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Globalisation and Cointegration among the States and Convergence across the Continents: A Panel Data Analysis

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Abstract

This paper tried to examine the level of cointegration among various nations across the continents in regard to the globalisation. Also here attempt is made to analyse the nature of inter and intra continental variation in globalisation over time. The proximity and convergence over time in terms of the growth of globalisation is also examined by using a panel data set over a period of 1970 to 2007. The outcome reveals the presence of cointegration among the selected nations despite the fact that the European nations are more cointegrated than the other continents. It is followed by the countries in Africa and Asia. The proximity matrices of overall globalisation and political globalisation provided some important indications that geographical proximity, economic necessities, cultural and political understanding play crucial role in determining the clusters of countries in terms of globalisation or choice of the countries to open with other nations for trade, cultural exchange etc.

Key words: Globalisation, Proximity, Stationarity, Cointegration, Regional Convergence, Panel Data.

JEL Classification: H77, O57, O40, F43, C82, R1, R11

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Globalisation and Cointegration among the States and Convergence across the Continents: A Panel Data Analysis

Introduction:

Globalisation has become a myth and conceived to be the solution to several social and economic problems across countries (World Bank and IMF, 2007). Nations are supposed to gain more in terms of faster economic growth, improvement of human development through globalisation and interactions with other countries than national isolation (Dreher, 2006; Kulkarni, 2005; Amavilah, 2009a). Amavilah (2009b) have also shown that human development index depends on conventional factors and forces, national symbols as well as globalisation. Opening up of free trade not only increases efficiency but also helps in reducing pollution emission due to greater competitive pressure and greater access to greener production technologies (Cole, 2004). International capital transactions might also affect national pollution levels (Antiweiler et al, 2001). However, Heintz (2006) raised doubts about the role of globalisation in employment challenge and ensuring quality of work life, poverty reduction as well as gender equity. According to Cherni (2001), “the problem that globalisation has not been able to dissolve is the pronounced economic and many other unjust disparities between the developed and developing world. If anything, environmental problems that have been caused or worsened as a result of globalization in cities of the developing world can be added to a list of already existing, and perhaps worsening, critical problems such as poverty and lack of sanitation and running waste and accumulating urban waste”. Thus, there are contradictory forecasts in regard to the impact of globalisation on the development as perceived by various researchers. Despite many limitations pointed out by a large number of studies and cautions against unrestricted globalisation and opening of countries to the outside world without considering the competing ability of the domestic sectors, bringing in foreign capital without considering its social, economic, demographic and environmental consequences; a large number of countries have followed this path blindly (Beams, 2000; Effland et al, 2006; Heintz, 2006; Tang, 2008; Versi, 2004; Ewege, 2005).

The move for trade relaxation, integration of economies and globalisation came out of the apprehension that it is very difficult to progress beyond a certain point with their own efforts due to lack of complete knowledge, technology and hence efficiency on many fronts

and thus interdependence and free trade has no other alternative that leads to specialisation, accelerate trade and mutually benefit the participating countries that leads to the faster growth of their economies. The bargaining capability, socio-political strength, terms of trade and its change remain out of consideration among many of the country heads and that ultimately leads to some undesirable consequences afterwards. Of course, a few countries, who despite being the signatory of many international treaties, follow the path of globalisation and open economy with some restrictions to safeguard the interest of various domestic industries, their employees, markets and also the socio-cultural values.

Moreover, there are differences in timing and phase of implementations of globalisation measures (tariff reduction and opening of domestic market to international businesses and entrepreneurs, allowing foreign capital and labour movement etc) by several countries not only due to the apprehension of facing unequal and stiff competition without having adequate technological progress, but also due to the fear of adverse impacts on the social and economic position and hence strong opposition faced from various social and political institutions at home (Beams, 2000; Effland et al, 2006). Thus, we observe even within the same Asian region such as China, Malaysia, Singapore, Korea etc started integrating their economies with the rest of the world much earlier (in 1980s) while India followed the path only in 1990s after the observation of faster growth of those economies through capital and technological transfer from the developed countries. Moreover, despite the social and political differences many of the countries are found open their trade relaxations first with their geographical neighbours although due to the scarcity of material wealth and technology they are also found to open trade and socio-political relations with some distant countries but with some time lag. Therefore, the differences in proximity in terms of globalisation are apparent among the nations across the continents. It may also be due to the ideological differences, political set up and the requirement of commodities and technologies. For example, out of the necessity for petroleum, India had to foster more trade ties with oil and natural gas producing countries like Syria, Arab, Iran etc even though they are relatively distant nations. Homogeneity of socio-political, economic and cultural homogeneity may be the important reasons behind the closeness among the nations across the continents.

The purpose of the present paper is to examine the level of cointegration among various nations across the continents in regard to the globalisation. Also the proximity and convergence over time in terms of the growth of globalisation is examined by using a panel data set over a period of 1970 to 2007.

Data:

Data on various globalisation indices across the countries for the period 1970 to 2007 have been collected from the KOF index of globalisation Dreher (2006), Dreher et al (2008). The information on GDP across the countries for the years 1970, 1983, 1992 and 2008 have been collected from various issues of *World Development Reports*. Also human development index figures were collected from various issues of *Human Development Report* published by UN. As information on all aspects of globalisation, GDP, Human Development Index is not available for some countries, which were not considered for the present analysis. We have considered only 75 countries across the continents for which data on all the relevant variables are available for the period 1970 to 2007 or 2008.

Methods:

First of all we examined the stationarity of the globalisation index across the countries by using augmented Dickey-Fuller (ADF) test (Unit Root test, Dickey and Fuller, 1979). The test is done on the basis of the following regression equation:

$$\Delta Y_{it} = \alpha_i + \beta_i \cdot t + \gamma_{i0} Y_{i,t-1} + \sum_{j=1}^{p_i} \delta_{i,j} \Delta Y_{i,t-j} + \varepsilon_{it} \text{ where } t = 1, \dots, T \dots (1)$$

Here, Y_{it} is the value of globalisation index of i^{th} country at time t . The inference is based on the usual τ -statistic of γ_{i0} , which has a non-standard distribution. The Akaike information criterion is used to determine the lag length parameter p_i . Equation is estimated in both form, including and excluding time trend.

Thereafter we tested whether the countries in each continent are co-integrated in terms of growth of globalisation over time by using augmented Engle-Granger (AEG) test (Engle and Granger, 1987). Similar regression like that of equation-1 is used for least square errors obtained from the regression of time series data on globalisation index of a country on those of other countries in each continent. Also, the coefficient of variation in the level of globalisation among the countries in each continent and its variation over time is computed. From the trend of coefficient of variation we can examine the convergence or divergence of the series of globalisation among the countries across various continents.

A number of methods have been used for the testing of convergence. Inverse relation between the rate of growth and initial value is used as the condition of convergence by Baumol (1986), DeLong (1988), Barro (1991), Barro and Sala-i-Martin (1992), and Mankiw et al. (1992). But the method was criticised by Quah (1993), Bernard and Durlauf (1996), and Evans (1997) on the ground of its reliability and suggested the time series methods of unit

root and cointegration techniques for examining convergence (Quah, 1992; Bernard and Durlauf, 1995; Li and Papell, 1999). Also, panel unit root test is suggested by Levin and Lin (1992, 1993), Quah (1994), Im et al. (1997), Taylor and Sarno (1998), Choi and Ahn (1999). Im et al. (1997) propose a Lagrange multiplier (LM) statistic to test for the presence of unit roots in the panel framework. Sala-i-Martin's (1994, 1995) so-called beta convergence is also associated with some methodological problems that raises the question of effectiveness of this method, especially in case of the time series data. Here, for the purpose, testing of stationarity of coefficient of variation is used. If the coefficient of variation is stationary, it is an indication of the convergence of the selected countries of a continent in terms of globalisation. Also Johansen's method of testing Co-integration is used to test whether any co-integration exists or not among the continents in terms of temporal variation in coefficient of variation in globalisation index among the selected countries.

