HUMAN DIMENSION OF GLOBALIZATION

THE RELATIONSHIP BETWEEN GLOBALIZATION, ECONOMIC GROWTH AND INCOME INEQUALITY

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This study investigates the relationship between globalization and income inequality by developing a new globalization index based on economic growth. In addition two other indices of globalization, non-parametric Kearney and parametric principal component analysis are used as benchmarks to compare the results. The proposed new index is decomposed into four sub-components. The index is also estimated in several forms separated by different economic growth variables and in decomposed or composite forms. The main feature of this approach is that the estimation of globalization index and the examination of its relationship with economic development are conducted in one step. All indices are compared in respect of their level, development and correlations. The empirical analysis is based on a panel data consisting of 61 developed and developing countries observed during the period 1995–2001. Regression analysis is used to estimate the effects of globalization on income inequality. To examine the sensitivity of the relationship between globalization and inequality, different inequality variables are employed. It is expected that the indices serve as useful tools in comparing the globalization process among countries and the evaluation of the globalization effect on economic development and income inequality. This study is useful in the construction of a new multidimensional index of globalization with different and estimated weights attached to the determinant factors.

Keywords: globalization, income inequality, economic growth, index.

1. Introduction

Globalization can be defined from various aspects not only in respect to economic activities, but also to political, technological, cultural interactions and taking into account many key factors such as standardization, transportation, communication, trading, migration, *etc.* Through the process, economies become closer and more interrelated. As countries are speeding up their openness in recent years, there have been increasing concerns related to the globalization and its impacts on issues such as economic growth, poverty, inequality, regional differences, cultural dominance, environment, or economic integration. Countries with large heterogeneity in the degree of globalization have

shown different development patterns and results. The different degrees of development have become a source of inequality or poverty. Thus, the link between economic growth, inequality, poverty and globalization has become the focus of attention of many researchers.

Despite the increasing interests in the influence of globalization on economic growth and inequality, there are not many empirical studies examining the links between them. The limited empirical evidence is a result of a lack of theoretical development, limited data and unsatisfactory measures of globalization. In recent years, several researchers have been developing methods of measurement of globalization to test the relationships mentioned. The limited evidence also suggests contradictory views on the issue. For instance, some argue that globalization provides benefits by enhancing economic development and the reducing inequality of people with high economic opportunity, while others are against globalization due to its restricted beneficiaries. In general there is an agreement that globalization increases inequality but it reduces poverty while its regional concentration increases. Such development has been observed in India and China.

Currently there is no standard rule of measure and measurement of globalization. The need for research in this area has recently attracted great attention. Several attempts have been made to quantitatively measure globalization. Different measures ranging from single measures like trade to multidimensional measures with different coverage of various aspects have been produced. The differences are attributed to the availability of data and the technical skill of the researchers. The globalization index can indicate the level or the progress of globalization of countries which is also in turn changing over time. The globalization index can be employed to quantify its impact on the difference in development or integration of countries, and the index can be used to study the causal relationship between globalization, income inequality and poverty. In addition, the international levels of globalization can be compared over time and across regions to investigate inter-regional and intra-regional comparisons of openness.

The main purpose of this study is to investigate the relationship between globalization and income inequality by developing a new globalization index based on economic growth. Two existing indices of globalization, the Kearney and principal component analysis, are used as benchmarks to compare the results. The proposed globalization index is decomposed into four sub-components suggested by the Kearney index. The new index is estimated in different forms separated by different economic growth variables. The main feature of this model is the estimation of the globalization index and examination of its relationship with economic development, which is conducted in one single step procedure. To examine the sensitivity of the relationship between globalization and inequality, we employed different inequality variables in the different models. All indices including the newly suggested index are compared in respect to their level and development. Various variables employed in the models provide sufficient flexibility to assess the measure and impacts of globalization. It is expected that the indices provide useful tools to compare the globalization process among countries and the evaluation of the globalization effects on the economies. This study can also be useful in the construction of a new index of globalization considering the multidimensional nature of the issue and different weights attached to the determinant factors. The empirical analysis is based on a small panel data consisting of 61 developed and developing countries observed during the period 1995–2001. Regression analysis is used to estimate the relationship between income inequality and globalization intensity.

This paper is organized as follows. The literature review on the links between globalization, economic growth and inequality follows in Section 2. In Section 3 the used data is described. In Section 4 previous indices including composite Kearney and principal component-based indices are described. The development of the indices over time and regions is also illustrated and discussed. In Section 5, the new index of globalization, based on different component system and its relationship with different economic growth variables, is introduced. Section 6 includes not only index values, but also the rankings of countries, the regional differences of globalization, and the development of globalization over time. The impacts of globalization on income inequality estimated through regression analyses with various inequality variables are discussed in Section 7. Finally, Section 8 summarizes the results and concludes this study.

2. The Literature on Globalization, Growth and Inequality Relationships

The interest in and amount of research on the relationships between globalization, economic growth and income inequality has been increasing in recent years. The growing interest is a result of the rapid development of international relations and the speed at which the recent wave of globalization is proceeding. The theoretical literature on each component is vast but the empirical evidence on the nature and causal relationship between the different interrelated factors of interest remains poor. Thus, there is an urgent need for further research and methodological development at different levels and aspects to shed light on the issues.

Recently, there have been a limited number of studies on different combinations of the links between key factors of interest such as inequality, poverty, growth, trade and globalization. Aghion and Williamson (1998) study the links between globalization, growth and inequality, while Collier and Dollar (2001) examine the relationships between globalization, growth and poverty. Mahler (2001) shows little evidence of a relationship between economic globalization and the disposable income or earnings of households in the case of developed countries. Mayer (2001) mentioned that globalization gives benefits even to the poor countries for instance in the form of access to new technologies and opportunities, while countries show different technology, skill absorption and development abilities. Manasse and Turrini (2001) examined the impacts of globalization on inequality through trade integration, while Miller (2001) argues that globalization leads to a significant increase in income inequality.

Lindert and Williamson (2001) state that globalization has very different implications for inequality in a country. The authors classify the effects of globalization on inequality into five categories within and between countries. Among the effects, one is that a greater degree of globalization has reduced inequality. Talbot (2002) argues that a new international inequality has been derived through the old style of international inequality, which explains the increasing global inequality. The nineteenth century globalization was one of the most important reasons of increasing international inequality in the study of Bata and Bergesen (2002a, 2002b). Ajayi (2003) concludes that integration combined with other factors, like the maintenance of macroeconomic stability, the development of human capital, high investment ratios, infrastructure and institutions, can enhance economic growth. Mussa (2003) examined issues related to the distribution of benefits from increasing globalization activity. In general the focus on economic growth has changed from identification of factors generating growth and convergence to how growth is dis-

tributed in an economy. Heshmati (2006c) reviews the economic literature on the world distribution of income and income inequality. The exiting research supports increased awareness of the problem, its measurement and quantification, the identification of causal factors and policy measures that affect global income inequality.

