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Exploring Income Convergence for Central and South Asia

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Abstract

Income convergence refers to the idea that poor countries grow more quickly than rich ones and catch up in terms of per capita income; as a result, the per capita income of integrated nations eventually converges. Beta convergence suggests that less developed nations grow more quickly than more developed ones and reach their average per capita income level by growing more quickly. Meanwhile, sigma convergence suggests that the per capita income disparity among the countries in a regional block narrows over time.

The objective of this study is to test income convergence through beta and sigma convergence for Central and South Asia integration using data from 1990 to 2022. Sigma convergence is

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tested through the standard deviation and coefficient of variation of average per capita income, while beta convergence is tested using panel unit root tests. The results of the study confirm the beta convergence and sigma convergence, which implies income convergence for the integration of Central and South Asia.
The implications of this study are manifold. It recommends that Central and South Asian countries ensure economic, political and social cooperation with one another. This is possible by eliminating trade restrictions and decreasing import taxes to increase free trade. Additionally, ensuring free labor, capital, and technology movement between Central and South Asia will be beneficial for ensuring economic integration, facilitating income convergence, and reducing income inequality between these regions. This study contributes to the income convergence literature by focusing on integration between Central Asia and South Asia.

Keywords: income convergence, economic integration, Central Asia, South Asia

JEL: F15, F43, O4, O47

Introduction

The world is gradually turning into a global village. One of the most prominent effects of globalization is the incredible degree of regional integration among the nations (Singer 2016). The interaction between the nations of the world takes many different forms, including the cross-border movement of people and ideas, as well as the cross-border trade of products and services (Rodrik 2008). Convergence is a term used in economics that can refer to social, technological, real, nominal, and income convergence, among other concepts (Islam 2003). Sala-i-Martin (1996) introduced the concepts of economic convergence and divergence. The process of eliminating disparities in real income and economic growth between economies is known as income convergence. Real convergence occurs when poorer economies or areas overtake wealthy ones, and the gap between their real incomes narrows. By contrast, income divergence occurs when the gap between their real incomes widens.

Income convergence can be gauged through beta convergence and sigma convergence. Beta convergence, which is a prerequisite for income convergence, explains that less developed nations grow more quickly than more developed ones, converging towards distinct steady-states. Meanwhile, sigma convergence suggests that the per capita income disparity among the countries in a regional block narrows over time (Sala-i-Martin 1996).

Convergence testing for economies is an ongoing topic in economics. However, after the 2008 financial crisis, it gained more prominence as a result of heated political debate for convergence clubs or specific regions, like the European Union (EU), where the process of convergence stopped and divergence in per capita real income took place. Since the 1990s, developing countries have experienced greater financial and trade globalization than developed countries. Although many economic associations are in place,

questions remain about the costs and benefits of economic associations, as well as who will win and lose from these associations in the form of trade agreements, customs unions, and other forms of integration schemes already in place (Fedajev et al. 2022).

Due to a rise in globalization and international competition, regional integration among nations has expanded almost everywhere in the world during the past nearly 50 years. Import substitution policies have changed to trade openness policies, resulting in increasing commerce with neighbors and participation in regional integration. Due to a reduction in trade restrictions on international trade and an increase in nation-to-nation integration, protectionism policies were replaced with policies of trade openness, and trade openness has since become the benchmark for measuring and realizing economic growth and well-being.

Political and economic factors have stimulated regional integration. Nations have shifted toward economic integration to expand markets, opportunities, and production rivalry in local markets. Additionally, as economies have become more intertwined, there has been a rise in social and economic integration, which has led to a more stable trading climate and fewer disputes among countries. The previous agreement, the General Agreement on Tariffs and Trade (GATT), paved the way for the creation of the World Trade Organization (WTO) and stoked national excitement for increased trade openness. The countries that joined the WTO abolished trade restrictions and participated more in international trade, which grew more quickly than in those countries with trade restrictions. Due to this increase in trade openness, economic integration started in the shape of regional trade arrangements, including custom unions, preferential trading arrangements (PTAs), common markets, and single markets or monetary unions all over the world. Almost all nations today are members of one or more regional organizations (Kheyfets and Chernova 2021).

Regional economic cooperation among nations or regions accelerates economic development in the member nations and makes them more competitive in the international market. It leads to the establishment of mutually compatible economic policies, which increase the volume of trade through better use of economies of scale. This has a long-lasting, favorable impact on economic development, increases income levels, and decreases income inequalities (Dey and Neogi 2015). Regional economic integration lowers obstacles to international labor movement and can help to enhance job possibilities. It is crucial for emerging countries because it accelerates their rates of development. These regional economic agreements facilitate trade and capital development by reducing barriers and lowering or eliminating tariffs, lowering the cost of goods for consumers in the associated nations. It minimizes earnings disparities in the area.

These regional associations have given nations more power to focus on issues relevant to their economic growth stages and to speed up trade among their neighbors. Political

cooperation among the member countries is facilitated by regional commonalities and understanding (Gammadigbe 2021).

