	1.729	1.739	1.744	1.771	1.771	1.774	1.771	1.799	1.825
South Asia	0.882	0.864	0.880	0.785	0.774	0.785	0.760	0.761	0.758	0.732	0.724	0.719	0.717	0.716	0.584	0.688	0.758
South Asia and Sub-Saharan Africa	1.173	1.208	1.243	1.209	1.134	1.147	1.142	1.115	1.101	1.074	1.064	1.060	1.058	1.059	1.002	1.037	1.114
Sub-Saharan Africa	1.240	1.286	1.326	1.301	1.217	1.232	1.232	1.200	1.185	1.159	1.149	1.146	1.144	1.145	1.101	1.124	1.199

Note: The coefficient of variation is ratio among the standard deviation and the mean.

In these contexts for the world regions, the big challenge is to deal with the convergence process of Sub-Saharan Africa with the remaining world regions (this can be confirmed in Figure 3).

The world regions with the highest averages for the coefficient of variation are the following (Figure 3): North America and Sub-Saharan Africa; East Asia and the Pacific and Sub-Saharan Africa; and the Middle East and North Africa and Sub-Saharan Africa. The lowest averages appear in Latin America and the Caribbean, Europe and Central Asia, and North America.

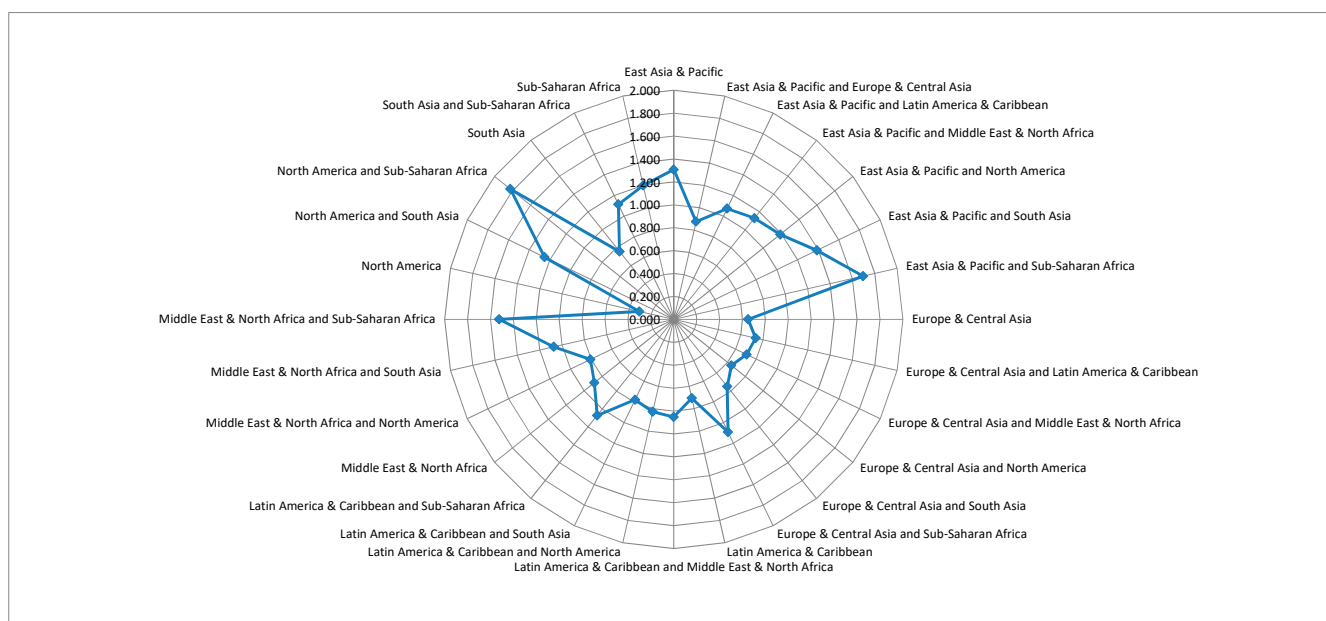


Figure 3. The average coefficient of variation, for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering each world region.

5. Beta Convergence

The results presented in Table 3 (all results of this regression are presented in Table A3) reveal signs of beta convergence between the world’s countries. This speed of convergence is higher for upper middle-income, high-income, and low-income countries (Tables 4 and A4). The coefficient of convergence is not statistically significant for the following groups of income levels: low and lower middle; low and upper middle; low and high; and lower and upper middle. The lowest speed of convergence was found for lower middle-income countries and for high- and upper-middle-income countries.

Table 3. Beta convergence, for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering all countries.

Independent Variable	Coefficient	Beta Convergence (%)
Logarithm of GDPpc lagged	−0.005 *	0.501

Note: *, Statistically significant at 1%.

Table 4. Beta convergence, for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering each group of levels of income.