Concerning the measurement of globalization, Heshmati (2006a and 2006b) introduces two composite indices of globalization. The first is based on the Kearney/Foreign Policy magazine and the second is obtained from a principal component analysis. They indicate the level of globalization and show how globalization has developed over time for different countries. The indices are composed of four components: economic integration, personal contact, technology and political engagement, each generated from a number of indicators. A breakdown of the index provides possibilities for identifying the sources of globalization at the country level and associating it with their economic policy measures. The empirical results show that a low rank in the globalization process is due to conflicts, economic and technology factors with limited possibility for the developing countries to affect. The high ranked developed countries share similar patterns in distribution of various components. The indices were also used in a regression analysis framework to study the causal relationships between income inequality, poverty and globalization. The results show evidence of a weak and negative relationship between globalization and income inequality and poverty. Regional location explains most of the variations in income inequality and poverty among the sample countries.

Dreher (2006; see also Dreher *et al.* 2010) concludes that globalization promotes growth by giving results that more globalized countries show a higher economic growth rate, while the lowest growth rates are attributed to those who are not globalized. Thus, the result from limited data suggests positive association between openness and economic growth. Summers (2006) acknowledges that globalization, in addition to positive effects, has adverse effects like increasing inequality.

In a recent collected volume sponsored by WIDER-UNU, consisting of studies in development economics and policy by Nissanke and Thorbecke (2007), the impact of globalization on the world's poor by focusing on transmission mechanisms is presented. The volume is a serious attempt to better understand the major links and to document some of the main transmission mechanisms. There are also other pieces of research that have explored those mechanisms. Among others Harrison (2007) compiled a work sponsored by the NBER on globalization and poverty; Hertel and Winters (2006) developed a model of world trade to explore the same issues; and Hoekman and Olarreaga (2007) inspected the same mechanisms at a micro level. These books complement each other extremely well and will help policymakers in their objectives for the achievement of the Millennium Development Goals and eradicating poverty.

3. The Data

The database created by Kearney is the first unique one used for the computation of the globalization index. The data is a small panel data covering 62 countries observed during the period 1995–2000 but updated on an annual basis. It was collected from various secondary data sources such as national sources, international organizations and financial institutions. In this study, we expanded the period to 1995–2001, which is composed of 61 countries and has a total of 427 observations.[1] The index is composed of four main

components. The four components are the same as those of the Kearney index. Economic integration, personal contacts, technology, and political engagement are selected to represent globalization which affects the economic performance of countries and the living conditions of their citizens.

In order to assess the effect of globalization on the economy of the countries and their citizens, several normalized economic and economic growth variables such as GDP, GDP growth, GDP per capita and growth in GDP per capita are included. Table 1 shows summary statistics of the four components of globalization, GDP-based economic growth variables and the various globalization indices, including Kearney indices and principal component-based indices. We can see large variations in the index components and GDP values which affect the calculated indices. The mean values of GDP and GDP per capita are much higher than the median values with large standard deviations which show evidence of skewed distribution of GDP levels. The growth rates are more evenly distributed. The large dispersion of components makes the mean and median value differ. Only the political component has similar mean and median values.

Table 1

Summary statistics, globalization data, 1995–2001, NT = 61 × 7 = 427 observations

Variable and definition	Mean	Median	Std Dev	Minimum	Maximum
GDP in million in $US 2000 prices	462,700	112,851	1,286,678	3,837	9,838,899
GDPG – GDP growth	3.527	3.750	3.475	–13.130	12.220
GDPcap – GDP per capita in $US 2000 prices	9,984	4,452	10,534	203	38,032
GDPGcap – GDP per capita growth	2.393	2.670	3.410	–14.300	10.560
Kearney (K) Economic component	0.644	0.497	0.564	0.050	3.588
Kearney (K) Personal component	0.593	0.513	0.458	0.015	2.420
Kearney (K) Technology component	0.388	0.103	0.561	0.000	2.856
Kearney (K) Political component	1.216	1.189	0.595	0.073	2.695
K – Unweighted Kearney index	2.841	2.268	1.515	0.929	7.692
KW – Weighted Kearney index	3.504	2.625	2.137	0.944	10.758
PC1 – First principal component	0.000	–0.415	1.000	–0.999	4.846
PC2 – Second principal component	0.000	0.106	1.000	–4.628	5.020
PC3 – Third principal component	0.000	0.048	1.000	–6.072	3.803
PC4 – Fourth principal component	0.000	–0.123	1.000	–3.540	3.722
PCW – Weighed average of 4 components	0.000	–0.158	0.584	–0.952	2.509

In Table 2, we can observe correlation coefficients among the index sub-components, different indices and growth variables shown in Table 1. While the economic component shows a decreasing (–0.16) trend over time, technology shows an increasing trend, as much as (0.16). The personal and economic components are highly correlated (0.63).

There are negative correlations between components and economic variables such as GDP and the growth of GDP, while the four index components are positively correlated among themselves. Personal components show a negative correlation with GDP and political components are negatively associated with GDP growth. While GDP per capita has a positive correlation with all index components, GDP growth per capita is positively correlated only with economic and personal components. Aggregate country level and per capita level economic variables also show different relationships with the other index components.

Table 2

Pearson correlation coefficients, N = 427

	Year	Economic	Personal	Technology	Political	K	KW	PCW	GDP	GDPG	GDP/cap	GDPG/cap
Year	1.000											
Economic	–0.160	1.000										
	0.001											
Personal	0.043	0.626	1.000									
	0.375	0.0001										
Techno-logy	0.163	0.310	0.390	1.000								
	0.001	0.0001	0.0001									
Political	0.053	0.048	0.096	0.441	1.000							
	0.273	0.324	0.049	0.0001								
K	0.035	0.695	0.717	0.777	0.603	1.000						
	0.475	0.0001	0.0001	0.0001	0.0001							
KW	0.018	0.747	0.724	0.776	0.528	0.992	1.000					
	0.717	0.0001	0.0001	0.0001	0.0001	0.0001						
PCW	0.323	0.288	0.422	0.708	0.794	0.809	0.769	1.000				
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001					
GDP	0.022	–0.070	–0.123	0.462	0.405	0.267	0.230	0.398	1.000			
	0.656	0.147	0.011	0.0001	0.0001	0.0001	0.0001	0.0001				
GDPG	–0.094	0.142	0.148	–0.020	–0.101	0.051	0.058	–0.033	–0.053	1.000		
	0.052	0.003	0.002	0.685	0.038	0.295	0.228	0.497	0.276			
GDP/cap	0.048	0.439	0.504	0.807	0.505	0.813	0.822	0.731	0.475	–0.056	1.000	
	0.325	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.248		
GDPG/cap	–0.070	0.151	0.200	0.053	–0.014	0.131	0.135	0.052	–0.020	0.952	0.037	1.000
	0.151	0.002	0.0001	0.275	0.767	0.007	0.005	0.280	0.674	0.0001	0.441	

Notes: K = Unweighted Kearney index, KW = weighted Kearney index, PCW = weighted principal component index based on the first four principal components, GDP = GDP in $US 2000 prices, GDPG = = GDP growth, GDP/cap = GDP in $US 2000 per capita, GDPG/cap = GDP growth per capita, p-values are given under the coefficients. *Source:* Author's calculations.