Regional economic integration may be important for development for a variety of reasons. Initially, economic integration encourages capital and labor movement in the region, which can boost labor productivity. Second, trade arrangements benefit all countries while boosting the volume of commodities exchanged in the region, like customs unions or free trade agreements. Lastly, regional economic integration encourages the adoption of cutting-edge technologies that improve the quality of a product and lower domestic production costs by encouraging the exchange of ideas, products, and expertise among regional businesses (Gul, Haq, and Khan 2022).

Central Asia consists of Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan, and Uzbekistan. In the early 1990s, the nations of Central Asia gained independence from the USSR and moved towards free market economies. These nations are bringing reforms for modernization and to raise living standards. They have abundant natural resources, rich cultures, an educated labor force, and strategic positions, in particular, their proximity to China. This may give them an excellent opportunity for economic expansion. Many factors may stimulate development, the most significant of which is foreign trade because these nations heavily depend upon it. Due to limited access to the global markets, intra-regional trade is very vital for these nations. In the last two decades or so, Tajikistan and the other countries of Central Asia gained significant advantages from the improved regional integration in the global economy. The growth in international trade is regarded as the engine for the economic development of the region as it reduces poverty, decreases income inequality through income convergence, and brings prosperity (Gul, Haq, and Khan 2022).

The economies of the Central Asian states are well-established, and there is enormous room for expansion. The entire GDP of Central Asia reached $347 billion in 2021, having increased more than sevenfold over the last two decades. Since 2000, the population of Central Asia has grown by 1.4 times, creating a sizable sales market and a growing supply of labor resources. The demographics of the region favor economic growth, with the existing age distribution predicting an increase in labor resources in the future. Over the last 20 years, Central Asia's average annual economic growth rate has been 6.2%, compared to 5.3% in developing nations and a global average of 2.6%.

The increase in exports, workers' remittances, and foreign direct investment all helped to lower poverty and raise income. Exports from the area in 2021 reached $165.5 billion, a sixfold rise over the last two decades. The amount of FDI coming into Central Asia has climbed more than seventeen times in the last two decades, reaching $211 billion in 2021. Although FDI is increasing in the region, its structure, which is country- and sector-specific, shows some difficulties. International investors' perceptions of the region are still influenced by the lack of openness, their distance from important economic

hubs, and the fact that they lack access to the ocean. The region is underinvested, as evidenced by the fact that the ratio of FDI to GDP, excluding investment in the commodity industries, is lower than the global average (Kim, Mariano, and Abesamis 2022).

Central Asian nations may overcome their structural development challenges with a coordinated effort. There is no choice but to cooperate in the areas of water and energy due to increased energy demand during a time of rapid economic growth and the fact that the nations share river basins. Coordination of initiatives to build transportation infrastructure and reduce climate risk is also crucial. Infrastructure bottlenecks must be removed to increase economic productivity, commerce, and economic alliances with neighboring nations; they must also diversify production and exports (Cheong and Turakulov 2022).

The GDP growth rates of Central Asian countries from 1991 to 2022 are shown in Figure 1. The initial per capita growth rates of all the member countries were negative, but they soon started to become positive and increase quickly. This clearly demonstrates that the per capita income of all countries rises with time; the average per capita growth rate of the regional block converges, indicating income convergence among the member countries.