Looking at the similarity and dissimilarity in the move towards globalisation across the countries one can check the cluster of countries in terms of timing and degree of steps towards globalisation. The proximity and clusters of the countries across the continents in terms of cluster of globalisation is examined through the dendogram drawn on the panel data on globalisation index.

Annual compound rate of growth of various indices for the period 1970 to 2007, 1970 to 1990 (pre-globalisation movement) and 1990 to 2007 (post-globalisation movement) have also been computed to see the changes before and after the 1990 after which the focus of globalisation with GATT accord and formation of WTO have taken place. Also structural transformation has taken place in various countries after 1990, though some countries started opening up their economies in the 1980s. Annual compound rates of growth of GDP of various countries from 1970 to 2008, as well as for the sub-periods 1970 to 1992 and 1992 to 2008 have been computed. In the same way, rate of growth of HDI during 1975 to 2005 and also for 1975 to 1990 and 1990 to 2005 sub-periods has been computed.

Also the correlation between the growth of different components of globalisation indices and the growth of human development indicators for various sub-periods are calculated to know if there exists any such relation. It would help us in identifying the role of globalisation and its components in the growth of human development of various countries. Also the bi-variate correlation between growth and coefficient of variation in growth between various globalisation indices and that of GDP and HDI across the continents during the whole as well as pre and post globalisation period is computed and compared.

Results:

The result of augmented Dickey-Fuller (ADF) test used for trend stationarity of the degree of overall globalisation across the countries (presented in Appendix-2) shows that the series follow random walks i.e., integrated of order one for all the selected countries across the continents despite the fact that there are differences in the value of lag coefficients. Therefore, theoretically there is the possibility that the countries within a continent will be cointegrated in terms of growth of overall globalisation over the years. The augmented Engel-Granger (AEG) tests as well as the Log-likelihood estimated results are presented in Table 1. Also the trace statistics shows the presence of at least one co-integrating equation, which is however not presented here.

Continent	Coefficient	T-value*	Adj. R ²	F-Statistic	Log-likelihood	AIC	Max-lag	Remark
Asia	-0.91461	-5.4754	.44599	29.980	-28.3663	1.641	9	Co-int. At 1%
Europe	-0.99359	-5.8768	.48229	34.537	-55.4243	3.104	9	Co-int. At 1%
Africa	-0.95997	-5.1981	.41955	27.021	-65.1864	3.632	9	Co-int. At 1%
North America	-0.46464	-3.3157	.20493	5.511	-52.7574	3.098	9	Co-int. At 1%
South America	-0.75352	-4.6866	.36803	21.965	-55.3917	3.102	9	Co-int. At 5%
Oceania	-0.61742	-3.9338	.28678	15.475	-87.8473	4.857	9	Co-integrated
*Critical value at 1% level = -3.621023, at 5% level = -2.943427, at 10% level = -2.610263								

The table shows that the lag coefficients in all cases are significant and all the continents are co-integrated in terms of globalisation move throughout the period. But there are differences in the level of co-integration and European countries are found to be more co-integrated which may be due to their social, economic, demographic and cultural homogeneity than that of other continents. It is followed by the countries in Africa and Asia, which is due to the fact that majority of African countries are still underdeveloped and they have not progressed much in terms of globalisation and expanding their export markets, inflow of foreign capital. But some of Asian countries integrated with the world at a very faster rate (Korea, Indonesia, Singapore, China) and some have started some time later and with some caution (India, Sri Lanka etc) and some are still lagging behind. But all are following more or less same economic policies with little variation in degree. Also there is huge difference in the size of the Asian economies in terms of population, GDP, investment where three of the four most populous countries in the world belong and all of them followed the same path despite the varied opposition against the globalisation at domestic level. The North America is found to be cointegrated with much lower degree where also we find

coexistence of very large economy like USA, Canada and also the very small economy like Panama, Trinidad & Tobago. Similar is the case of South America and Oceania.

Year	Asia	Africa	Europe	North America	South America	Oceania
1970	41.76	16.46	13.72	29.38	17.97	28.36
1971	41.53	16.66	13.47	28.95	15.92	30.24
1972	40.71	16.74	13.71	28.68	15.43	29.75
1973	39.52	15.97	14.31	29.22	13.94	29.66
1974	37.53	15.05	14.19	27.69	13.55	30.04
1975	38.37	15.27	14.01	26.96	13.55	30.36
1976	37.88	16.85	14.43	28.58	14.17	31.70
1977	37.52	17.22	15.01	28.85	13.38	31.35
1978	37.64	16.40	15.62	28.83	13.85	29.42
1979	38.80	16.57	15.72	29.43	13.96	28.05
1980	39.92	14.95	15.13	29.56	14.53	26.97
1981	39.42	13.82	14.83	29.27	14.81	29.63
1982	39.82	13.43	14.84	29.97	14.88	28.81
1983	40.28	13.13	14.83	28.92	15.23	28.76
1984	41.02	13.89	15.06	30.38	15.06	31.09
1985	39.17	13.97	14.90	31.04	14.35	30.81
1986	39.13	15.50	14.98	30.90	14.81	32.27
1987	39.06	14.82	15.11	31.65	14.73	32.32
1988	37.20	14.17	14.33	31.05	14.21	31.86
1989	38.47	15.57	14.62	30.61	15.92	31.48
1990	37.25	15.11	13.40	30.27	16.09	32.37
1991	34.70	13.77	10.43	28.76	15.45	34.15
1992	34.44	13.88	9.37	27.55	13.96	34.19
1993	33.79	14.04	8.15	27.78	14.99	35.17
1994	32.64	16.21	7.93	27.20	13.74	36.75
1995	32.49	14.67	7.60	25.42	14.87	36.54
1996	31.15	12.84	7.16	23.28	13.32	34.46
1997	30.59	14.24	6.84	23.06	10.77	33.93
1998	29.02	13.37	6.55	21.79	10.66	32.92
1999	27.55	13.78	6.31	20.44	11.00	32.79
2000	25.78	14.54	6.01	19.49	9.79	33.35
2001	26.13	16.03	5.20	18.86	8.46	31.56
2002	24.87	14.81	5.45	18.69	8.80	30.30
2003	25.62	14.75	5.15	18.22	8.73	31.89
2004	25.42	14.22	4.51	16.72	8.93	32.27
2005	23.93	15.06	4.82	15.66	8.78	28.98
2006	21.84	15.94	5.03	14.96	8.27	29.96
2007	22.06	16.30	5.19	14.77	9.50	27.71