4. The Benchmark Indices

4.1. The Index Results

In the form of multidimensional index components, the Kearney and principal component indices are computed for 61 countries and 7 years of data. As mentioned above, the Kearney (K) and Principal Component (PC) analysis indices serve as benchmark indices in analysis of the countries' globalization (see Heshmati 2006b for a detailed description of the index computation and composition). These unweighted indices are further computed in weighted forms (KW and PCW). In the correlation between the new index and Kearney indices, the Kearney indices are dominated by the technology component index. The weighted principal component index is highly correlated with the political component.

The summary statistics of the different indices and their sub-components, Kearney and principal component indices, are given in Table 1. The correlation coefficients among indices are displayed in Table 2. While Kearney-based indices have different standard deviations, with the exception of weighted principal component indices, the PCW indices show normalized standard deviation values such as unity. Unlike the Kearney indices, the weighted principal component index with four components indicates that the globalization process is increasing over time (0.32). The Kearney unweighted and weighted indices correlations with PCW are found to be high, 0.81 and 0.77. The correlation coefficients among globalization indices are found to be high and statistically significant.

4.2. Variations in the Indices

Table 3A shows the four disaggregated Kearney index components, the unweighted aggregate Kearney index (K) with equal weights and the weighted aggregate Kearney index (KW) with differentiated weights, the first four principal components (PC1-PC4) based on the principal component analysis and weighted principal component (PCW) globalization index. The table provides ranks of the sample countries in two different ways. It arranges countries in descending order, first by rank of weighted Kearney index, while the second rank is by the weighted principal component index. The globalization ranks of countries are changing depending on the different indices used as reference. The major differences in the ranks are related to Singapore, the USA, Malaysia, Korea, China, India and Brazil. While Ireland has the top position when the weighted Kearney index is applied, the USA has the top rank in the weighted principal component index. Iran, Ukraine and Uganda were placed as least globalized countries, based on the KW index in the table. The result based on the PCW index, shows that Slovenia, Ukraine and Panama are among the least globalized countries. The low rank of countries shows low values, particularly in technology and economic components, while high rank countries have similar levels of the various disaggregate components. There are several exceptions such as Argentina and Russia which have extremely high political component values, and these values to a large extent determine their relatively high ranks at 28 and 30. In the case of China and India, despite their high political score, they are ranked only 44 and 46 due to low index values in the other components.

Globalization indices by country, ranked by weighted Kearney index (KW)

Rank(KW)	country	Kearney index components				Kearney indices		Rank (PCW)	Principal components				
		economic	personal	technology	political	K	KW		PC1	PC2	PC3	PC4	PCW
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Ireland	2.456	2.024	0.577	1.280	6.338	8.585	4	2.710	–2.990	2.360	1.419	0.996
2	Switzer-land	1.450	1.975	1.015	1.582	6.022	8.103	7	2.007	–0.655	0.501	–0.255	0.848
3	Sweden	1.430	0.970	1.372	2.164	5.937	8.045	2	1.740	0.650	0.412	–0.091	1.073
4	Singapore	2.503	1.596	0.974	0.432	5.506	7.989	44	1.865	–2.649	–1.605	–3.067	–0.341
5	Canada	0.779	0.892	1.502	2.370	5.543	7.096	5	1.378	1.249	0.169	–0.634	0.966
6	UK	1.397	0.937	0.912	2.189	5.435	7.014	3	1.217	0.761	1.349	0.136	0.999
7	Nether-lands	1.742	1.019	0.840	1.490	5.092	6.952	10	1.455	–0.321	0.296	–0.064	0.660
8	Finland	0.909	0.804	1.756	1.723	5.191	6.811	9	1.289	0.679	–0.726	0.430	0.759
9	USA	0.438	0.345	2.323	2.501	5.607	6.773	1	1.394	2.963	–1.431	0.447	1.329
10	Denmark	1.262	1.072	0.982	1.849	5.165	6.746	8	1.321	0.068	0.399	0.683	0.791
11	Norway	0.778	0.781	1.645	1.572	4.775	6.508	12	1.046	0.581	–0.915	0.344	0.579
12	Austria	0.849	1.271	0.820	1.973	4.912	6.192	11	1.048	0.279	0.796	–0.414	0.653
13	France	0.655	0.814	0.347	2.526	4.343	5.203	6	0.591	1.264	1.966	–0.228	0.873
14	Germany	0.664	0.648	0.588	1.876	3.775	4.757	13	0.418	0.970	0.710	–0.134	0.548
15	New Zealand	0.572	0.736	1.265	0.902	3.476	4.631	21	0.594	0.092	–1.654	0.170	0.107
16	Australia	0.511	0.363	1.385	1.250	3.509	4.450	15	0.392	0.952	–1.334	0.275	0.294
17	Portugal	0.831	1.089	0.300	1.281	3.501	4.417	18	0.199	–0.337	0.509	1.092	0.192
18	Italy	0.592	0.590	0.264	2.030	3.477	4.157	14	0.121	0.882	1.292	0.060	0.479
19	Czech	0.797	1.278	0.254	1.198	3.527	4.119	27	0.483	–0.643	0.421	–2.148	–0.104
20	Spain	0.589	0.684	0.304	1.459	3.036	3.732	16	0.088	0.374	0.613	0.039	0.231
21	Malaysia	1.097	0.737	0.200	1.048	3.082	3.668	47	0.174	–1.134	–0.249	–1.309	–0.391
22	Hungary	0.810	0.812	0.192	1.095	2.909	3.488	32	0.125	–0.425	0.149	–1.617	–0.203
23	Israel	0.516	1.078	0.541	0.433	2.567	3.332	42	–0.099	–0.821	–1.014	0.857	–0.317
24	Panama	1.777	0.328	0.055	0.344	2.504	3.184	59	0.056	–1.886	–0.416	–0.773	–0.617
25	Poland	0.356	0.633	0.145	1.685	2.818	3.174	22	–0.112	0.357	0.759	–0.528	0.089
26	Greece	0.301	0.903	0.180	1.173	2.557	3.052	24	–0.218	0.024	0.297	0.685	0.013
27	Japan	0.278	0.117	0.622	1.394	2.411	3.029	19	–0.221	1.217	–0.130	–0.295	0.170
28	Argentina	0.412	0.103	0.078	1.871	2.464	2.846	17	–0.311	0.967	0.965	–0.215	0.217
29	Korea Rep.	0.436	0.269	0.424	0.845	1.974	2.612	41	–0.458	0.154	–0.726	–0.296	–0.313
30	Russian Fed.	0.333	0.110	0.038	1.948	2.429	2.604	23	–0.450	0.998	1.073	–1.004	0.088
31	Egypt	0.220	0.481	0.006	1.775	2.482	2.569	20	–0.544	0.696	1.012	0.825	0.146
32	Chile	0.674	0.199	0.152	0.912	1.937	2.550	37	–0.342	–0.017	–0.214	–0.316	–0.235
33	Nigeria	0.589	0.310	0.001	1.467	2.367	2.548	28	–0.422	0.009	0.564	0.188	–0.107
34	Croatia	0.526	0.961	0.128	0.262	1.877	2.466	57	–0.402	–1.208	–0.923	0.435	–0.602
35	Slovenia	0.492	0.592	0.555	0.174	1.813	2.458	61	–0.337	–0.966	–1.753	–0.475	–0.714