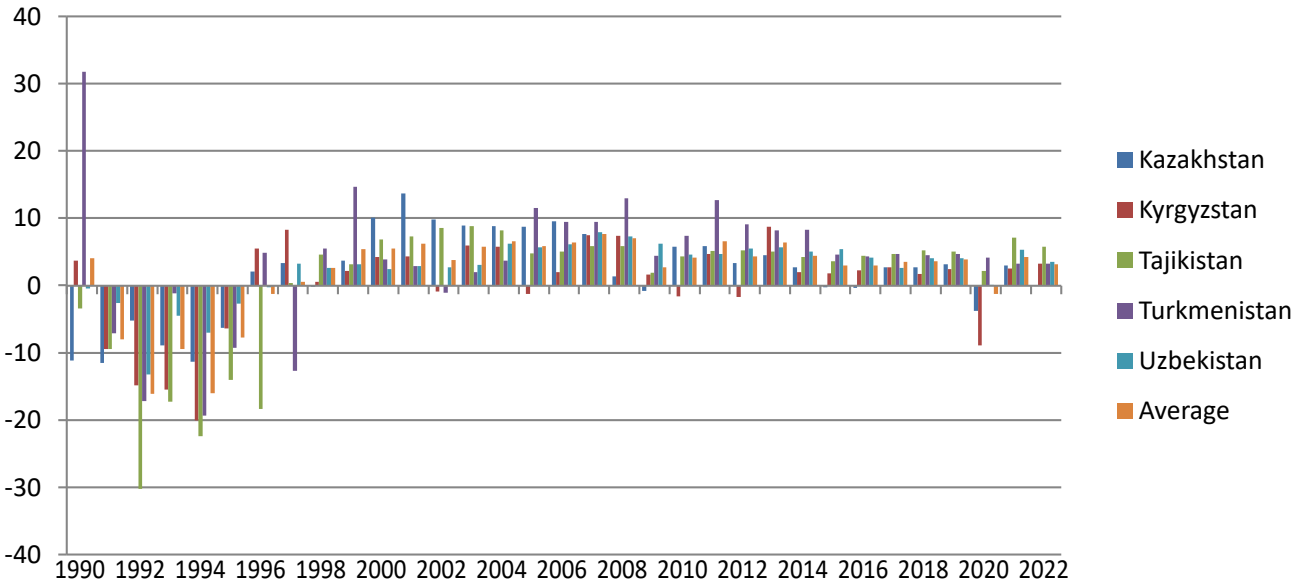

Figure 1. Annual GDP per capita growth rates of Central Asia

Source: World Bank n.d.

The South Asian Association for Regional Cooperation (SAARC) is the intergovernmental and geopolitical union of the countries in South Asia. It has eight permanent member nations, including Afghanistan, Bhutan, Bangladesh, India, the Maldives, Nepal, Pakistan, and Sri Lanka. SAARC was established on 8th December 1985 in Dhaka, Bangladesh, to raise the well-being of the people of South Asia. SAARC

supports collaboration in diverse fields and maintains and encourages cooperation with regional and international organizations for economic integration and development. In 2021, it covered three percent of the world's land mass (5,099,611 square km, or 1,968,971 square miles), twenty-one percent of the world's population, and 5.22% (US$4.47 trillion) of the global economy. In 2021, the GDP (PPP) was US$14.85 trillion, while the GDP (nominal) in the same period was $4.47 trillion (Bishwakarma and Hu 2022).

SAAR Cestablished the South Asia Free Trade Area (SAFTA) in 2006, which was the first step in moving towards the second step, a Customs Union, the third step, a Common Market, and finally, an Economic (Monetary) Union. SAFTA was expected to steadily move towards the customs union of South Asia, but unfortunately, investment among member nations is currently very low and not very encouraging of trade relations; it seems the targets they set will not be easy to reach. The share of trade among the member nations of SAARC is only 5% of the total share of regional trade. FDI is also very low because the flow of intra-regional FDI is about 4% of the overall FDI. According to an Asian Development Bank (ADB) report, trade among SAARC members could raise their agricultural exports by US$15 billion annually, from the present US$8 billion to US$23 billion (Islam 2022).

Long-term prosperity and peace in the region have been elusive. The political discourse is frequently discussed in SAARC meetings, emphasizing the need to refrain from interfering in member nations' internal issues. At the twelfth and thirteenth SAARC summits, significant emphasis was placed on enhancing cooperation among the member nations to combat terrorism.

Figure 2 shows the GDP growth rates of SAARC countries from 1991 to 2022. In the initial year, we can see that this rate is lower in all the countries and very far away from the average value of the block. Then, it started to increase in all the economies, and the gap from the average value was minimized in the last years, which clearly shows that income disparity is decreasing over time in the block.

Countries and regional blocks are usually interested in forming a forum for mutual socio-economic benefits. The countries Central Asia and South Asia also formed such a forum which is called Subregional Economic Cooperation in South and Central Asia. The purpose of this forum is basically to cooperate in trade and infrastructure (energy and transport) and to connect the people of the two regions for mutual interests. Likewise, the countries of both regions are also members of other forums and try to enhance economic cooperation. Therefore, this study was conducted in this context and its main objective is to explore income convergence for Central and South Asian countries.