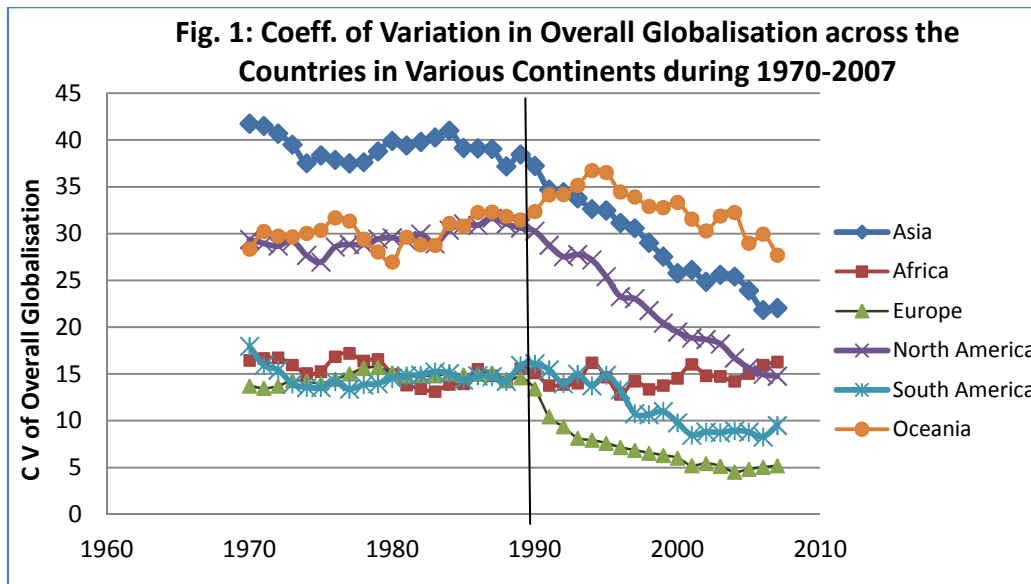


Table 2 reveals that though initially there was high degree of variation in overall globalisation across the Asian countries, it declined sharply after the globalisation move in 1991. Almost all the continents recorded decline in inter-country variation in globalisation index during 1990s except the Africa and Oceania where marginal changes are observed. The indication is that majority of countries across the globe, except a few in Africa and Oceania could follow the tempo of globalisation after the GATT accord and formation of WTO to promote free trade, flow of capital and investment, cultural and knowledge exchange in order to achieve faster growth, reduce poverty etc. Despite the rapid reduction in inter-country variation in overall globalisation, Asia is still at the top in terms of variation in globalisation level across the countries, which may be due to large scale variation in economic, demographic, socio-political scenario across the countries. On the other hand, Europe recorded sharp decline in inter-country variation in overall globalisation especially after the formation on EU and of course the globalisation move across the world. The cultural, economic, technological, demographic and socio-political homogeneity has prompted these countries to open themselves among EU as well as other countries in the world. The much dependence on technological advancement and trade for the progress of these nations are well known since long time and that got more impetus after the formation EU and WTO.

The convergence of the selected countries in terms of overall globalisation is examined through the trend of coefficient of variation in globalisation index across the countries in all those continents. First of all, stationarity of the coefficient of variation is checked by using augmented Dickey-Fuller test with Schwarz Information Criterion. Also the coefficient of

trend is estimated and its significance is examined by using least square regression $\ln Y_{it} = a + b.t + u_{it} \dots (2)$. Y_t is the coefficient of variation. The result is presented in Table 3.

Table 3: Test of Trend Stationarity and Trend of Coefficient of Variation in overall Globalisation among the Selected Countries across the Continents									
	Schward Info Criterion				Least square Regression on Time				
	Level Form		First Difference		Dependent Variable is Ln CV				
Continent	Coeff.	τ	Coeff.	τ	Coeff.	t-statistic	R^2	R_{bar}^2	F
Asia	.0234	.8145	-1.0178	-5.897*	-.016	-12.53*	.813	.808	156.98*
Europe	-.0085	-.333	-.550	-3.566**	-.036	-11.97*	.799	.794	143.29*
Africa	-.3667	-2.825	-1.0725	-6.262*	-.0024	-2.18**	.116	.092	4.736*
North America	.0487	1.721	-.756	-4.541*	-.0167	-8.144*	.648	.638	66.324*
South America	-.0859	-1.447	-1.056	-6.301*	-.0154	-7.486*	.609	.598	56.034*
Oceania	-.1603	-1.682	-1.0656	-6.155*	.0025	2.417**	.14	.12	5.843*
Critical Value at	1% = -3.621, 5% = -2.943		1% = -3.627, 5% = -2.946		1% = -.2.457, 5% = -1.697				
Note: * indicates that the coefficient is significant at 1% level of significance, while ** indicates that the coefficient is significant at 5% level of significant.									

Table 3 reveals that all the series of coefficient of variations are non-stationary (have unit root) but integrated of order one (as the first difference of all the series are stationary). The coefficients of the first difference series are negative that indicate all the selected countries within each continent have been converging over time. In other words, the countries that were already more globalised, chance of further globalisation declines; while the countries that were closed to the outside world after they opened and started relaxing barriers scope of globalisation become faster than those formerly open economies. The differences in the coefficients are indications of different level of convergence and the continents having high initial coefficient of variation like Asia recorded faster convergence than the continents having less initial inter-country variations like that of Europe.

Moreover, testing of co-integration of coefficient of variation in globalisation index (across the counties) of six continents by using trace statistics, maximum Eigen value as well as co-integrating coefficient (**Johansen Cointegration Test**) as presented in Appedix-1 suggests that there exist at least one co-integrating equation. Johansen (1988) test is used for the advantage of knowing multiple cointegrated equations. It is also a broad indication of reduction in variability in openness among the nations of various continents.

The dendogram drawn on the panel data on globalisation index shows the cluster of countries in respect of globalisation within each continent. Figure 2 shows that among the Asian countries India, Pakistan, Sri Lanka, Bangladesh, Nepal and Syria (mostly south-east Asian nations) belong to a single cluster. The second broad cluster includes South Korea, Thailand, Phillipines, Indonesia and China who started opening borders with other countries

in early 1980s and recorded faster growth and preceded the countries in the former cluster. Most of the countries in the former cluster recorded faster economic growth in later part of 1990s (De and Pal, 2011). The third broad cluster includes Japan, Malaysia, Israel, Turkey and Oman who were also open much before due to the industrial progress through technological and human capital transfer and also because of the business of oil by Oman. Due to its vicinity with Europe Turkey also have historical openness with the neighbouring countries. Singapore is however is outside these clusters as it has been an open economy with large industrial and international business centre and one of the best tourist destinations for a long period of time.