Level of Income	Independent Variable	Coefficient	Beta Convergence (%)
Low	Logarithm of GDPpc lagged	−0.020 **	2.02
Low and lower middle	Logarithm of GDPpc lagged	−0.002	
Low and upper middle	Logarithm of GDPpc lagged	−0.001	
Low and high	Logarithm of GDPpc lagged	−0.003	
Lower middle	Logarithm of GDPpc lagged	−0.011 ***	1.106
Lower and upper middle	Logarithm of GDPpc lagged	−0.009	
Lower middle and high	Logarithm of GDPpc lagged	−0.007 *	0.702
Upper middle	Logarithm of GDPpc lagged	−0.023 ***	2.327
Upper middle and high	Logarithm of GDPpc lagged	−0.014 *	1.41
High	Logarithm of GDPpc lagged	−0.022 *	2.225

Note: *, Statistically significant at 1%; **, Statistically significant at 5%; ***, Statistically significant at 10%.

These findings for beta convergence reveal that there are signs of convergence inside each income group; however, this evidence is weaker or inexistent between income groups, showing some signs of convergence clubs.

Table 5 (all results of these regressions are presented in Table A5) highlights that the speed of convergence is higher for the following world regions: North America; Europe and Central Asia and North America; Europe and Central Asia; Latin America and the Caribbean and South Asia; Europe and Central Asia and the Middle East and North Africa; and Europe and Central Asia and South Asia. The lowest values for the speed of convergence are found for Latin America and the Caribbean and North America; East Asia and the Pacific and Latin America and the Caribbean; East Asia and the Pacific and the Middle East and North Africa; and East Asia and the Pacific and North America. For the following regions, the coefficient of convergence is not statistically significant: East Asia and Pacific; East Asia and Pacific and South Asia; East Asia and Pacific and Sub-Saharan Africa; Europe and Central Asia and Sub-Saharan Africa; Latin America and the Caribbean and Sub-Saharan Africa; Middle East and North Africa and Sub-Saharan Africa; North America and Sub-Saharan Africa; South Asia; South Asia and Sub-Saharan Africa; and South Asia and Sub-Saharan Africa.

Table 5. Beta convergence, for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering each world region.

Level of Income	Independent Variable	Coefficient	Beta Convergence (%)
East Asia & Pacific	Logarithm of GDPpc lagged	−0.007	
East Asia & Pacific and Europe & Central Asia	Logarithm of GDPpc lagged	−0.011 *	1.106
East Asia & Pacific and Latin America & Caribbean	Logarithm of GDPpc lagged	−0.009 **	0.904
East Asia & Pacific and Middle East & North Africa	Logarithm of GDPpc lagged	−0.009 ***	0.904
East Asia & Pacific and North America	Logarithm of GDPpc lagged	−0.008 ***	0.803
East Asia & Pacific and South Asia	Logarithm of GDPpc lagged	−0.008	
East Asia & Pacific and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.001	
Europe & Central Asia	Logarithm of GDPpc lagged	−0.017 *	1.715
Europe & Central Asia and Latin America & Caribbean	Logarithm of GDPpc lagged	−0.011 *	1.106
Europe & Central Asia and Middle East & North Africa	Logarithm of GDPpc lagged	−0.015 *	1.511
Europe & Central Asia and North America	Logarithm of GDPpc lagged	−0.018 *	1.816
Europe & Central Asia and South Asia	Logarithm of GDPpc lagged	−0.015 *	1.511
Europe & Central Asia and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.002	
Latin America & Caribbean	Logarithm of GDPpc lagged	−0.013 *	1.309
Latin America & Caribbean and Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 *	1.309
Latin America & Caribbean and North America	Logarithm of GDPpc lagged	−0.011 *	1.106
Latin America & Caribbean and South Asia	Logarithm of GDPpc lagged	−0.016 *	1.613
Latin America & Caribbean and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.005	
Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 **	1.309
Middle East & North Africa and North America	Logarithm of GDPpc lagged	−0.013 *	1.309
Middle East & North Africa and South Asia	Logarithm of GDPpc lagged	−0.015 **	1.511
Middle East & North Africa and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.003	
North America	Logarithm of GDPpc lagged	−0.032 *	3.252
North America and South Asia	Logarithm of GDPpc lagged	−0.012 *	1.207
North America and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.003	
South Asia	Logarithm of GDPpc lagged	−0.005	
South Asia and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.002	
Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.002	

Note: *, Statistically significant at 1%; **, Statistically significant at 5%; ***, Statistically significant at 10%.

These findings confirm the problems of convergence between the Sub-Saharan Africa countries and the remaining world regions.

6. Discussion

This research aimed to analyze the convergence of GDP per capita worldwide over the last few years (2006–2021) and assess the consequences of the recent exogenous shocks on this evolution. For that, data from the World Bank were considered for all countries and organized by groups, taking into account the level of income and the region to which each country belongs. This statistical information was analyzed through panel data methodologies, finding the results for sigma and beta convergence.