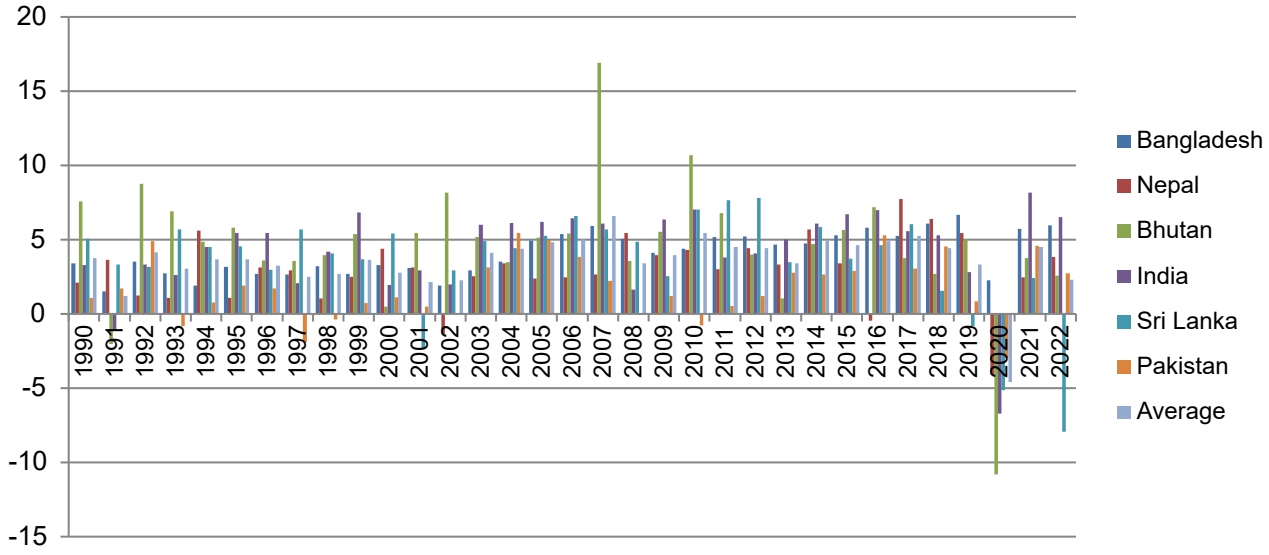

Figure 2. Annual GDP per capita growth rates of SAARC

Source: World Bank n.d.

Literature review

The first empirical work on income convergence started with Baumol (1986), and since then, it has been explored by numerous researchers. Initial research included cross-sectional studies, like Sala-i-Martin (1996) and Barro (1991), which confirmed the presence of cross-sectional income convergence. Later on, however, economists challenged the results and focused on time series studies (e.g., Bernard and Durlauf 1995; Strazicich, Lee, and Day 2004; Dawson and Strazicich 2010). Time series work has been done mostly for developed nations and most concluded that income convergence occurred for these nations. Few empirical works exist for developing nations, with only a few studies exploring intra-group income convergence using the panel technique.

The basic neoclassical model of economic growth (initially presented by Solow (1956) and Swan (1956) and consequently refined by Koopmans (1963), Cass (1965) and Mankiw, Romer, and Weil (1992) became the basis for many empirical research studies to test income convergence among nations and regions. Solow (1956) suggested that as an economy transitions to its long-term level of steady state, the initial per capita GDP growth rate is inversely associated with its subsequent per capita GDP growth rate. It means that rich nations, which initially have a higher per capita GDP growth rate and grow slower than poor nations have low per capita GDP growth rates. As a result, both rich and poor nations will converge to a similar level of per capita GDP in the long term. Therefore, there will be income convergence

among poor and rich nations. This was suggested by Solow, considering the diminishing returns to factors of production and constant return to output with no government intervention and a closed economy. Sala-i-Martin (2002) and Islam (2003) found the presence of conditional income convergence based on the neoclassical growth model.

Haider, Hameed, and Wajid (2010) conducted a comparative study of the founding nations of Association of Southeast Asian Nations (ASEAN) and selected SAARC nations by employing the beta and sigma convergence tests for the period 1984–2012. They found divergence between these two regional blocs. Their results also revealed conditional income convergence for ASEAN and South Asia. Dey and Neogi (2015) examined per capita income unconditional convergences for seven SAARC member nations by employing the beta convergence and sigma convergence tests for the period 1970–2011. The results showed the presence of per capita income unconditional convergences for SAARC nations.

Moreover, per capita income unconditional convergence was tested for the integration of China with SAARC to test whether there is an opportunity for a wider range of economic cooperation in the region. The results of beta convergence and sigma convergence tests revealed unconditional convergence after the integration of China with SAARC. In addition, with the inclusion of China, the convergence rate is also greater than before. It is suggested that there is immense opportunity in the area for further regional economic collaboration to increase trade, transfer modern technology, permit the free movement of people and capital across borders, reduce income disparity, and increase living standards.

Khan and Daly (2018) tested the income convergence for selected SAARC nations between 1960 and 2017, employing the panel unit root technique in the context of monetary union for the SAARC. Despite accounting for structural breaks, the results revealed little support for per capita income convergence. As suggested by Enders and Lee (2004), the study also employed two other techniques to test income convergence, which consider the smoothly evolving trend in per capita income rather than a possible linear trend. This study also adopted a technique developed by Phillips and Sul (2007), which allows for the examination of per capita earnings convergence within sub-groups. However, these techniques yielded minimal evidence of per capita income convergence for all the nations in the group.

In addition, their study suggested classifying SAARC nations into two non-overlapping per capita income convergence clubs, with Sri Lanka and India exhibiting an encouraging growth path. These findings raised the question about the feasibility of a monetary union for the member nations of SAARC. Conversely, Ahmed and Hussain (2019) have conducted a study for the European Union (EU) in the context of drawing lessons for SAARC nations. They argued that intra-regional trade and economic cooperation among SAARC nations is limited due to the long-standing bilateral disputes. This study

covered 1950 to 2016 (including Brexit) to find a promising lesson for SAARC by employing Gürler's model of economic integration. They concluded that a revived SAARC is nevertheless an appropriate vehicle for following a steady course of regional economic cooperation in South Asia. It could eventually lead to economic integration and resolve political disputes between nations.