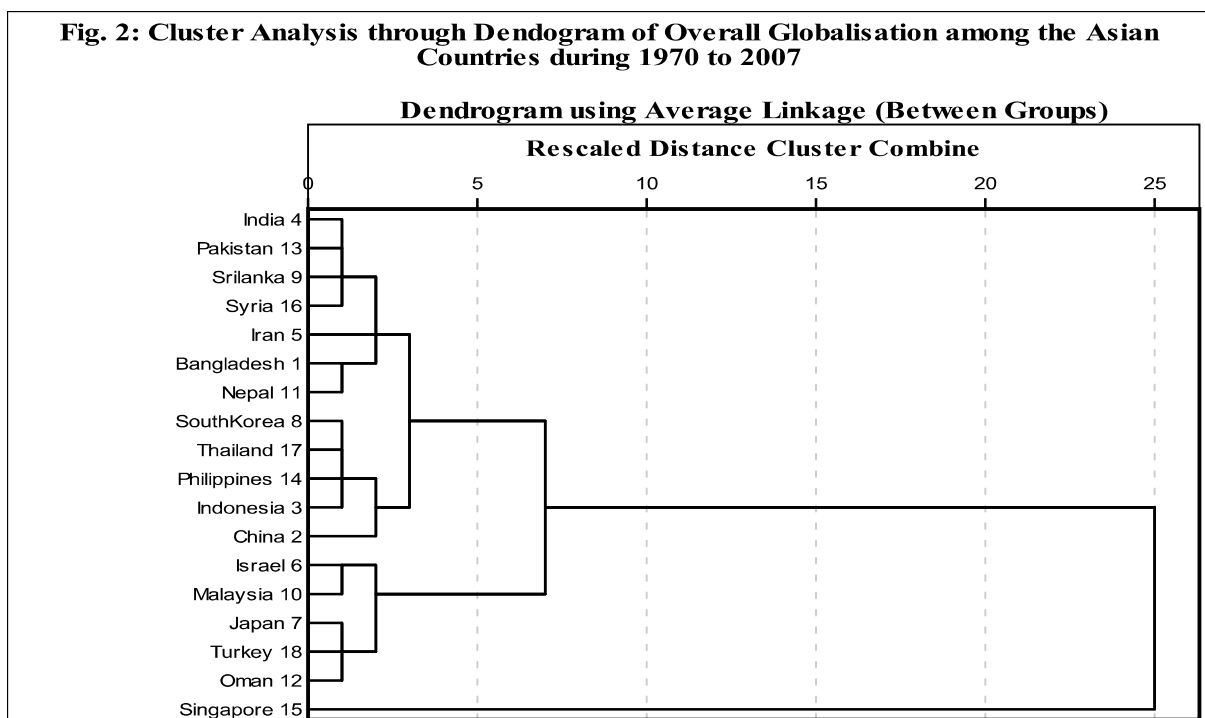


Fig. 2a however shows that India, Turkey, Japan, Indonesia and Pakistan form a cluster in terms of political globalisation, while Israel, Syria, Iran and Sri Lanka form another cluster. Malaysia, Thailand, Philippines, South Korea, Bangladesh, China and Singapore belong to a single cluster in terms of political globalisation. Oman is outside any of these clusters in terms of political globalisation.

Fig. 2a: Cluster Analysis through Dendrogram of Political Globalisation among the Asian Countries during 1970 to 2007

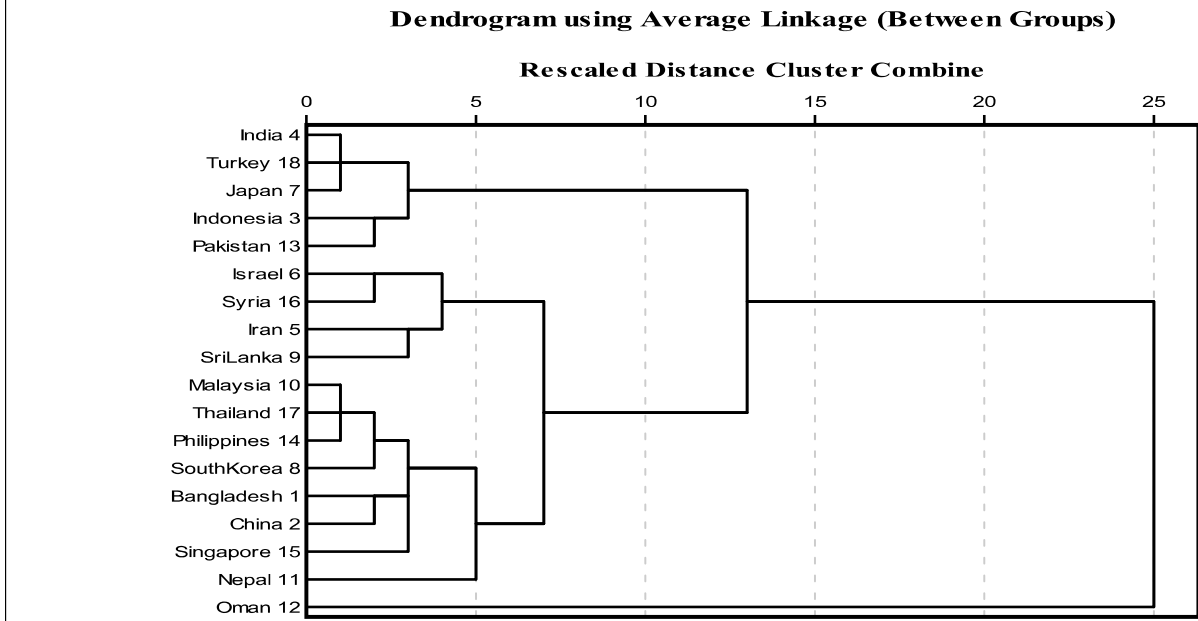
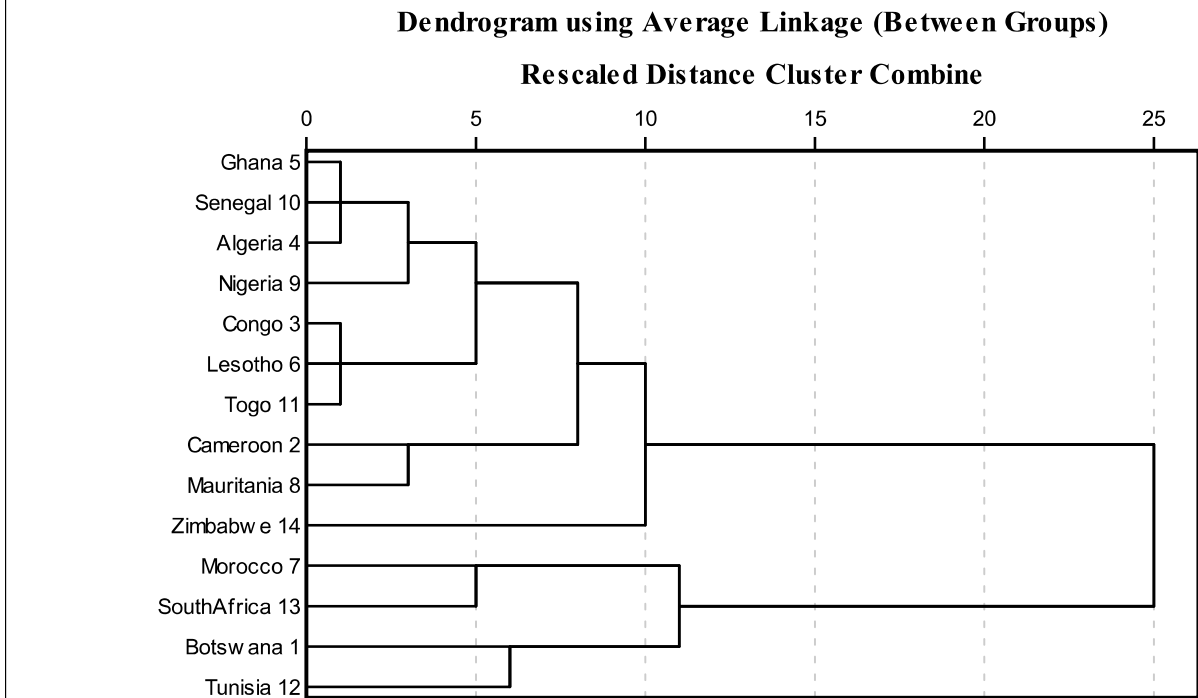
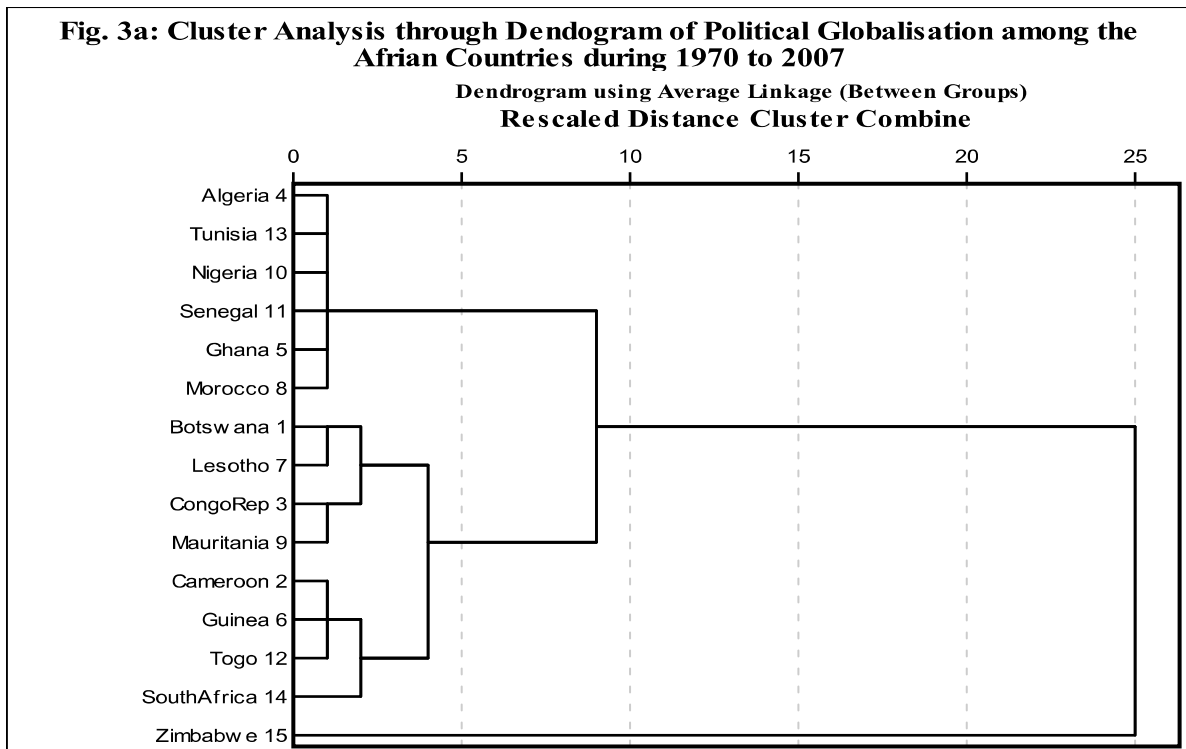