1	2	3	4	5	6	7	8	9	10	11	12	13	14
36	Slovakia	0.589	0.409	0.226	0.644	1.867	2.302	54	−0.420	−0.754	−0.905	−0.173	−0.550
37	Botswana	0.725	1.137	0.022	0.131	2.015	2.199	58	−0.532	−1.914	−0.570	2.308	−0.609
38	Pakistan	0.164	0.416	0.001	1.515	2.096	2.145	25	−0.649	0.397	0.620	1.018	−0.019
39	Tunisia	0.379	0.532	0.014	1.062	1.986	2.145	40	−0.534	−0.233	0.058	0.227	−0.292
40	Senegal	0.349	0.549	0.005	1.100	2.002	2.125	36	−0.632	−0.249	0.134	1.208	−0.230
41	Mexico	0.433	0.250	0.048	0.990	1.721	2.039	39	−0.556	0.229	−0.078	−0.435	−0.267
42	Kenya	0.204	0.514	0.006	1.236	1.960	1.986	35	−0.734	−0.044	0.221	1.069	−0.228
43	Venezuela	0.398	0.103	0.050	1.141	1.693	1.963	33	−0.582	0.387	0.103	−0.375	−0.206
44	China	0.337	0.047	0.014	1.333	1.732	1.962	31	−0.686	0.689	0.370	−0.855	−0.190
45	Indonesia	0.433	0.076	0.009	1.269	1.787	1.947	38	−0.606	0.218	0.202	−0.532	−0.266
46	India	0.096	0.214	0.005	1.541	1.856	1.911	26	−0.729	0.802	0.623	0.182	−0.037
47	Turkey	0.266	0.262	0.043	1.174	1.745	1.897	34	−0.635	0.318	0.138	−0.066	−0.213
48	Romania	0.295	0.329	0.052	1.006	1.682	1.885	43	−0.646	0.086	−0.104	−0.170	−0.325
49	Bangladesh	0.065	0.399	0.000	1.389	1.853	1.866	30	−0.751	0.226	0.355	1.121	−0.140
50	Thailand	0.614	0.143	0.046	0.794	1.597	1.864	53	−0.607	−0.333	−0.441	−0.768	−0.527
51	Brazil	0.250	0.050	0.068	1.253	1.620	1.859	29	−0.649	0.695	0.207	−0.300	−0.134
52	South Africa	0.490	0.138	0.148	0.639	1.414	1.851	49	−0.693	−0.026	−0.488	−0.552	−0.471
53	Philippi	0.741	0.157	0.021	0.644	1.564	1.850	56	−0.613	−0.523	−0.417	−0.541	−0.554
54	Morocco	0.258	0.642	0.005	0.682	1.587	1.667	48	−0.811	−0.453	−0.294	1.256	−0.426
55	Sri Lanka	0.370	0.613	0.007	0.498	1.488	1.607	55	−0.836	−0.779	−0.607	1.424	−0.551
56	Peru	0.312	0.165	0.091	0.723	1.291	1.579	46	−0.739	0.111	−0.402	0.031	−0.384
57	Colombia	0.315	0.169	0.036	0.789	1.309	1.578	45	−0.751	0.156	−0.259	0.095	−0.351
58	Saudi Arabia	0.415	0.145	0.009	0.717	1.286	1.565	51	−0.739	−0.005	−0.387	−0.973	−0.519
59	Uganda	0.211	0.854	0.001	0.362	1.428	1.545	50	−0.945	−0.868	−0.603	2.721	−0.492
60	Ukraine	0.391	0.275	0.013	0.694	1.374	1.506	60	−0.769	−0.550	−0.603	−0.399	−0.648
61	Iran	0.145	0.067	0.003	0.797	1.012	1.025	52	−0.955	0.287	−0.393	−0.745	−0.523

Notes: K = Unweighted Kearney index, KW = weighted Kearney index, PC1 = unweighted (first) principal component index, PC2 = unweighted (second) principal component, PC3 = unweighted (third) principal component index, PC4 = unweighted (fourth) principal component index, PCW = weighted principal component index based on the first four principal components. Rank1 and Rnk2 are rank orders by KW and PCW. *Source:* Author's calculations.

Table 3B presents the level of globalization by regional location of the sample countries. The ranking of regions is displayed in descending order of the weighted Kearney index (KW) which is consistent with the first principal component index rank (PC1). The ranks between Kearney indices are similar but this can be changed when it comes to the principal component analysis based indices due to the different weights and calculation methods. In the unweighted principal component analysis indices, it is obviously

shown that the different weights affect the globalization rank of the countries. The source of difference is attributed to the fact that different principal components are based on different sets of globalization indicators.

Table 3B

Globalization indices by region, ranked by weighted Kearney index (KW), NT = 427

Region	Globalization components				K	KW	Principal components				PCW
	Eco-nomic	Per-sonal	Tech-nolo-gy	Poli-tical			PC1	PC2	PC3	PC4	
West Europe	1.060	1.039	0.793	1.744	4.637	6.018	1.002	0.149	0.657	0.247	0.646
North America *	0.575	0.584	1.619	1.756	4.534	5.738	0.940	1.314	−1.063	0.065	0.674
South East Asia	1.078	0.542	0.250	0.838	2.707	3.464	0.043	−0.884	−0.502	−1.243	−0.416
East Europe	0.510	0.600	0.178	0.967	2.255	2.667	−0.281	−0.345	−0.210	−0.675	−0.330
East Asia	0.350	0.144	0.354	1.191	2.039	2.534	−0.455	0.687	−0.162	−0.482	−0.111
Latin America	0.571	0.171	0.072	1.003	1.817	2.200	−0.484	0.080	−0.012	−0.286	−0.247
Middle East & North Africa	0.342	0.523	0.103	0.974	1.942	2.196	−0.560	−0.083	−0.081	0.354	−0.270
Sub-Saharan Africa	0.428	0.584	0.030	0.822	1.864	2.042	−0.660	−0.515	−0.124	1.157	−0.356
South Asia	0.168	0.342	0.003	1.148	1.661	1.711	−0.784	0.186	0.119	0.600	−0.254

Note: * It includes Australia and New Zealand.

Under the unweighted calculations, the South Asian region is recognized as the lowest globalized region, which mostly comes from its very low technological factor, even if the region has a high political factor. The technological factor similarly affects the rank positions of Latin American and sub-Saharan African regions. Although East Asian and Latin American regions have low personal contacts, they are ranked at a medium level of globalization with high political engagements. South East Asia has a characteristic of high economic integration, and North America is outstanding at the technology level and transfer component.

As middle level globalized regions, the East European and East Asian regions are similar, but their key contributing components are somewhat different. East Asian region has the merit in technology transfer, and Eastern Europe has a higher personal contact component. West Europe and North America, which for practical purpose also include Australia and New Zealand, are ranked as the highest globalized regions. Technology transfer and political components for the North American region are higher, while the economic and personal components are higher in the case of Western Europe.