Zia (2019) examined intra-group income convergence for SAARC between 1999 and 2015 by employing the typical techniques of beta convergence and sigma convergence. This study investigates income convergence among the nations of SAARC in the presence of FDI, trade liberalization, government effectiveness, and modern technology transfer. The panel technique is applied to test income convergence, taking into account the regional heterogeneity. The study concludes that there is income divergence among the nations of SAARC and argues that they would not benefit from the regional economic association after signing SAFTA and SAPTA. Furthermore, it is concluded that SAARC is not as effective as it should be. Safdar and Nawaz (2020) also explored income convergence in SAARC for selected countries using the Solow–Swan (1956) growth model for the period 1972 to 2012. Their results did not conclude that there is betaconvergence or sigmaconvergence for the specified period, nor are they consistent with the Solow–Swan growth model.

Gammadigbe (2021) asserted that regional trade agreements (RTAs) stimulate economic growth in nations that participate in these agreements through trade, transfer of knowledge and technology, and economies of scale. He carried out the study to explore how regional trade integration contributed to economic growth and income convergence in Africa. The findings reveal that regional trade integration encourages economic growth in Africa. They also support the African Continental Free Trade Area (ACFTA) project, which aims to reduce non-tariff restrictions on trade and improve infrastructure to maximize the impacts on growth in all African nations that participate in the RTAs.

Kheyfets and Chernova (2021) investigated income convergence for the Eurasian Economic Union (EAEU) nations. They concluded that the rate of income convergence for the associated nations decreased. However, they concluded that China and its Belt and Road Initiative (BRI) program paved the way for integration into this union. The EAEU member nations are leaning towards China due to its financial support.

Likewise, Alinsato (2022) analyzed the nature of West African Economic and Monetary Union (WAEMU) relations from 1995 to 2015 using beta convergence techniques and the spatial competition model of Dendrinos and Sonis (1990). He concluded that there was divergence in standards of living. In addition to this, the study also revealed very poor integration among the countries in the region, and they have competitive relationships with each other. The study suggested that it is necessary to increase the rate of regional economic integration in WAEMU, bearing in mind the comparative advantage of every nation in the region.

Hu et al. (2022) investigated the impact of China's BRI economic development project on fostering regional economic integration. China adopted a policy of openness that encouraged globalization. Thus, this study determined income convergence across the periods 1960 to 2016 and 1979 to 2016. They contend that the BRI countries that exhibit income convergence towards China in their income convergence testing typically already had a close economic link with China. In contrast, nations with relatively limited economic ties with China typically do not demonstrate convergence. Thus, they argued that the BRI may allow them to catch up with China. They also concluded that China contributes to greater regional integration and income convergence.

Korwatanasakul (2022) comprehensively reviewed the progress of "Asian" economic integration, which covers the main Asian regional economic blocs. The study argued that continent-wide and comprehensive regional economic integration in the Asian region is not likely to happen because the integration practice has been generally limited to the countries of East and Southeast Asia, as other Asian regions are less globalized and integrated. Furthermore, it was suggested that the gradual integration process would be jointly beneficial for every nation of the economic association by improving technology, increasing the labor force, building capacity, and increasing the market with the upcoming accomplishment of the ASEAN single market and ample regional economic cooperation.

For the Central Asian nations, Gul, Haq, and Khan (2022) investigated income convergence. Using beta and sigma convergence, they examined the income convergence between 2003 and 2019. Both sigma and beta convergence tests confirmed income convergence in Central Asian nations. They concluded that economic integration is beneficial for Central Asia and suggested that these countries should maintain economic cooperation with one another by reducing trade barriers and import duties. Additionally, it will be beneficial to ensure labor force mobility freely throughout the Central Asian nations since it will support economic integration and reduce regional income inequality.

The literature reviewed here shows that several studies examined income convergence for various regional blocks using various methods;in most cases, they concluded that income convergence existed. Some studies confirmed intra-group income convergence for SAARC, like Dey and Neogi (2015), Zia (2019) and Safdar and Nawaz (2020). By contrast, Gul, Haq, and Khan (2022, pp. 448–461) conducted an intra-group income convergence for the Central Asian countries and concluded that there was income convergence. We found no study in the literature that tested inter-group income convergence in SAARC and Central Asia. As a result, this study fills the research gap in the literature by exploring inter-group income convergence in SAARC and Central Asia.