Fig. 3: Cluster Analysis through Dendrogram of Overall Globalisation among the African Countries during 1970 to 2007





Within Africa, Ghana, Senegal, Algeria and Nigeria are in proximity and belong to one cluster in terms of both overall and political globalisation (Fig. 3 and Fig. 3a). Congo, Lesotho and Togo are in close proximity in terms of overall globalisation. However, Cameroon, Mauritania and Zimbabwe are connected with the former two clusters distantly and are the most backward in terms of various economic development parameters. Morocco, South Africa, Botswana and Tunisia form another cluster in terms of overall globalisation. Fig. 3a also shows that Botswana, Lesotho, Congo Republic and Mauritania have been close neighbours in terms of political globalisation and Cameroon, Guinea, Togo and South Africa form another cluster. Whereas, Zimbabwe has been suffering from high level of political instability & is out of any cluster in terms of political openness.

In Europe, four broad clusters in terms of overall globalisation and three main clusters in respect of political globalisation over time are observed (Fig. 4 and Fig. 4a). Ireland, Norway, Denmark and Austria are in proximity among themselves; while Switzerland, Sweden, Belgium and Netherlands are in another cluster. France, England and Finland form a cluster, whereas Hungary, Portugal, Italy, Spain and Greece belong to one cluster in respect of overall globalisation. Moreover, the first two clusters are closely linked with each other. Austria, Italy, Belgium, France, Netherlands and the Nordic countries Sweden, Finland, Norway, and Denmark belong to one big cluster in respect of political globalisation while

Hungary, Portugal, Greece and Ireland, Spain, Switzerland are two small clusters and they are closely related along with England in political openness.

Fig. 4: Cluster Analysis through Dendrogram of Overall Globalisation among the European Countries during 1970 to 2007

Dendrogram using Average Linkage (Between Groups)

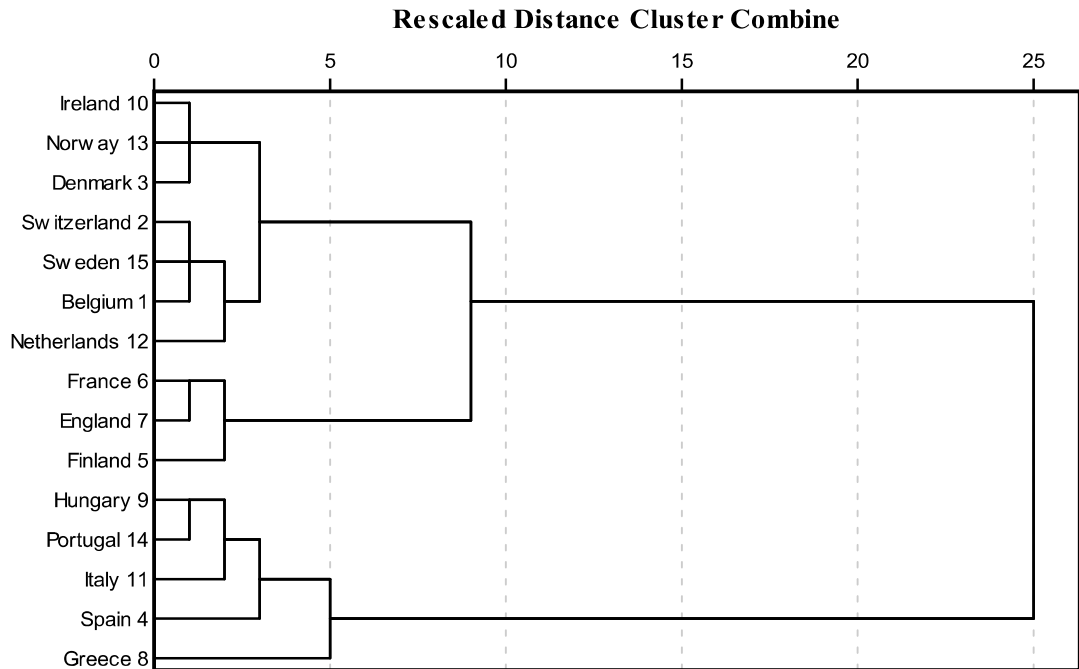
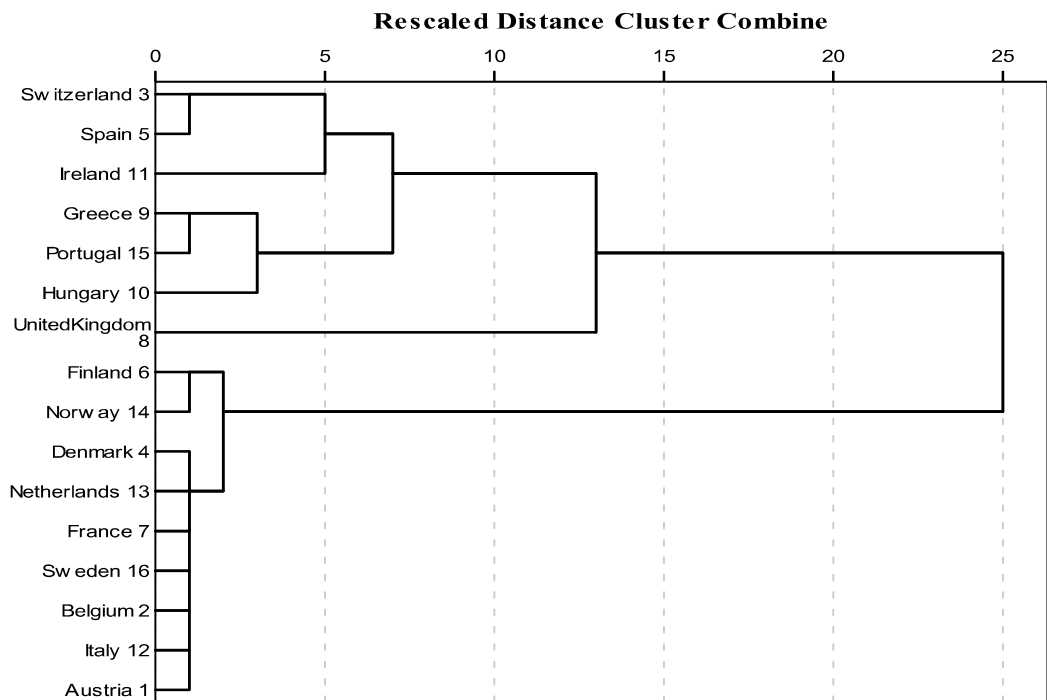