4.3. Temporal Patterns of the Indices

In Table 3C, the average value of index components and aggregate indices over time for the period 1995 to 2001 are reported. During 1995–1997, economic integration increased from 0.75 to 0.81, and it sharply decreased in 1998 and it maintains a slowly decreasing pattern until 2001. The decline is a result of the East Asian financial crisis.

The other components in 2001 are higher than those in 1995. The technology component increased from 0.22 to 0.52. The personal contact showed a steep increase in 1999 but it declined gradually. The political component increased with small fluctuation over time. The indices show different patterns over time. PC1, PC2, PC4 and PCW report an increasing pattern in recent years, while Kearney and weighted Kearney have very similar development patterns over time.

Table 3C

Development of globalization indices over time, NT = 427

| year | Globalization components | | | | K | KW | Principal components | | | | PCW |
	Eco-nomic	Per-sonal	Tech-nology	Politi-cal			PC1	PC2	PC3	PC4	
1995	0.746	0.548	0.224	1.206	2.724	3.406	–0.379	–0.101	0.210	–0.137	–0.198
1996	0.727	0.607	0.318	1.198	2.850	3.528	–0.325	–0.089	0.164	–0.154	–0.177
1997	0.813	0.563	0.349	1.180	2.905	3.619	–0.227	–0.108	0.071	–0.120	–0.143
1998	0.580	0.569	0.400	1.207	2.755	3.358	–0.083	–0.140	0.017	–0.033	–0.079
1999	0.559	0.640	0.434	1.197	2.830	3.473	0.097	–0.071	–0.077	0.053	0.023
2000	0.564	0.620	0.474	1.140	2.798	3.481	0.376	0.092	–0.159	0.086	0.196
2001	0.518	0.605	0.519	1.386	3.028	3.661	0.542	0.417	–0.226	0.304	0.379

Table 3D shows the level and development of average percentage changes in the four index components, as well as the two aggregate benchmark indices over time. The changes are calculated based on the annual average including all countries. While the variations of economic, personal and political components show both positive and negative signs over time, only the technology component has always shown positive values which indicate that there has been continuous technological development over time.

Table 3D

Percentage change in globalization indices over time, NT = 427

| year | Globalization components | | | | Weighted indices | |
	economic	personal	technology	political	KW	PCW
1995/1996	2.968	19.939	61.016	–1.000	4.370	0.457
1996/1997	13.465	–5.813	29.248	–1.017	3.282	–10.179
1997/1998	–25.420	0.202	42.580	2.424	–7.247	12.407
1998/1999	–4.802	16.464	28.613	2.673	2.858	3.006
1999/2000	0.901	–2.022	30.493	–4.687	–0.684	–2.998
2000/2011	4.060	–3.363	20.637	25.421	9.712	–13.751

Notes: K = Unweighted Kearney index, KW = weighted Kearney index, PC1 = unweighted (first) principal component index, PC2 = unweighted (second) principal component, PC3 = PC1 = unweighted (third) principal component index, PC4 = unweighted (fourth) principal component index, PCW = = weighted principal component index based on the first four principal components. *Source:* Author's calculations.

The sample countries cover a large share of global GDP and population. The sample and results are sufficient to be used in making inferences about globalization at the global and regional levels. It should be noted that ideally one should weight the resulting globalization components and indices by GDP and/or population of the sample countries to provide a better picture of the level and development of globalization over time. Similar weighted averages should be considered for the regional comparisons. The population and GDP weighted indices and components are a better base for computation of changes in globalization over time. Due to the short time period, no such weights are accounted for in this study. However, in a long time series it is recommended to avoid biased pictures of temporal patterns of globalization and its changes.

5. The New Globalization Index and its Relationship with Economic Growth

In this study we adopted Kearney's index (2002, 2003) approach which is the first attempt to construct a composite globalization index. The index is non-parametric and composed of four main components including economic integration, personal contact, technology, and political engagement. These are in total based on 13 indicators[2] which are normalized and aggregated by using an *ad hoc* weighted procedure into a single index. We call this index an unweighted index as the weights attached to each of the indicators is identical and equal to 1.

Two other approaches are tried to compute an index of globalization with a similar structure to that of the Kearney's index, but by using the parametric principal component analysis (Heshmati 2006a) and factor analysis (Andersen and Herbertsson 2003). Heshmati (2006a) suggested the principal component (PC) analysis where weights are estimated and also using various Kearney indices for the purpose of comparison and sensitivity analysis. In the unweighted Kearney index, equal weight on each of the 13 determinants of the index is used in the basic index, but some variables are given double weight in the alternative differentiated weighted index.

The principle component analysis method is a useful technique to establish relations among several variables. When there are p variables, we can extract essential components with coefficients which are identical with the eigenvectors of the covariance matrix. The principal components among related factors are sorted in descending order of the variance of the factor. By minimizing the sum of squared residuals, the distance between the point and the principal axis is minimized. With the least squares method notion, the principal component model can be described as follows:

$$Y \quad = \quad X \cdot B + E \tag{1}$$

where Y (n x p) is a matrix of the observed variables, X (n x j) is a matrix of scores of the principal components, B (j x p) is a matrix of eigenvectors, and E (n x p) is a matrix of residuals. The number of observations is n, p is the number of partial variables, and j is the number of variables or indicators of globalization. In this case, the distance between the estimated common point and the observed points is minimized.

Kearney (2003) and Heshmati (2006b) indices are used here as benchmarks to compare a new globalization index and its variations. We adopt the same index structure and components of the Kearney and Principal Component indices described in Heshmati (2006b) for the purpose.

In previous studies the causal links between globalization, inequality, poverty and growth have been investigated in a two-step procedure. In the first step the globalization index is computed non-parametrically or parametrically, and in the second step the latter three are regressed on globalization to investigate the impact of globalization on the former ones. The distinguishing feature of this study compared with the previous ones is in that both of these steps are estimated parametrically and in a single step.

In order to compute the new proposed indices, we first specify the relationship between economic growth and the index components indicators. Economic growth can be measured with various features such as level and changes in the size of an economy or growth and changes in the growth rate. It can be representative for a country level or per capita-based value considering the size of population. We applied four different values as economic growth treated as a dependent variable: GDP, GDP growth, GDP per capita and growth in GDP per capita. Concerning the independent variables, the globalization indicators are either grouped into four major components as in the decomposed Kearney index or alternatively lumped into one composite index like the principal component analysis. These two alternative specifications combined with the 4 measures of economic growth lead to an estimation of 8 models. For summary statistics of the growth variables, see Table 1.

The first types of models (Kearney type) and the impact of each globalization component on different economic growth (EG) measures is written as follows:

$$\log EG_{it} = a_o + a_1 \log ECON_{it} + a_2 \log PERS_{it} + a_3 \log TECH_{it} + \\ + a_4 \log POLI_{it} + u_{it} \tag{2}$$

where
$$\log Comp_{it} = \sum_{j=1}^{J-1} b_j \log X_{jit} + (1 - \sum_j b_j) \log X_{Jit} \tag{3}$$

In (2), the log EG is represented by the logarithm of four different measures of GDP and each is specified as a function of the logarithm of the four globalization components: ECON, PERS, TECH and POLI. Each of the globalization components in (3) is estimated as a function of normalized J indicators (X) specific to that component. The component ECON includes economic variables, PERS includes personal variables, TECH includes technology variables, POLI includes political variables, u is an error term and subscripts i and t refer to a country and time periods.