Research methodology

This is a panel data study for testing inter-group income convergence for Central Asia and South Asia for the period 1990–2022.Data on per capita income measured in USD were collected from the World Bank online database. Central Asian countries are Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, while Bangladesh, Bhutan, India, Pakistan, Sri Lanka, and Nepal are selected countries from South Asia. To examine income convergence, we use panel unit root tests like Levin-Lin-Chu (LLC), introduced by Levin, Lin, and Chu (2002), Im-Pesaran-Shin (IPS), developed by Im, Pesaran, and Shin (2003), and the PP-Fisher Chi-square and ADF-Fisher Chi-square tests, introduced by Choi (2001). The panel unit root tests are tested based on the following equation (1):

$$y_{it} = \alpha + \beta y_{it-1} + \varepsilon_{it}. \quad (1)$$

To avoid the unit root problem, extra lags can be included, and the above equation (1) can be written as follows:

$$\Delta y_{it} = \alpha + \rho y_{it-1} + \sum_{j=1}^{p} \delta_{ij} \Delta y_{it-j} + \varepsilon_{it}, \quad (2)$$

where Y_{it} denotes the average per capita income of the countries selected for the analysis. The negative value of ρ in the LLC and IPS tests will indicate income convergence, as positive values represent income divergence. Sigma convergence tests whether there is a decline or not in differences in per capita amongst the nations or in regions over time. To explore the sigma convergence, Standard deviation (SD) and the coefficient of variation (CV) are employed.The following formula is employed:

$$CV = SD / AM \times 100, \quad (3)$$

where SD is standard deviation, and AM is arithmetic mean. If the value declines over time, it shows that the gaps in per capita earnings among the economies have decreased, so there is sigma convergence.

Results and discussion

As discussed earlier, the beta convergence for the integration of Central Asia and South Asia is tested through panel unit root tests. The results of these panel unit root tests are given in Table 1. The result of the LLC test is significant,

witha negative coefficient (–18.88). The result of the IPS test also shows a significant result with a negative coefficient (–10.28). The result of the PP-Fisher Chi-square test shows a significant result with a positive coefficient (316.82). The result of the ADF-Fisher Chi-square test shows a significant result with a positive coefficient (567.13). The results of these tests show that income per capita converges when Central Asia and South Asia integrate; thus, these results confirm beta convergence.

Table 1. Results of Beta convergence when Central Asia integrates with SAARC

LLC		IPS		PP-Fisher Chi-square		ADF Fisher Chi-square	
Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
–18.88*	< 0.01	–10.28*	< 0.01	316.82*	< 0.01	567.13*	< 0.01

Source: author's estimation.

Sigma convergence is tested through the SD and CV of average per capita income. Table 2 showsthe results of the SD and CV, while Figure 3 shows the CV over time. The SD and CV of the average per capita income for Central Asia and South Asia between 1990 and 2022 show a downward trend. The declining trend of CV can be witnessed between 1990 and 1998. However, it started an upward trend in 1999, reaching 96.68 in 2007. There is not much change in the CV between 2009 and 2014. However, the CV value decreased from 88.64 in 2015 to 80.66 in 2022. The CV value for the whole period decreased, which demonstrates that the variation in per capita income decreased over time. This confirms the presence of sigma convergence when Central Asia integrates with South Asia. The results of the beta convergence and sigma convergence confirm income convergence when Central Asia integrates with South Asia.

Table 2. Results of Sigma convergence when Central Asia integrates with SAARC

Year	Bang	Nepal	Bhutan	India	Sri Lanka	Pak	Kazak	Kyrgyz	Tajik	Turkmen	Uzbek	CV
1990	493.10	420.74	747.23	534.48	1320.63	956.99	5831.07	1203.48	1308.32	3533.60	1565.56	91.46
1991	500.49	436.10	732.03	528.89	1364.53	973.46	5156.94	1089.90	1185.14	3281.34	1524.99	85.91
1992	518.11	441.48	796.24	546.44	1407.77	1021.31	4887.37	928.31	826.59	2715.93	1322.82	85.55
1993	532.25	446.29	851.20	560.79	1487.92	1013.01	4453.56	784.57	683.58	2684.65	1263.35	82.06
1994	542.45	471.27	892.63	586.17	1555.01	1020.79	3949.04	627.21	529.99	2165.77	1174.38	77.08
1995	559.69	476.45	944.40	618.14	1625.57	1040.28	3700.75	587.30	455.38	1965.33	1142.97	73.58
1996	574.84	491.30	978.49	651.95	1673.99	1057.98	3776.08	619.67	371.83	2060.70	1140.38	74.22
1997	590.00	505.77	1013.49	665.46	1768.99	1037.74	3901.33	671.25	373.04	1799.60	1177.27	74.55
1998	609.01	511.05	1053.54	693.40	1840.96	1033.88	3893.93	675.06	390.32	1897.86	1208.29	73.08
1999	625.36	523.88	1110.06	740.91	1908.86	1041.52	4037.45	689.41	402.62	2176.84	1246.73	73.24
2000	646.04	546.93	1115.62	755.48	2011.98	1053.00	4446.45	718.33	430.34	2261.70	1276.76	76.77
2001	666.07	564.07	1176.65	777.73	1965.82	1058.22	5055.31	749.41	461.57	2326.36	1313.19	82.31
2002	678.87	556.36	1272.63	793.10	2023.39	1058.78	5550.50	742.44	501.03	2300.63	1348.76	86.56
2003	698.73	570.41	1338.50	840.81	2122.21	1091.80	6046.32	786.35	545.25	2345.87	1389.58	89.28
2004	723.23	589.75	1385.39	892.38	2216.27	1151.28	6580.88	831.48	590.03	2432.10	1475.97	91.63
2005	758.89	603.75	1456.48	947.76	2332.65	1208.68	7155.34	820.71	617.93	2711.98	1560.29	93.92
2006	799.78	618.56	1535.42	1008.67	2486.64	1255.20	7837.62	837.13	649.17	2968.11	1656.22	96.47
2007	847.28	635.00	1795.07	1070.13	2628.15	1283.22	8438.10	900.02	687.06	3249.87	1787.49	96.68
2008	890.29	669.55	1859.07	1087.58	2756.12	1282.18	8554.82	966.41	727.55	3672.65	1917.84	94.30
2009	927.02	696.14	1961.93	1156.88	2826.23	1297.46	8487.54	982.37	741.35	3835.86	2037.58	91.42