The literature review highlighted the trends of convergence verified in some parts of the world over the last decades, which were disturbed by the COVID-19 pandemic. This was shown, specifically, for the European Union countries [18]. The difficulties that the African countries have to converge between them and with the other continents are also revealed by the scientific community [37].

The results from the sigma convergence confirm the disruptions caused by the COVID-19 pandemic on the convergence process worldwide; however, its impact seemed weaker when compared to that caused by the global financial crisis. When the analysis was made by groups based on their level of income, these disturbances in 2021 were also verified. More recent statistical information is needed to confirm, in future approaches, these pandemic tendencies. On the other hand, lower average dispersion for the GDP per capita was found inside groups related to low, upper middle, and high income. This average dispersion was great when countries from different groups of levels of income were put together, such as low- and high-income nations and lower middle- and high-income countries. There are some signs of convergence clubs here. In general, the world region groups also presented signs of divergence in 2021. In some cases, these signs appeared in 2020, namely for the groups where European and Central Asian nations were considered. In other cases, the divergence began in 2019 (particularly when Latin America and the Caribbean and the Middle East and North Africa countries were taken into account). These findings highlight that the implications of the pandemic were asymmetric (to be confirmed in future research). This opens up new possibilities for future research in these fields. The average dispersion for the world region groups was lower in North America, Europe and Central Asia and North America, Europe and Central Asia and Latin America and the Caribbean, Europe and Central Asia and the Middle East and North Africa, Europe and Central Asia and Latin America and the Caribbean, Europe and Central Asia and South Asia, South Asia and Latin America and the Caribbean, and South Asia. These findings reveal evidence of clubs of convergence and some signs of catching-up phenomena between countries belonging to different world regions. The sub-Saharan African nations have higher average coefficients of variation.

The beta convergence analysis shows that there are signs of convergence worldwide; nonetheless, the speed of convergence is greater between the nations inside the following groups of income levels: low income; upper middle income; and high income. These findings confirm the idea of clubs of convergence for these groups. There is also evidence of beta convergence (with lower speeds) for the lower middle income, lower middle and high income, and upper middle- and high-income countries, showing signs of catching up processes. The world region groups with the highest speed of convergence have, generally, countries from North America, Europe, and Central Asia, revealing again signs of clubs of convergence and catching up trends.

7. Conclusions

The convergence process verified worldwide over the last few years (since 2006) was disturbed by exogenous shocks, including the global financial crisis and the COVID-19 pandemic. Nonetheless, these disruptions were not symmetric, and the consequences of the pandemic on the convergence process seem weaker globally than those from the financial crisis (to be confirmed in future studies with more recent data). In any case, the process of convergence has continued worldwide, with evidence of clubs of convergence and catching-up phenomena. In fact, there are signs of convergence inside some groups

and between countries with different levels of income, revealing the role of the high-income countries in promoting income in the lower-income nations. On the other hand, special attention is needed for the African countries, specifically the sub-Saharan ones.

In terms of practical implications and insights for economic and territory management, it is important to reinforce cooperation worldwide to better promote the convergence in the level of income per capita between the countries, where the richer countries play a fundamental role in creating conditions for catching-up processes. In terms of policy recommendations, it could be important to design programs of financial support for the sub-Saharan countries, where the problems of convergence in GDP per capita seem to be more serious. Balanced economic growth is crucial for sustainable development. For future research, it is suggested to explore the contexts inside each group of countries. It could be interesting, for example, to better understand the frameworks of the sub-Saharan African countries, where the weaknesses are greater and the challenges to improving economic growth are enormous. This is particularly important for territory planning in these nations, where economic growth theories may provide relevant insights. Territory-related dimensions of convergence assessments have been highlighted in the literature [58]. It was also suggested to test other variables that may influence these trends of convergence, considering the approaches to conditional convergence. This research aimed to analyze the influence of the level of income and the location of countries on convergence trends worldwide. For future research, it is suggested to test the size of the pandemic in each group of levels of income and world regions. It could also be interesting to test the socioeconomic differences inside each region, the public policy responses to COVID-19, the European Union policies, cohesion, and differences in the industry structure.

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Data Availability Statement: Data will be available upon reasonable request.

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Conflicts of Interest: The author declares no conflict of interest.

Appendix A

Table A1. List of countries by income.

Level of Income	Countries
Low income	Afghanistan
	Burkina Faso
	Burundi
	Central African Republic
	Chad
	Congo, Dem. Rep.
	Ethiopia
	Gambia, The
	Guinea
	Guinea-Bissau
	Liberia
	Madagascar
	Malawi
	Mali
	Mozambique
	Niger
Rwanda	
Sierra Leone	
Sudan	
Togo	

Table A1. Cont.