Fig. 4a: Cluster Analysis through Dendrogram of Political Globalisation among the European Countries during 1970 to 2007

Dendrogram using Average Linkage (Between Groups)



Among the selected North-American countries only USA and Canada belong to one cluster in terms of overall as well as political globalisation index, who are also the geographical neighbour (Fig. 5 and 5a). Dominican Republic, Nicaragua, Guatemala and Honduras are in one cluster and Costa Rica, Jamaica, Trinidad and Tobago form a cluster with Panama in terms of overall as well as political globalisation indicators. However, except USA and Canada all other countries follow more or less similar path in respect political globalisation as is clear from Fig 5a. Geographical proximity here is highly related to the economic and political proximity and globalisation cluster of those countries.

Fig. 5: Cluster Analysis through Dendrogram of Overall Globalisation among the North American Countries during 1970 to 2007
Dendrogram using Average Linkage (Between Groups)

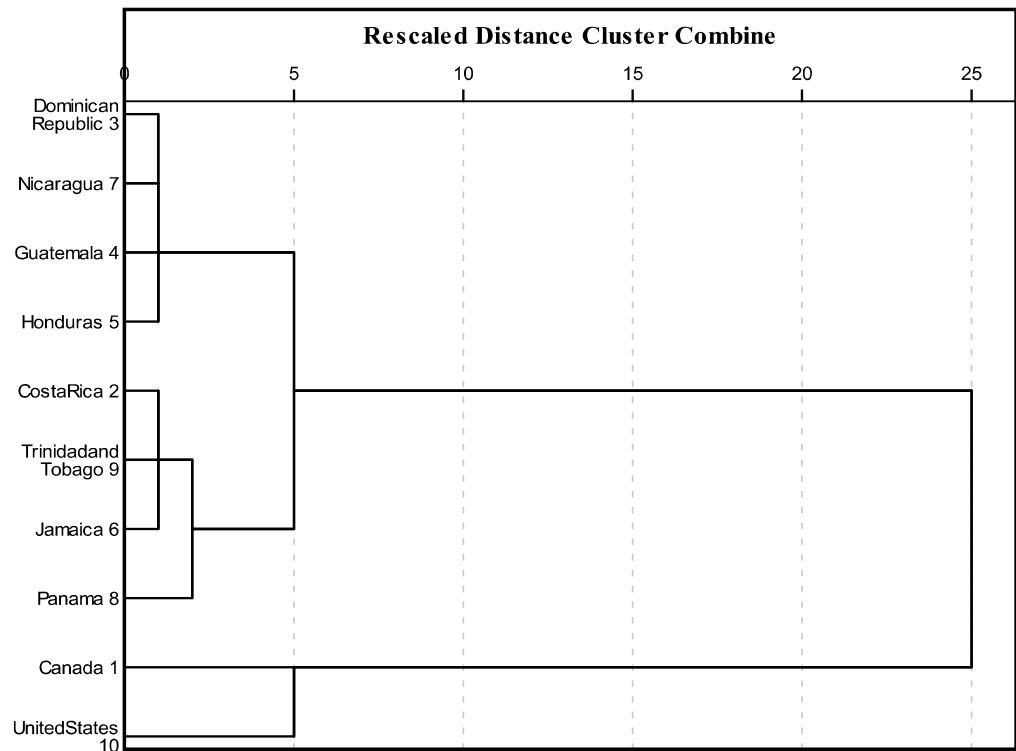


Fig. 5a: Cluster Analysis through Dendrogram of Political Globalisation among the North American Countries during 1970 to 2007

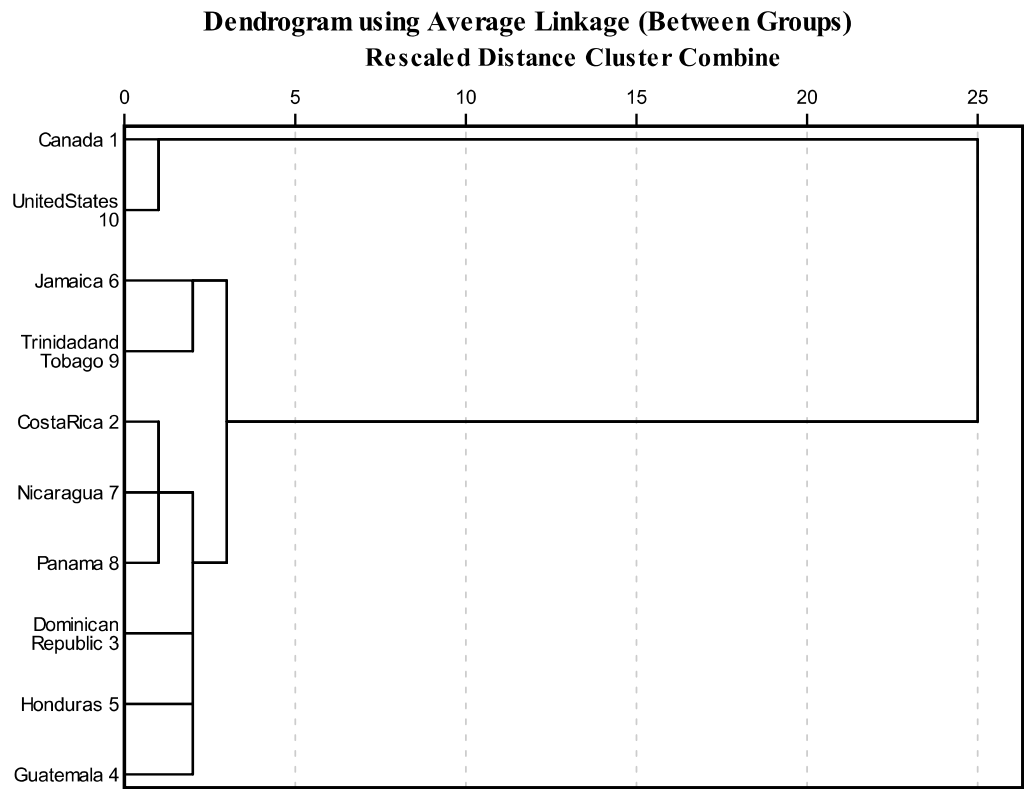


Fig. 6: Cluster Analysis Through Dendrogram of Overall Globalisation among the South American Countries during 1970 to 2007