Each indicator variable has its own parameters (b) reflecting its share contribution to the globalization component as in Kearney's index, although here they are estimated and not assigned on an *ad hoc* basis and with equal weights. For example, the economic factor, ECON, has four sub-indicators such as trade, foreign direct investment, portfolio investment, and income payments and receipts. Because the sum of b_j assumed to be unity, we only need three coefficients to calculate the ECON value. The b_4 can be derived by $1-b_1-b_2-b_3$. The parameters, a_0-a_4 in model (2), are obtained by a regression analysis of economic growth variables and globalization sub-components, and these represent the weights of each component or the effects of globalization on economic growth. Here no restrictions are imposed on the total sum of the effects. The model is non-linear in parameters and the estimation is conducted in an iterative two-step proce-

dure where the parameters of the globalization components are estimated and their effects on economic growth are estimated in the second step.

The second model which is based on the principal component analysis approach does not distinguish between the four globalization components and lumps all 13 indicators into one single index. However, instead it allows estimation of the weights and several principal components that can be distinguished by their contributions to the composite index. The model corresponding to (2) and (3) is written as:

$$\log EG_{it} = a_o + a_1 \log Index_{it} + u_{it} \tag{4}$$

where log EG is again representing the different GDP measures including GDP, GDP growth, GDP per capita, and growth in GDP per capita in order, and INDEX is specified as a function of all 13 globalization indicators without distinguishing the four components: economic, personal, technology and political components, *u* is an error term and the subscripts *i* and *t* refer to country and periods.

$$\log Index_{it} = \sum_{j=1}^{J-1} b_j \log X_{jit} + (1 - \sum_{j=1}^{J-1} b_j) \log X_{Jit} \tag{5}$$

In the second model, we can estimate the model with four different economic growth definitions as in the first model. The second model is also estimated in an iterative two-step procedure where the whole 13 indicators are employed to estimate the composite globalization index (5) and then estimate its impacts on economic growth (5). From the estimation of (2) through (5), we could obtain estimates of the contributions of each indicator on the globalization index and the effects of globalization on the economic growth of countries. Thus, the combination of the disaggregated and aggregated globalization index and four economic growth definitions leading to eight different models are estimated in total.

Table 4 shows the estimation results from the eight models; the first four models are based on the model type 1 with disaggregated globalization components (group-1, equations 2 and 3) and the remaining four models are based on the model type 2 aggregate or composite globalization index (group-2, equations 4 and 5). In the case of Model11, it shows negative values related to a1 and a2. It means that the GDP shows a negative relationship with the first and the second sub-components of the economic factor, while GDP growth has a negative relationship with the first component and a positive relationship with the second component in Model12. Parameters b1 – b3, c1 – c2, d1 – d2, e1 – e2 are the coefficients of globalization indicators associated with different components of the index.

GDP based estimation of the new globalization indices

Parameter	Model11 GDP		Model12 GDP/capita		Model13 GDP growth		Model14 Growth in GDP/capita		Parameter	Model21 GDP		Model22 GDP/capita		Model23 GDP growth		Model24 Growth in GDP/capita	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err		Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
a0	24.065	0.133	7.530	0.133	2.942	0.667	1.827	0.660	a0	24.065	0.133	7.530	0.133	2.942	0.667	1.827	0.660
a1	−0.995	0.366	−0.257	0.366	4.301	1.836	2.185	1.817	a1	3.468	0.457	5.133	0.457	6.104	2.291	5.983	2.268
a2	−0.948	0.318	2.539	0.318	2.438	1.597	3.920	1.581	g1	−0.390	0.129	−0.256	0.078	−0.065	0.277	−0.289	0.341
a3	0.723	0.256	2.449	0.256	1.070	1.282	1.361	1.269	g2	−0.080	0.067	−0.115	0.046	0.517	0.257	0.422	0.236
a4	4.688	0.232	0.402	0.232	−1.705	1.162	−1.483	1.150	g3	0.211	0.068	0.143	0.045	0.129	0.187	0.239	0.201
b1	1.359	0.417	5.104	6.658	−0.092	0.395	−0.791	1.219	g4	−0.028	0.086	0.177	0.060	0.123	0.250	−0.007	0.247
b2	0.280	0.218	2.290	3.091	0.733	0.339	1.156	0.933	g5	−0.076	0.065	0.321	0.052	−0.076	0.187	0.328	0.224
b3	−0.736	0.394	−2.864	4.387	0.184	0.251	0.655	0.639	g6	0.410	0.112	0.419	0.076	−0.159	0.231	−0.186	0.233
c1	0.279	0.223	0.649	0.098	−0.191	0.518	0.501	0.288	g7	−0.608	0.117	−0.246	0.050	0.634	0.196	0.513	0.164
c2	−1.502	0.730	0.848	0.100	−0.397	0.783	−0.284	0.447	g8	0.317	0.083	0.439	0.063	−0.092	0.189	0.071	0.197
d1	1.520	0.583	0.920	0.124	−0.524	1.333	0.311	0.850	g9	−0.049	0.091	0.124	0.058	0.188	0.245	0.181	0.248
d2	−0.236	0.465	0.259	0.120	1.075	1.558	0.796	1.107	g10	−0.059	0.080	−0.086	0.055	0.079	0.222	−0.024	0.227
e1	0.212	0.043	3.548	1.853	1.975	1.191	2.230	1.533	g11	0.287	0.069	0.278	0.046	−0.552	0.295	−0.553	0.298
e2	−0.141	0.030	−3.580	2.162	−0.263	0.458	−0.440	0.612	g12	−0.190	0.045	−0.281	0.036	0.074	0.110	0.109	0.115
Adj R-Sq	0.820		0.784		0.071		0.054		Adj R-Sq	0.820		0.784		0.071		0.054	
RMSE	0.668		0.668		3.350		3.316		RMSE	0.668		0.668		3.350		3.316	
# of obs	427		427		427		427		# of obs	427		427		427		427	

Notes: Adj R-Sq means adjusted R-square. RMSE is root mean square error. # of obs means number of observations.

With the help of the adjusted R-square values and root mean square errors (RMSE) in Model11, Model12, Model21 and Model22, we can see that the GDP and GDP per capita show evidence of more adequate relationships. It is obvious that it is easier to explain variations in GDP levels rather than growth rates of GDP. Model21 shows the relationship between GDP measure and aggregated globalization index as shown in (5). The main difference between model group-1 and model group-2 is the structure of combining the underlying globalization indicators. The former consists of factors in the different components, while the latter is calculated with a composite index of all indicators.