Level of Income	Countries
Low income	Uganda
	Zambia
Lower middle income	Algeria
	Angola
	Bangladesh
	Benin
	Bhutan
	Bolivia
	Cabo Verde
	Cambodia
	Cameroon
	Comoros
	Congo, Rep.
	Cote d'Ivoire
	Egypt, Arab Rep.
	El Salvador
	Eswatini
	Ghana
	Haiti
	Honduras
	India
	Indonesia
	Iran, Islamic Rep.
	Kenya
	Kiribati
	Kyrgyz Republic
	Lao PDR
	Lebanon
	Lesotho
	Mauritania
	Micronesia, Fed. Sts.
	Mongolia
	Morocco
	Myanmar
	Nepal
	Nicaragua
	Nigeria
	Pakistan
	Papua New Guinea
	Philippines
	Samoa
	Sao Tome and Principe
	Senegal
	Solomon Islands
Sri Lanka	
Tajikistan	
Tanzania	
Timor-Leste	
Tunisia	
Ukraine	
Uzbekistan	
Vanuatu	
Vietnam	
West Bank and Gaza	
Zimbabwe	
Upper middle income	Albania
	Argentina
	Armenia

Table A1. *Cont.*

Level of Income	Countries
Upper middle income	Azerbaijan
	Belarus
	Belize
	Bosnia and Herzegovina
	Botswana
	Brazil
	Bulgaria
	China
	Colombia
	Costa Rica
	Dominica
	Dominican Republic
	Ecuador
	Equatorial Guinea
	Fiji
	Gabon
	Georgia
	Grenada
	Guatemala
	Guyana
	Iraq
	Jamaica
	Jordan
	Kazakhstan
	Libya
	Malaysia
	Maldives
	Marshall Islands
	Mauritius
	Mexico
	Moldova
	Montenegro
	Namibia
	North Macedonia
	Palau
	Paraguay
	Peru
Russian Federation	
Serbia	
South Africa	
St. Lucia	
St. Vincent and the Grenadines	
Suriname	
Thailand	
Tonga	
Turkiye	
Tuvalu	
High income	Antigua and Barbuda
	Aruba
	Australia
	Austria
	Bahamas, The
	Bahrain
	Barbados
	Belgium
	Bermuda
	Brunei Darussalam
	Canada

Table A1. *Cont.*

Level of Income	Countries
High income	Cayman Islands
	Chile
	Croatia
	Curacao
	Cyprus
	Czechia
	Denmark
	Estonia
	Finland
	France
	Germany
	Greece
	Hong Kong SAR, China
	Hungary
	Iceland
	Ireland
	Israel
	Italy
	Japan
	Korea, Rep.
	Latvia
	Lithuania
	Luxembourg
	Macao SAR, China
	Malta
	Nauru
	Netherlands
	New Zealand
	Norway
	Oman
	Panama
	Poland
	Portugal
	Puerto Rico
	Qatar
	Romania
	Saudi Arabia
	Seychelles
	Singapore
	Slovak Republic
Slovenia	
Spain	
St. Kitts and Nevis	
Sweden	
Switzerland	
Trinidad and Tobago	
United Arab Emirates	
United Kingdom	
United States	
Uruguay	

Table A2. Summary statistics of the GDP per capita for the groups of countries by income.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Low income	352	1773	822	705	5047
Lower middle income	848	5813	3424	1353	19,240

Table A2. Cont.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Upper middle income	800	14,476	5656	3335	35,689
High income	976	44,507	22,245	4401	157,603

Table A3. Regression results for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering all countries.

Independent Variable	Coefficient	Standard Error	Z	P > z	Beta Convergence (%)	Hausman Test	Pesaran's Test of Cross Sectional Independence	Modified Wald Test for Groupwise Heteroskedasticity	Wooldridge Test for Autocorrelation
Logarithm of GDPpc lagged	−0.005 *	0.002	−2.660	0.008	0.501	194.740 *	163.010 *	32,962.530 *	17.909 *
Constant	0.063 *	0.014	4.630	0.000					

Note: *, Statistically significant at 1%.

Table A4. Regression results for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering each group of level of income.