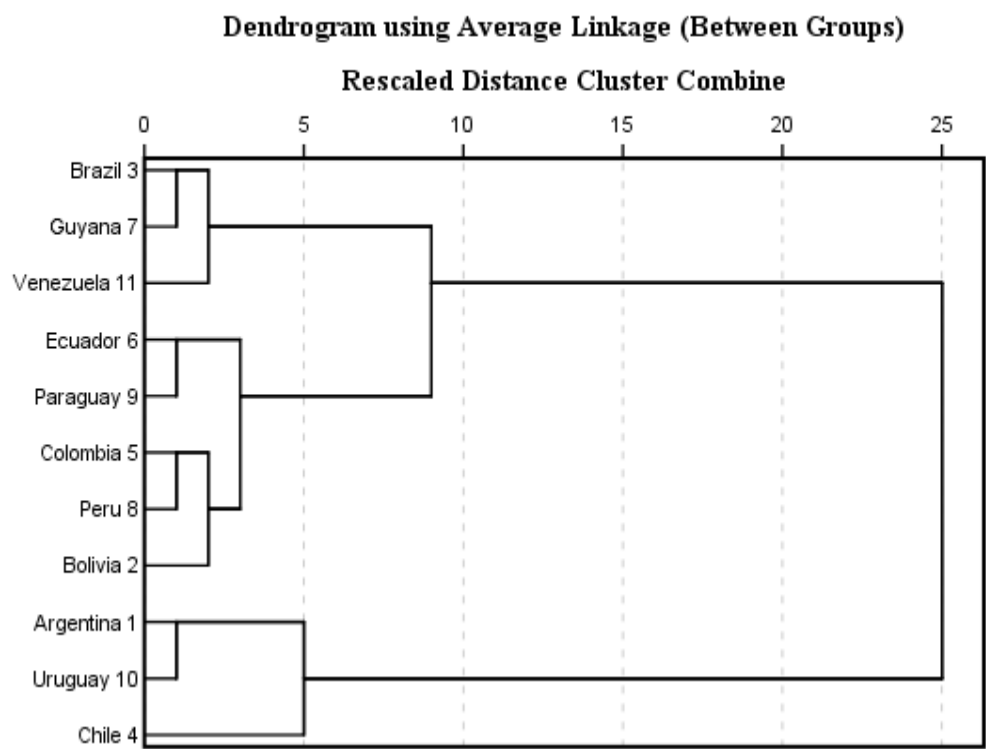
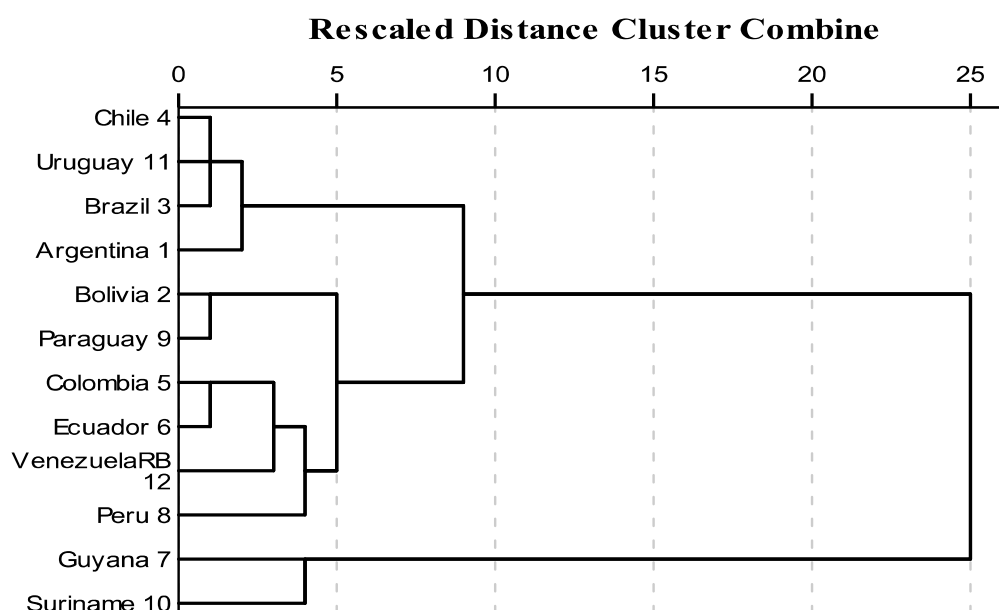


Fig. 6a: Cluster Analysis through Dendrogram of Political Globalisation among the South American Countries during 1970 to 2007

Dendrogram using Average Linkage (Between Groups)



There is minor difference in the clusters of overall and political globalisation in South America though geographical proximity also plays an important role in the path of globalisation followed by countries. On the one hand Brazil, Guyana and Venezuela are in one cluster while Argentina, Uruguay and Chile belong to another cluster in terms of overall globalisation. Ecuador, Paraguay, Colombia, Peru and Bolivia form a cluster in the sense of overall globalisation. However, Brazil joins the cluster of Argentina, Uruguay and Chile in the group of political globalisation and Venezuela joined the group of Bolivia, Paraguay, Colombia, Ecuador and Peru in political globalisation and that group is remotely connected with the former group in respect of political globalisation move. On the other hand, Guyana and Surinam remain jointly isolated in terms of political openness.

1	2	3	4	5	6	7
Continent	GDP 1970-2008	GI 1970-2007	PGI 1970-2007	SGI 1970-2007	EGI 1970-2007	HDI 1975-2005
Asia	0.0850	0.0196	0.0224	0.0228	0.0178	0.0104
Africa	0.0692	0.0131	0.0206	0.0073	0.0132	0.0080
Europe	0.0971	0.0112	0.0053	0.0158	0.0122	0.0035
North America	0.0658	0.0116	0.0110	0.0098	0.0145	0.0052
South America	0.0848	0.0143	0.0128	0.0154	0.0162	0.0056
Corr.	$R_{23} = .15, R_{24} = -.39, R_{25} = .69, R_{26} = -.01, R_{37} = .87^*, R_{47} = -.97^{**}, R_{57} = .36, R_{67} = .67$					

Table-3B: Average Compound Rate of Growth of GDP and HDI during the Previous Period

1	2	3	4	5	6	7
Continent	GDP 1970-1992	GI 1970-1990	PGI 1970-1990	SGI 1970-1990	EGI 1970-1990	HDI 1975-1990
Asia	0.1087	0.0149	0.0227	0.0133	0.0100	0.0120
Africa	0.0941	0.0075	0.0196	-0.0029	0.0052	0.0136
Europe	0.1101	0.0107	0.0006	0.0180	0.0131	0.0033
North America	0.0746	0.0063	0.0082	0.0055	0.0072	0.0052
South America	0.0861	0.0085	0.0062	0.0062	0.0135	0.0059
Corr.	$R_{23} = .82^*$, $R_{24} = .17$, $R_{25} = .62$, $R_{26} = .35$, $R_{37} = .26$, $R_{47} = .96^{**}$, $R_{57} = -.53$, $R_{67} = -.63$					

Table-3C: Average Compound Rate of Growth of GDP and HDI during the Post Period

1	2	3	4	5	6	7
Continent	GDP 1992-2008	GI 1990-2007	PGI 1990-2007	SGI 1990-2007	EGI 1990-2007	HDI 1990-2005
Asia	0.0604	0.0252	0.0222	0.0342	0.0271	0.0209
Africa	0.0353	0.0197	0.0220	0.0194	0.0228	0.0162
Europe	0.0804	0.0117	0.0109	0.0133	0.0112	0.0071
North America	0.0539	0.0180	0.0145	0.0149	0.0233	0.0105
South America	0.0835	0.0212	0.0208	0.0265	0.0196	0.0105
Corr.	$R_{23} = -.28$, $R_{24} = -.38$, $R_{25} = .07$, $R_{26} = -.60$, $R_{37} = .84^*$, $R_{47} = .80^*$, $R_{57} = .77$, $R_{67} = .84^*$					