Year	Bang	Nepal	Bhutan	India	Sri Lanka	Pak	Kazak	Kyrgyz	Tajik	Turkmen	Uzbek	CV
2010	967.56	726.05	2171.91	1238.01	3025.30	1287.61	8979.33	966.15	773.67	4119.57	2131.35	91.97
2011	1017.63	748.01	2319.59	1285.28	3257.44	1294.51	9506.73	1011.32	813.52	4643.31	2231.05	92.42
2012	1070.60	781.10	2411.89	1337.47	3512.13	1309.93	9823.69	993.73	855.68	5066.23	2354.59	91.93
2013	1120.69	807.13	2436.86	1404.54	3634.61	1346.28	10264.30	1080.54	898.64	5481.15	2487.24	92.06
2014	1173.89	853.14	2551.48	1490.02	3846.82	1382.09	10539.04	1101.70	937.00	5935.69	2613.74	91.06
2015	1236.00	882.30	2695.63	1590.17	3990.35	1421.83	10510.77	1121.08	970.36	6208.29	2753.97	88.64
2016	1307.73	878.15	2889.49	1701.18	4174.63	1497.16	10476.35	1146.10	1013.31	6478.47	2867.05	86.11
2017	1376.60	946.04	2998.47	1795.91	4427.54	1542.90	10758.52	1177.43	1060.91	6784.17	2943.09	85.31
2018	1460.30	1006.60	3079.14	1891.13	4495.71	1612.83	11053.36	1197.611	1116.29	7089.94	3062.48	84.72
2019	1557.96	1061.48	3233.59	1944.31	4458.43	1626.74	11402.76	1226.82	1172.07	7422.36	3185.33	84.68
2020	1593.35	1018.10	2884.20	1813.53	4229.75	1578.43	10974.24	1117.70	1197.21	7064.44	3187.04	84.77
2021	1684.43	1042.97	2992.43	1961.96	4331.47	1650.69	11298.36	1145.56	1281.96	7275.93	3356.03	83.83
2022	1784.74	1083.03	3468.95	2089.73	4488.08	1695.95	11290.90	1182.91	1356.31	7297.31	3473.36	80.66

Source: author's estimation based on World Bank Data n.d.

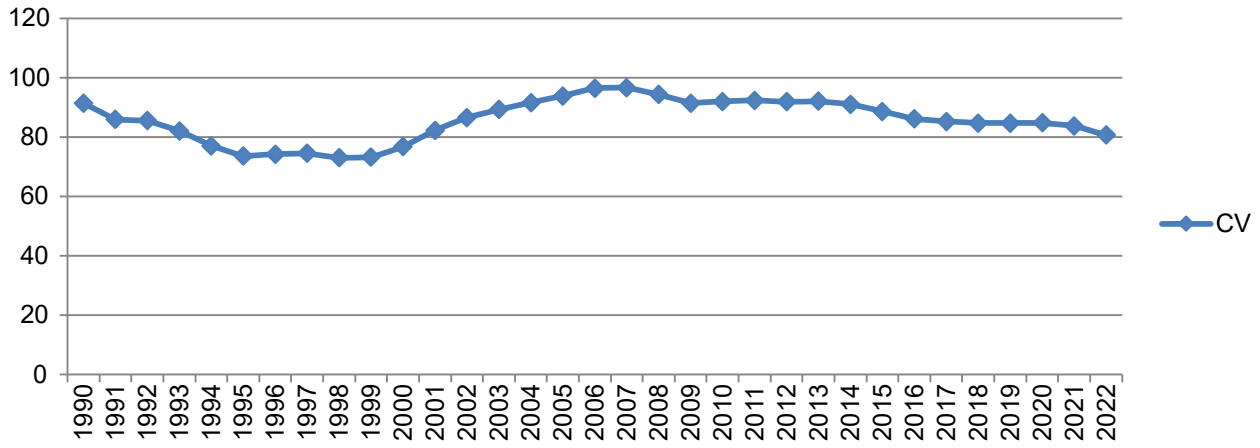

Figure 3. Results of CV when Central Asia integrates with South Asia

Source: author's estimation based on World Bank Data n.d.