Level of Income	Independent Variable	Coefficient	Standard Error	Z	P > z	Beta Convergence (%)	Hausman Test	Pesaran's Test of Cross Sectional Independence	Modified Wald Test for Groupwise Heteroskedasticity	Wooldridge Test for Autocorrelation																																																																																																																																										
Low	Logarithm of GDPpc lagged	−0.020 **	0.010	−2.020	0.044	2.020	24.410 *	5.670 *	1400.930 *	41.824 *																																																																																																																																										
	Constant	0.157 **	0.073	2.150	0.032						Low and lower middle	Logarithm of GDPpc lagged	−0.002	0.004	−0.410	0.682	1.106	96.070 *	38.331 *	7196.360 *	87.798 *	Constant	0.029	0.028	1.060	0.287	Low and upper middle	Logarithm of GDPpc lagged	−0.001	0.004	−0.320	0.748	0.702	83.490 *	52.078 *	10,764.370 *	10.074 *	Constant	0.028	0.028	1.010	0.311	Low and high	Logarithm of GDPpc lagged	−0.003	0.002	−1.400	0.163	2.327	95.400 *	83.078 *	10,614.300 *	126.831 *	Constant	0.036 **	0.014	2.530	0.011	Lower middle	Logarithm of GDPpc lagged	−0.011 ***	0.006	−1.920	0.055	1.410	55.830 *	32.528 *	5516.920 *	54.034 *	Constant	0.113 **	0.046	2.460	0.014	Lower and upper middle	Logarithm of GDPpc lagged	−0.009	0.006	−1.590	0.112	1.410	100.110 *	79.747 *	23,446.710 *	9.709 *	Constant	0.102 **	0.047	2.180	0.029	Lower middle and high	Logarithm of GDPpc lagged	−0.007 *	0.002	−3.970	0.000	2.225	113.560 *	111.357 *	16,621.350 *	146.453 *	Constant	0.083 *	0.015	5.630	0.000	Upper middle	Logarithm of GDPpc lagged	−0.023 ***	0.012	−1.880	0.060	2.225	45.000 *	51.063 *	2962.010 *	10.025 *	Constant	0.241 **	0.113	2.130	0.034	Upper middle and high	Logarithm of GDPpc lagged	−0.014 *	0.002	−5.880	0.000	2.225	106.600 *	139.267 *	19,356.890 *	14.468 *	Constant	0.154 *	0.025	6.190	0.000	High	Logarithm of GDPpc lagged	−0.022 *	0.007	−3.320	0.001	2.225	53.710 *	88.232 *	9086.180 *
Low and lower middle	Logarithm of GDPpc lagged	−0.002	0.004	−0.410	0.682	1.106	96.070 *	38.331 *	7196.360 *	87.798 *																																																																																																																																										
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Note: *, Statistically significant at 1%; **, Statistically significant at 5%; ***, Statistically significant at 10%.

Table A5. Regression results for the GDP per capita (PPP, constant 2017 international \$), over the period 2006–2021, considering each world region.

Level of Income	Independent Variable	Coefficient	Standard Error	Z	P > z	Beta Convergence (%)	Hausman Test	Pesaran's Test of Cross Sectional Independence	Modified Wald Test for Groupwise Heteroskedasticity	Wooldridge Test for Autocorrelation										
East Asia & Pacific	Logarithm of GDPpc lagged	−0.007	0.006	−1.190	0.235	1.106	32.610 *	21.984 *	15,627.300 *	58.236 *										
	Constant	0.084 ***	0.048	1.740	0.082						East Asia & Pacific and Europe & Central Asia	Logarithm of GDPpc lagged	−0.011 *	0.003	−4.370	0.000	1.106	60.550 *	87.639 *	10,192.110 *
East Asia & Pacific and Europe & Central Asia	Logarithm of GDPpc lagged	−0.011 *	0.003	−4.370	0.000	1.106	60.550 *	87.639 *	10,192.110 *	116.156 *										
	Constant	0.133 *	0.023	5.680	0.000															

Table A5. Cont.