Table-4A: CV of Growth of GDP and HDI during the Whole Period

1	2	3	4	5	6	7
Continent	GDP 1970-2008	GI 1970-2007	PGI 1970-2007	SGI 1970-2007	EGI 1970-2007	HDI 1975-2005
Asia	38.71	39.80	44.99	54.26	55.04	42.72
Africa	42.01	40.45	43.44	98.62	73.72	61.89
Europe	21.024	30.503	116.320	27.789	35.307	16.904
North America	52.463	37.278	67.762	61.886	42.835	54.013
South America	14.810	28.906	57.442	36.909	35.487	37.579
Corr.	$R_{23} = .85^*$, $R_{24} = -.40$, $R_{25} = .69$, $R_{26} = .55$, $R_{37} = .75$, $R_{47} = -.81^*$, $R_{57} = .90^{**}$, $R_{67} = .74$					

Table-4B: CV of Growth of GDP and HDI during the Previous Period

1	2	3	4	5	6	7
	GDP 1970-1992	GI 1970-1990	PGI 1970-1990	SGI 1970-1990	EGI 1970-1990	HDI 1975-1990
Asia	42.73	69.32	83.99	110.03	136.46	47.77
Africa	36.61	68.84	60.27	-166.63	249.70	23.45
Europe	10.863	38.580	1384.652	37.293	54.500	27.171
North America	26.391	58.690	182.421	166.218	66.623	63.958
South America	22.271	51.243	133.716	125.470	55.728	41.522
Corr.	$R_{23} = .98^{**}$, $R_{24} = -.80^*$, $R_{25} = -.21$, $R_{26} = .70$, $R_{37} = .20$, $R_{47} = -.40$, $R_{57} = .82^*$, $R_{67} = -.46$					

Table-4C: CV of Growth of GDP and HDI during the Post Period

Continent	GDP 1992-2008	GI 1990-2007	PGI 1990-2007	SGI 1990-2007	EGI 1990-2007	HDI 1990-2005
1	2	3	4	5	6	7
Asia	126.04	38.39	47.92	65.46	63.05	42.94
Africa	212.00	50.33	89.47	76.83	83.78	61.95
Europe	68.124	60.293	74.697	68.216	82.159	16.937
North America	139.602	56.855	91.876	68.001	53.882	54.160
South America	33.755	35.952	57.550	54.323	49.295	43.745
Corr.	$R_{23} = .25$, $R_{24} = .56$, $R_{25} = .87^*$, $R_{26} = .46$, $R_{37} = -.25$, $R_{47} = .36$, $R_{57} = .29$, $R_{67} = -.22$					

The overall impact of globalisation on the economic growth and human development is robust. Table 3a shows that though overall globalisation especially social and economic globalisation is positively correlated with overall human development index (HDI); political globalisation is negatively correlated with HDI. During the pre-globalisation phase, continents had better overall globalisation and strong in political globalisation recorded better economic growth and also human development. But in the post-globalisation phase the impacts in overall sense weakened though some positive impact on human development is observed (Table 3b & 3c). Continents having more inter-country variability in globalisation recorded significantly positive variation in economic growth and that is more significant in case of effect of variability in social globalisation on human development across the countries. On the other hand, variation in political globalisation is inversely connected with the human development (Table 4a). All these correlations were highly significant in the pre-globalisation period (Table 4b) while they became weaker in the post-globalisation phase (after 1990s). However, positive correlation between the variation in social globalisation and economic growth became stronger in the post 1990 phase. Though correlation between social globalisation and human development index was strong in the earlier period, it became weak in the post 1990 phase. It indicates that in the previous period, social globalisation was having more impact on non-economic human development factors that is education and health indicators and in the later phase though it has accelerated the growth process that has not been reflected in the human development indicators.

Conclusion:

In this paper we have tried to examine whether and to what extent nations within the continents are co-integrated in regard to their move towards globalisation over time. It should be noted that all the nations within each continent are not considered here due to data limitations, but the data sets available and used here are sufficient to draw conclusions. The results suggest the presence of co-integration among the selected nations despite the fact that the European nations are more co-integrated than the other continents. It is followed by the countries in Africa and Asia. Looking at the characteristics of the selected nations of various continents, it is apparent that Socio-political, demographic and cultural homogeneity/heterogeneity, differences in economic and technological advancement play important roles in the choice of globalisation path (timing and speed) of various nations and that makes the differences in level of co-integration, coefficient of variation among the

nations of various continents on the globe. In case of coefficient of variation and its change over time, Europe is far ahead of the other continents.

The proximity matrices of overall globalisation and political globalisation provided some important indications that geographical proximity, economic necessities, cultural and political understanding play crucial role in determining the clusters of countries in terms of globalisation or choice of the countries to open with other nations for trade, cultural exchange etc. The continent that recorded less variability and more openness are found to progress faster, though the relationship of various globalisation components with the economic and human development indices are robust. Countries in each continent are found to converge over time but there are the differences in the speed of convergence. The differences in the coefficients indicate different level of convergence and the continents having high initial coefficient of variation like Asia recorded faster convergence than the continents having less initial inter-country variations like that of Europe. Overall, the convergence is observed across the globe which indicates the nations with less initial value of globalisation indices are opening at faster rate than the initially more globalised countries for various social and economic interests.

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Appendix-1: Testing of Convergence of the Continents in terms of Inter-country Variability in Globalisation Index Over Time					
Sample (adjusted): 1972 2007			Trend assumption: Linear deterministic trend		
Unrestricted Cointegration Rank Test (Trace), Hypothesized Trace 0.05					
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	
None	0.776052	130.0795	95.75366*	0.0000	
At most 1	0.594761	76.21117	69.81889*	0.0141	
At most 2	0.417359	43.69318	47.85613	0.1166	
At most 3	0.302533	24.24653	29.79707	0.1902	
At most 4	0.268754	11.27571	15.49471	0.1951	
At most 5	0.000209	0.007537	3.841466	0.9304	
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level					
Unrestricted Cointegration Rank Test (Maximum Eigenvalue), Hypothesized Max-Eigen 0.05					
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	
None	0.7760	53.8683	40.0776*	0.0008	
At most 1	0.5948	32.5180	33.5180	0.0719	
At most 2	0.4174	19.4467	27.5843	0.3807	
At most 3	0.3025	12.9708	21.1316	0.4549	
At most 4	0.2688	11.2682	14.2646	0.1413	
At most 5	0.00021	0.0075	3.8415	0.9304	
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level					
Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):					
Asia	Africa	Europe	North America	South America	Oceania
-0.952912	0.152886	-0.045020	1.184383	-0.055702	-0.676364
-0.732616	-0.235926	1.394487	-0.832391	1.132443	0.716793
0.179888	-0.536305	0.918485	-0.826114	0.096673	0.280253
-0.530755	-0.797162	-0.300921	0.383884	0.991910	-0.504235
0.205878	-0.492168	-0.071849	0.226619	-1.080784	0.111492
-0.369610	0.102385	-0.072080	-0.124086	0.850050	-0.564012
Unrestricted Adjustment Coefficients (alpha):					
D(ASIA)	D(AFRICA)	D(EUROPE)	D(North America)	D(South America)	D(OCEANIA)
0.528054	-0.272354	-0.202343	0.023472	0.543527	0.111590
-0.024094	0.053864	-0.181877	-0.065392	-0.186538	-0.605237
0.195445	0.381557	0.126605	0.494345	0.045349	0.134528
-0.100540	0.174454	-0.180760	-0.026704	-0.111896	0.483687
0.058588	0.262912	0.087753	-0.064442	0.225508	-0.082391
-0.010202	-0.003214	-0.003408	-0.001331	0.002088	0.001682
1 Cointegrating Equation(s): Log likelihood -226.9959					
*Indicates that the coefficient is significant at 5 per cent level of significance.					