Conclusion

Income convergence is the concept that poor countries grow more quickly than rich ones, and that they catch up in terms of per capita income; as a result, the per capita incomes of all nations eventually converge. The possibility for developing countries to have quicker growth than developed countries is assumed to be due to the application of diminishing returns to capital in developed countries, while developing countries have the potential for faster growth than developed countries. Additionally, developing nations may copy and duplicate the institutions, technologies, and methods of production used by developed nations.

Different regions of the world engage in integration. Thus, it is important to test whether income converges or not after their integration. The objective of this study was to determine inter-group income convergence for Central Asia and South Asia. Beta convergence was investigated to determine whether countries with lower initial growth rates experience faster growth than those with higher initial growth rates. Panel unit root tests were used, revealing beta convergence for the inter-group of Central Asia and South Asia. The sigma convergence was also tested. When there is a decline in the difference in income levels among the countries, it is known as "sigma convergence." The results confirmed sigma convergence for the inter-group of Central Asia and South Asia. The beta and sigma convergence tests indicate income convergence for Central and South Asia integration,thereby achieving the objective of the study.

The results of the study suggest that economic integration is beneficial for both SAARC and Central Asian economies; therefore, it is recommended that these economies and blocks ensure economic integration among themselves by eliminating

trade barriers and reducing taxes on imports. SAARC members have already signed a free trade agreement, but unfortunately, it is not very effective. Therefore, it is recommended that it should be implemented in the true sense and efforts be made for the next stage of economic integration, the "Customs Union", where member nations not only allow free trade among themselves but also formulate similar policies for non-member nations for trade.

Central Asian nations are working for free trade agreements, and the leaders of all these nations have agreed to launch a free trade agreement for member nations to increase trade. Central Asian nations are land-locked countries without access to deep harbors in the region, relying on roads and railways for trade. Therefore, Central Asia must launch a free trade agreement among member nations and with other nations in the region to increase the volume of trade, fostering income convergence in the region.

Free trade among nations is crucial for the income convergence of nations or regions. It encourages innovations and boosts investment in human capital, improves marketing channels, increases management expertise, and promotes economic development. Economists believe that financial assets should be free to move across national borders to maximize the return on investment. In the local input markets, competition increases due to international trade. Through a variety of ways, international trade helps to promote capital development and economic growth in the host country. It is beneficial during times of financial difficulty, encouraging the transfer of advanced technology and increasing labor productivity while lowering labor costs. The development of underdeveloped areas is possible with an increase in trade. It is vital for Central and South Asia to reduce trade restrictions, and policies should be adopted that increase international trade, which is very significant for reducing income inequality and helping income convergence. This study contributes the case of integration of Central Asia and South Asia to the income convergence literature. The limitation of the study is that this study is limited to income convergence. Future researchers could also examine the determinants of income convergence.

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Badanie konwergencji dochodów w Azji Środkowej i Południowej

Konwergencja dochodowa odnosi się do idei, że kraje ubogie rozwijają się szybciej niż kraje bogate i nadrabiają zaległości pod względem dochodu na mieszkańca. W rezultacie dochód na mieszkańca krajów zintegrowanych ulega zbliżeniu. Konwergencja beta sugeruje, że kraje słabiej rozwinięte osiągają swój średni poziom dochodu na mieszkańca poprzez szybszy wzrost. Tymczasem zbieżność sigma sugeruje, że dysproporcja dochodów *per capita* między krajami w bloku regionalnym zmniejsza się w czasie.

Celem tego badania jest przetestowanie konwergencji dochodów poprzez konwergencję beta i sigma dla integracji krajów Azji Środkowej i Południowej na podstawie danych z lat 1990–2022. Konwergencja sigma jest testowana za pomocą odchylenia standardowego i współczynnika zmienności średniego dochodu na mieszkańca, podczas gdy konwergencja beta jest testowana za pomocą testów panelowych pierwiastka jednostkowego. Wyniki badania potwierdzają konwergencję beta i sigma, co implikuje konwergencję dochodów krajów Azji Środkowej i Południowej.

Konsekwencje tego badania są wielorakie. Zaleca się, aby kraje Azji Środkowej i Południowej rozwijały współpracę gospodarczą, polityczną i społeczną. Jest to możliwe dzięki wyeliminowaniu ograniczeń handlowych i zmniejszeniu podatków importowych w celu zwiększenia swobodnego

handlu. Ponadto zapewnienie swobodnego przepływu siły roboczej, kapitału i technologii między Azją Środkową a Południową będzie korzystne dla zapewnienia integracji gospodarczej, ułatwienia konwergencji dochodów i zmniejszenia nierówności dochodowych między tymi regionami. Niniejsze badanie wnosi wkład w literaturę dotyczącą konwergencji dochodów, koncentrując się na integracji między Azją Środkową a Azją Południową.

Słowa kluczowe: konwergencja dochodów, integracja gospodarcza, Azja Środkowa, Azja Południowa