Level of Income	Independent Variable	Coefficient	Standard Error	Z	P > z	Beta Convergence (%)	Hausman Test	Pesaran's Test of Cross Sectional Independence	Modified Wald Test for Groupwise Heteroskedasticity	Wooldridge Test for Autocorrelation																																																																																																																																																																																																																																																																																												
East Asia & Pacific and Latin America & Caribbean	Logarithm of GDPpc lagged	−0.009 **	0.005	−1.970	0.049	0.904	63.880 *	63.222 *	12,496.310 *	82.474 *																																																																																																																																																																																																																																																																																												
	Constant	0.101 *	0.038	2.660	0.008						East Asia & Pacific and Middle East & North Africa	Logarithm of GDPpc lagged	−0.009 ***	0.005	−1.840	0.066	0.904	65.400 *	27.202 *	33,333.320 *	5.513 **	Constant	0.103 **	0.041	2.490	0.013		East Asia & Pacific and North America	Logarithm of GDPpc lagged	−0.008 ***	0.004	−1.850	0.065	0.803	34.840 *	26.059 *	13,660.390 *	63.502 *	Constant	0.097 **	0.039	2.470	0.013		East Asia & Pacific and South Asia	Logarithm of GDPpc lagged	−0.008	0.005	−1.480	0.138		47.660 *	28.625 *	18,287.450 *	18.211 *	Constant	0.097 **	0.044	2.200	0.028		East Asia & Pacific and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.001	0.003	−0.480	0.633		68.240 *	43.893 *	20,426.910 *	125.068 *	Constant	0.028	0.021	1.350	0.177		Europe & Central Asia	Logarithm of GDPpc lagged	−0.017 *	0.003	−6.900	0.000	1.715	20.600 *	79.307 *	1076.020 *	48.933 *	Constant	0.196 *	0.030	6.540	0.000		Europe & Central Asia and Latin America & Caribbean	Logarithm of GDPpc lagged	−0.011 *	0.002	−4.910	0.000	1.106	57.530 *	121.547 *	1632.080 *	75.389 *	Constant	0.124 *	0.026	4.740	0.000		Europe & Central Asia and Middle East & North Africa	Logarithm of GDPpc lagged	−0.015 *	0.002	−6.320	0.000	1.511	73.100 *	78.588 *	4927.760 *	7.852 *	Constant	0.171 *	0.028	6.180	0.000		Europe & Central Asia and North America	Logarithm of GDPpc lagged	−0.018 *	0.003	−7.150	0.000	1.816	22.050 *	85.559 *	1023.720 *	51.996 *	Constant	0.202 *	0.030	6.670	0.000		Europe & Central Asia and South Asia	Logarithm of GDPpc lagged	−0.015 *	0.002	−7.290	0.000	1.511	42.490 *	81.794 *	1789.310 *	13.340 *	Constant	0.170 *	0.022	7.690	0.000		Europe & Central Asia and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.002	0.002	−1.090	0.275		58.000 *	83.731 *	7168.120 *	102.275 *	Constant	0.036 **	0.015	2.370	0.018		Latin America & Caribbean	Logarithm of GDPpc lagged	−0.013 *	0.003	−3.800	0.000	1.309	35.990 *	50.349 *	381.770 *	34.654 *	Constant	0.135 *	0.027	4.940	0.000		Latin America & Caribbean and Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 *	0.004	−3.140	0.002	1.309	96.830 *	53.538 *	3598.500 *	10.780 *	Constant	0.132 *	0.035	3.770	0.000		Latin America & Caribbean and North America	Logarithm of GDPpc lagged	−0.011 *	0.002	−4.970	0.000	1.106	39.840 *	55.668 *	419.710 *	36.585 *	Constant	0.115 *	0.019	6.180	0.000		Latin America & Caribbean and South Asia	Logarithm of GDPpc lagged	−0.016 *	0.004	−4.080	0.000	1.613	50.690 *	54.586 *	833.540 *	20.303 *	Constant	0.163 *	0.030	5.380	0.000		Latin America & Caribbean and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.005	0.003	−1.540	0.124		61.150 *	68.584 *	10,344.340 *	78.128 *	Constant	0.052 **	0.021	2.470	0.014		Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 **	0.007	−1.970	0.049	1.309	55.980 *	6.941 *	4645.070 *	7.500 **	Constant	0.143 **	0.062	2.290	0.022		Middle East & North Africa and North America	Logarithm of GDPpc lagged	−0.013 *	0.004	−2.870	0.004	1.309	63.710 *	10.038 *	4268.200 *	7.697 **	Constant
East Asia & Pacific and Middle East & North Africa	Logarithm of GDPpc lagged	−0.009 ***	0.005	−1.840	0.066	0.904	65.400 *	27.202 *	33,333.320 *	5.513 **																																																																																																																																																																																																																																																																																												
	Constant	0.103 **	0.041	2.490	0.013						East Asia & Pacific and North America	Logarithm of GDPpc lagged	−0.008 ***	0.004	−1.850	0.065	0.803	34.840 *	26.059 *	13,660.390 *	63.502 *	Constant	0.097 **	0.039	2.470	0.013		East Asia & Pacific and South Asia	Logarithm of GDPpc lagged	−0.008	0.005	−1.480	0.138		47.660 *	28.625 *	18,287.450 *	18.211 *	Constant	0.097 **	0.044	2.200	0.028		East Asia & Pacific and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.001	0.003	−0.480	0.633		68.240 *	43.893 *	20,426.910 *	125.068 *	Constant	0.028	0.021	1.350	0.177		Europe & Central Asia	Logarithm of GDPpc lagged	−0.017 *	0.003	−6.900	0.000	1.715	20.600 *	79.307 *	1076.020 *	48.933 *	Constant	0.196 *	0.030	6.540	0.000		Europe & Central Asia and Latin America & Caribbean	Logarithm of GDPpc lagged	−0.011 *	0.002	−4.910	0.000	1.106	57.530 *	121.547 *	1632.080 *	75.389 *	Constant	0.124 *	0.026	4.740	0.000		Europe & Central Asia and Middle East & North Africa	Logarithm of GDPpc lagged	−0.015 *	0.002	−6.320	0.000	1.511	73.100 *	78.588 *	4927.760 *	7.852 *	Constant	0.171 *	0.028	6.180	0.000		Europe & Central Asia and North America	Logarithm of GDPpc lagged	−0.018 *	0.003	−7.150	0.000	1.816	22.050 *	85.559 *	1023.720 *	51.996 *	Constant	0.202 *	0.030	6.670	0.000		Europe & Central Asia and South Asia	Logarithm of GDPpc lagged	−0.015 *	0.002	−7.290	0.000	1.511	42.490 *	81.794 *	1789.310 *	13.340 *	Constant	0.170 *	0.022	7.690	0.000		Europe & Central Asia and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.002	0.002	−1.090	0.275		58.000 *	83.731 *	7168.120 *	102.275 *	Constant	0.036 **	0.015	2.370	0.018		Latin America & Caribbean	Logarithm of GDPpc lagged	−0.013 *	0.003	−3.800	0.000	1.309	35.990 *	50.349 *	381.770 *	34.654 *	Constant	0.135 *	0.027	4.940	0.000		Latin America & Caribbean and Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 *	0.004	−3.140	0.002	1.309	96.830 *	53.538 *	3598.500 *	10.780 *	Constant	0.132 *	0.035	3.770	0.000		Latin America & Caribbean and North America	Logarithm of GDPpc lagged	−0.011 *	0.002	−4.970	0.000	1.106	39.840 *	55.668 *	419.710 *	36.585 *	Constant	0.115 *	0.019	6.180	0.000		Latin America & Caribbean and South Asia	Logarithm of GDPpc lagged	−0.016 *	0.004	−4.080	0.000	1.613	50.690 *	54.586 *	833.540 *	20.303 *	Constant	0.163 *	0.030	5.380	0.000		Latin America & Caribbean and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.005	0.003	−1.540	0.124		61.150 *	68.584 *	10,344.340 *	78.128 *	Constant	0.052 **	0.021	2.470	0.014		Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 **	0.007	−1.970	0.049	1.309	55.980 *	6.941 *	4645.070 *	7.500 **	Constant	0.143 **	0.062	2.290	0.022		Middle East & North Africa and North America	Logarithm of GDPpc lagged	−0.013 *	0.004	−2.870	0.004	1.309	63.710 *	10.038 *	4268.200 *	7.697 **	Constant	0.137 *	0.046	2.970	0.003													