The new globalization indices of countries are calculated with coefficients obtained from (3) and (5). Four indices are based on group-1 and the remaining four are based on group-2 as shown below in (6).

$$Gindex1j_i = a_o + a_1 ECON_i + a_2 PERS_i + a_3 TECH_i + a_4 POLI_i$$

$$Gindex2j_i = a_o + a_1 INDEX, \quad j = 1, 2, 3, 4$$

(6)

where *j* represents the type of economic growth value (1=GDP, 2=GDP growth, 3=GDP per capita, 4=GDP growth per capita). In the Gindex1j and Gindex2j, the first digit (1 or 2) represents the group type and the second digit (j) represents the type of economic growth variable. For instance, Gindex11 is type 1 of the globalization index group-1 which uses four components: ECON, PERS, TECH and POLI with coefficients based on GDP. Gindex21 refers to the type 1 of the globalization index group-2. The globalization index of group-1 is calculated by applying coefficients (a, b, c, d, and e) acquired by (2). The coefficient of Gindex11 are obtained from GDP, the coefficients of Gindex12 from GDP per capita, the coefficients of Gindex13 from GDP growth, and finally the coefficients of Gindex14 are obtained from growth in GDP per capita. On the other hand, the coefficient of group-2 comes from (5). The coefficient values of Gindex21 through Gindex24 are also obtained from GDP, GDP per capita, GDP growth, and growth in GDP per capita. They are all estimated in a non-linear method in growth models with the globalization index.

6. Variations in the Globalization Indices

The globalization indices, including the benchmark indices PCW, K and KW, and the new indices, Gindex11 – Gindex14 and Gindex21 – Gindex24, all vary across countries, regions and over time. In this section we briefly discuss such variations and their correlation relationships.

6.1. Variations and Ranking among the Globalization Indices

Table 5A shows eight globalization indices, the weighted principal component index and Kearney indices by country. All indices are computed for 61 countries and for 7 years. The countries are ranked by the PCW index. The globalization values are different depending on the type of index. While the USA is in top rank under Gindex11 and Gindex21 and likewise under PCW, Switzerland or Ireland show high values when Gindex12 – Gindex14 and Gindex22 – Gindex24 are applied and are similar to the Kearney indices. The UK and Switzerland show evenly high values on every index.

Table 5A

Globalization indices by country, ranked by the weighted principal component (PCW)

rank	country	Decomposed new indices				Composite new index				Benchmark indices		
		Gindex 11	Gindex 12	Gindex 13	Gindex 14	Gindex 21	Gindex 22	Gindex 23	Gindex 24	PCW	K	KW
1	2	3	4	5	6	7	8	9	10	11	12	13
1	USA	5.327	2.847	0.374	0.641	1.536	0.555	0.061	0.107	1.329	5.607	6.773
2	Sweden	2.794	2.737	1.343	1.858	0.806	0.533	0.220	0.311	1.073	5.937	8.045
3	UK	4.275	2.778	1.188	1.284	1.233	0.541	0.195	0.215	0.999	5.435	7.014
4	Ireland	0.120	2.300	3.208	2.980	0.035	0.448	0.526	0.498	0.996	6.338	8.585
5	Canada	3.650	2.629	−0.544	−0.133	1.052	0.512	−0.089	−0.022	0.966	5.543	7.096
6	France	4.079	1.821	−0.161	0.397	1.176	0.355	−0.026	0.066	0.873	4.343	5.203
7	Switzerland	2.363	3.887	0.904	1.709	0.681	0.757	0.148	0.286	0.848	6.022	8.103
8	Denmark	1.540	2.231	1.096	1.263	0.444	0.435	0.180	0.211	0.791	5.165	6.746

1	2	3	4	5	6	7	8	9	10	11	12	13
9	Finland	1.469	2.720	0.653	1.483	0.424	0.530	0.107	0.248	0.759	5.191	6.811
10	Netherlands	2.207	2.642	1.292	1.209	0.636	0.515	0.212	0.202	0.660	5.092	6.952
11	Austria	2.535	2.465	–0.158	0.938	0.731	0.480	–0.026	0.157	0.653	4.912	6.192
12	Norway	1.874	3.059	–0.166	0.717	0.540	0.596	–0.027	0.120	0.579	4.775	6.508
13	Germany	4.039	2.329	–0.240	0.035	1.165	0.454	–0.039	0.006	0.548	3.775	4.757
14	Italy	3.044	1.468	–0.535	–0.078	0.878	0.286	–0.088	–0.013	0.479	3.477	4.157
15	Australia	2.343	1.934	0.001	0.064	0.676	0.377	0.000	0.011	0.294	3.509	4.450
16	Spain	2.362	1.549	–0.002	0.292	0.681	0.302	0.000	0.049	0.231	3.036	3.732
17	Argentina	1.794	0.192	–0.662	–0.455	0.517	0.037	–0.108	–0.076	0.217	2.464	2.846
18	Portugal	0.881	1.259	1.181	1.461	0.254	0.245	0.193	0.244	0.192	3.501	4.417
19	Japan	3.996	2.357	–1.016	–0.632	1.152	0.459	–0.167	–0.106	0.170	2.411	3.029
20	Egypt	1.941	–0.289	0.980	0.616	0.560	–0.056	0.160	0.103	0.146	2.482	2.569
21	New Zealand	1.022	1.881	0.327	0.344	0.295	0.367	0.054	0.057	0.107	3.476	4.631
22	Poland	0.919	0.065	0.325	1.092	0.265	0.013	0.053	0.182	0.089	2.818	3.174
23	Russian Fed.	3.137	–0.342	0.649	0.673	0.905	–0.067	0.106	0.113	0.088	2.429	2.604
24	Greece	1.224	1.244	0.051	0.405	0.353	0.242	0.008	0.068	0.013	2.557	3.052
25	Pakistan	0.677	–0.673	0.833	0.495	0.195	–0.131	0.136	0.083	–0.019	2.096	2.145
26	India	1.996	–0.190	0.306	0.201	0.576	–0.037	0.050	0.034	–0.037	1.856	1.911
27	Czech	0.933	1.600	0.318	2.161	0.269	0.312	0.052	0.361	–0.104	3.527	4.119
28	Nigeria	0.703	–0.784	1.117	0.467	0.203	–0.153	0.183	0.078	–0.107	2.367	2.548
29	Brazil	2.018	0.502	–0.500	–0.485	0.582	0.098	–0.082	–0.081	–0.134	1.620	1.859
30	Bangladesh	–0.307	–1.196	0.936	0.734	–0.088	–0.233	0.153	0.123	–0.140	1.853	1.866
31	China	2.793	–0.107	0.963	0.768	0.805	–0.021	0.158	0.128	–0.190	1.732	1.962
32	Hungary	1.064	1.237	0.044	0.982	0.307	0.241	0.007	0.164	–0.203	2.909	3.488
33	Venezuela	1.743	0.581	–0.533	–0.729	0.502	0.113	–0.087	–0.122	–0.206	1.693	1.963
34	Turkey	1.575	0.424	–0.394	–0.541	0.454	0.083	–0.065	–0.090	–0.213	1.745	1.897
35	Kenya	0.144	–1.073	1.643	1.154	0.041	–0.209	0.269	0.193	–0.228	1.960	1.986
36	Senegal	–0.139	–0.713	1.346	0.718	–0.040	–0.139	0.221	0.120	–0.230	2.002	2.125
39	Mexico	1.961	1.103	–0.827	–1.002	0.565	0.215	–0.136	–0.167	–0.267	1.721	2.039
40	Tunisia	0.369	–0.125	0.544	0.331	0.106	–0.024	0.089	0.055	–0.292	1.986	2.145
41	Korea Rep.	2.088	1.108	0.338	0.416	0.602	0.216	0.055	0.070	–0.313	1.974	2.612
42	Israel	0.767	1.076	2.318	2.038	0.221	0.210	0.380	0.341	–0.317	2.567	3.332
43	Romania	1.170	0.129	0.278	0.164	0.337	0.025	0.046	0.027	–0.325	1.682	1.885
44	Singapore	1.004	3.029	1.475	1.184	0.289	0.590	0.242	0.198	–0.341	5.506	7.989
45	Colombia	1.281	0.754	–0.520	–0.688	0.369	0.147	–0.085	–0.115	–0.351	1.309	1.578
46	Peru	1.253	0.715	–0.174	–0.363	0.361	0.139	–0.029	–0.061	–0.384	1.291	1.579
47	Malaysia	–0.218	–0.044	0.868	0.620	–0.063	–0.009	0.142	0.104	–0.391	3.082	3.668
48	Morocco	0.326	–0.220	1.643	1.011	0.094	–0.043	0.269	0.169	–0.426	1.587	1.667
49	South Africa	1.817	0.653	0.496	0.493	0.524	0.127	0.081	0.082	–0.471	1.414	1.851
50	Uganda	–1.348	–0.782	2.740	1.883	–0.389	–0.152	0.449	0.315	–0.492	1.428	1.545
51	Saudi Arabia	2.108	0.805	–0.353	–0.508	0.608	0.157	–0.058	–0.085	–0.519	1.286	1.565
52	Iran	2.229	0.433	–0.206	–0.415	0.643	0.084	–0.034	–0.069	–0.523	1.012	1.025
53	Thailand	0.808	0.001	0.157	–0.248	0.233	0.000	0.026	–0.041	–0.527	1.597	1.864
54	Slovakia	–0.345	–0.135	0.495	0.029	–0.099	–0.026	0.081	0.005	–0.550	1.867	2.302
55	Sri Lanka	–0.673	–0.424	1.422	0.674	–0.194	–0.083	0.233	0.113	–0.551	1.488	1.607
56	Philippi	0.943	0.330	0.220	–0.321	0.272	0.064	0.036	–0.054	–0.554	1.564	1.850
57	Croatia	–0.440	0.332	1.673	1.401	–0.127	0.065	0.274	0.234	–0.602	1.877	2.466
58	Botswana	–2.093	–0.541	3.392	2.427	–0.604	–0.105	0.556	0.406	–0.609	2.015	2.199
59	Panama	–0.124	0.430	1.556	0.258	–0.036	0.084	0.255	0.043	–0.617	2.504	3.184
60	Ukraine	–0.169	–0.861	0.979	0.677	–0.049	–0.168	0.160	0.113	–0.648	1.374	1.506
61	Slovenia	–0.086	0.841	0.442	0.410	–0.025	0.164	0.072	0.069	–0.714	1.813	2.458