East Asia & Pacific and North America	Logarithm of GDPpc lagged	−0.008 ***	0.004	−1.850	0.065	0.803	34.840 *	26.059 *	13,660.390 *	63.502 *																																																																																																																																																																																																																																																																																												
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	Constant	0.028	0.021	1.350	0.177						Europe & Central Asia	Logarithm of GDPpc lagged	−0.017 *	0.003	−6.900	0.000	1.715	20.600 *	79.307 *	1076.020 *	48.933 *	Constant	0.196 *	0.030	6.540	0.000		Europe & Central Asia and Latin America & Caribbean	Logarithm of GDPpc lagged	−0.011 *	0.002	−4.910	0.000	1.106	57.530 *	121.547 *	1632.080 *	75.389 *	Constant	0.124 *	0.026	4.740	0.000		Europe & Central Asia and Middle East & North Africa	Logarithm of GDPpc lagged	−0.015 *	0.002	−6.320	0.000	1.511	73.100 *	78.588 *	4927.760 *	7.852 *	Constant	0.171 *	0.028	6.180	0.000		Europe & Central Asia and North America	Logarithm of GDPpc lagged	−0.018 *	0.003	−7.150	0.000	1.816	22.050 *	85.559 *	1023.720 *	51.996 *	Constant	0.202 *	0.030	6.670	0.000		Europe & Central Asia and South Asia	Logarithm of GDPpc lagged	−0.015 *	0.002	−7.290	0.000	1.511	42.490 *	81.794 *	1789.310 *	13.340 *	Constant	0.170 *	0.022	7.690	0.000		Europe & Central Asia and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.002	0.002	−1.090	0.275		58.000 *	83.731 *	7168.120 *	102.275 *	Constant	0.036 **	0.015	2.370	0.018		Latin America & Caribbean	Logarithm of GDPpc lagged	−0.013 *	0.003	−3.800	0.000	1.309	35.990 *	50.349 *	381.770 *	34.654 *	Constant	0.135 *	0.027	4.940	0.000		Latin America & Caribbean and Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 *	0.004	−3.140	0.002	1.309	96.830 *	53.538 *	3598.500 *	10.780 *	Constant	0.132 *	0.035	3.770	0.000		Latin America & Caribbean and North America	Logarithm of GDPpc lagged	−0.011 *	0.002	−4.970	0.000	1.106	39.840 *	55.668 *	419.710 *	36.585 *	Constant	0.115 *	0.019	6.180	0.000		Latin America & Caribbean and South Asia	Logarithm of GDPpc lagged	−0.016 *	0.004	−4.080	0.000	1.613	50.690 *	54.586 *	833.540 *	20.303 *	Constant	0.163 *	0.030	5.380	0.000		Latin America & Caribbean and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.005	0.003	−1.540	0.124		61.150 *	68.584 *	10,344.340 *	78.128 *	Constant	0.052 **	0.021	2.470	0.014		Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 **	0.007	−1.970	0.049	1.309	55.980 *	6.941 *	4645.070 *	7.500 **	Constant	0.143 **	0.062	2.290	0.022		Middle East & North Africa and North America	Logarithm of GDPpc lagged	−0.013 *	0.004	−2.870	0.004	1.309	63.710 *	10.038 *	4268.200 *	7.697 **	Constant	0.137 *	0.046	2.970	0.003																																																																
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Latin America & Caribbean and North America	Logarithm of GDPpc lagged	−0.011 *	0.002	−4.970	0.000	1.106	39.840 *	55.668 *	419.710 *	36.585 *																																																																																																																																																																																																																																																																																												
	Constant	0.115 *	0.019	6.180	0.000						Latin America & Caribbean and South Asia	Logarithm of GDPpc lagged	−0.016 *	0.004	−4.080	0.000	1.613	50.690 *	54.586 *	833.540 *	20.303 *	Constant	0.163 *	0.030	5.380	0.000		Latin America & Caribbean and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.005	0.003	−1.540	0.124		61.150 *	68.584 *	10,344.340 *	78.128 *	Constant	0.052 **	0.021	2.470	0.014		Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 **	0.007	−1.970	0.049	1.309	55.980 *	6.941 *	4645.070 *	7.500 **	Constant	0.143 **	0.062	2.290	0.022		Middle East & North Africa and North America	Logarithm of GDPpc lagged	−0.013 *	0.004	−2.870	0.004	1.309	63.710 *	10.038 *	4268.200 *	7.697 **	Constant	0.137 *	0.046	2.970	0.003																																																																																																																																																																																																																									
Latin America & Caribbean and South Asia	Logarithm of GDPpc lagged	−0.016 *	0.004	−4.080	0.000	1.613	50.690 *	54.586 *	833.540 *	20.303 *																																																																																																																																																																																																																																																																																												
	Constant	0.163 *	0.030	5.380	0.000						Latin America & Caribbean and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.005	0.003	−1.540	0.124		61.150 *	68.584 *	10,344.340 *	78.128 *	Constant	0.052 **	0.021	2.470	0.014		Middle East & North Africa	Logarithm of GDPpc lagged	−0.013 **	0.007	−1.970	0.049	1.309	55.980 *	6.941 *	4645.070 *	7.500 **	Constant	0.143 **	0.062	2.290	0.022		Middle East & North Africa and North America	Logarithm of GDPpc lagged	−0.013 *	0.004	−2.870	0.004	1.309	63.710 *	10.038 *	4268.200 *	7.697 **	Constant	0.137 *	0.046	2.970	0.003																																																																																																																																																																																																																																										
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Table A5. Cont.

Level of Income	Independent Variable	Coefficient	Standard Error	Z	P > z	Beta Convergence (%)	Hausman Test	Pesaran's Test of Cross Sectional Independence	Modified Wald Test for Groupwise Heteroskedasticity	Wooldridge Test for Autocorrelation
Middle East & North Africa and South Asia	Logarithm of GDPpc lagged	−0.015 **	0.006	−2.530	0.011	1.511	55.780 *	13.632 *	6287.900 *	7.578 **
	Constant	0.157 *	0.050	3.130	0.002					
Middle East & North Africa and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.003	0.003	−0.940	0.346		74.580 *	30.700 *	24,251.450 *	6.374 **
	Constant	0.038 ***	0.022	1.730	0.083					
North America	Logarithm of GDPpc lagged	−0.032 *	0.012	−2.700	0.007	3.252	2.400	4.619 *	2.110	15.184 ***
	Constant	0.356 *	0.129	2.760	0.006					
North America and South Asia	Logarithm of GDPpc lagged	−0.012 *	0.004	−2.760	0.006	1.207	18.600 *	11.165 *	708.600 *	2.065
	Constant	0.134 *	0.038	3.520	0.000					
North America and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.003	0.002	−1.460	0.143		28.150 *	27.741 *	5812.410 *	59.029 *
	Constant	0.038 **	0.016	2.330	0.020					
South Asia	Logarithm of GDPpc lagged	−0.005	0.015	−0.340	0.732		16.250 *	6.219 *	960.000 *	1.675
	Constant	0.078	0.125	0.620	0.535					
South Asia and Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.002	0.005	−0.350	0.730		47.970 *	29.184 *	10,551.060 *	13.570 *
	Constant	0.028	0.033	0.850	0.393					
Sub-Saharan Africa	Logarithm of GDPpc lagged	−0.002	0.004	−0.630	0.531		25.330 *	24.028 *	6236.360 *	56.352 *
	Constant	0.031	0.026	1.180	0.239					

Note: *, Statistically significant at 1%; **, Statistically significant at 5%; ***, Statistically significant at 10%.

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