Notes: Gindex11 – Gindex24 = Globalization index, K = Unweighted Kearney index, KW = weighted Kearney index, PCW = weighted principal component index based on the first four principal components. *Source:* Author's calculations.

Botswana is in the lowest rank in the Gindex11 and Gindex21 indices, while the other indices display somewhat different results in ranking. Panama, Ukraine and Slovenia show low levels of Gindex11 and Gindex21 index. The ranks of different indices do not show similar trends in comparison. We can see some countries have different results depending on the type of globalization index computed. For instance, Canada shows a high level not only in the PCW index but also in the Gindex11 and Gindex12 indices. However, Canada does not have a high globalized index based on the personal economic-based indices.

Pairs such as Gindex11 and Gindex21, Gindex12 and Gindex22, Gindex13 and Gindex23, Gindex14 and Gindex24 show similar ranking due to using the same dependent GDP variable. As mentioned above, these pairs of indices show a high positive relationship with respective GDP variables. Therefore, the position of the countries in the Gindex11 and Gindex21 is similar, while the two Kearney indices are similar in their pattern. The principal component index shows a different style due to the weighted normalized characteristic of the principal components. The mean of unweighted Kearney, weighted Kearney, PCW, Gindex11 and Gindex21 indices by country is shown in Fig. 1.
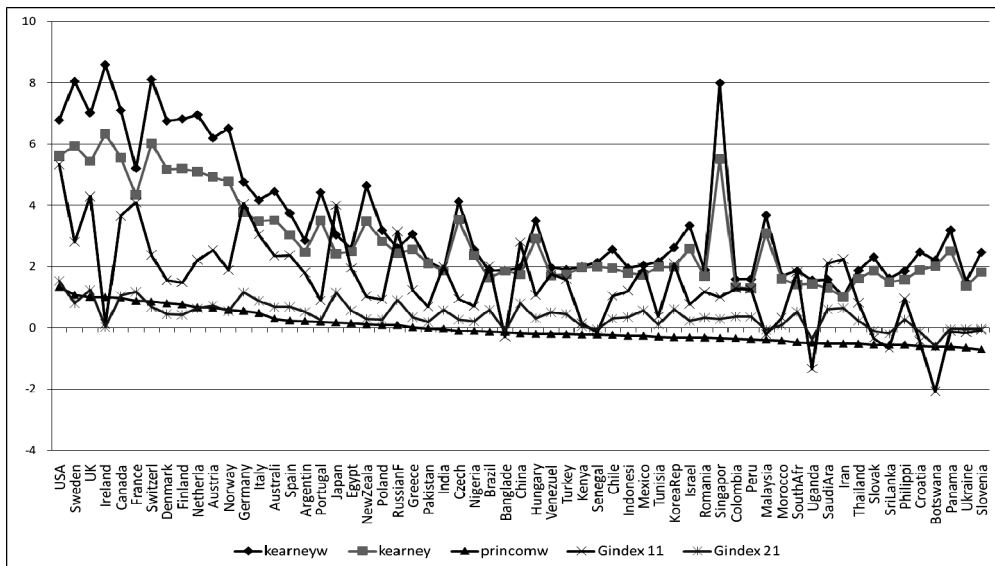
Fig. 1. Globalization indices by country ranked by weighted Kearney index (KW)

Table 5B shows the level of globalization indices discussed above by regional classification of the countries. It shows the eight new globalization indices and the previous indices such as PCW, K and KW. The ranking of regions is shown in the descending order of the weighted principal component index. The ranks among indices are again different due to the different weights and calculation methods employed. Under the country level GDP and GDP per capita value-based indices (Gindex11, Gindex12, Gindex21 and Gindex22), North America is considered as the top rank in the globalization, while Sub-Saharan Africa region is recognized as the highest globalized region based on GDP growth and growth in GDP per capita measure-based indices (Gindex13, Gindex14, Gindex23 and Gindex24). The mean quantity of each index used is reported in Fig. 1 but the regional location of the sample countries is shown in Fig. 2.

Globalization indices by region, ranked by the weighted principal component (PCW)

| region	Decomposed new indices				Composite new index				Benchmark indices		
	Gin-dex 11	Gin-dex 12	Gin-dex 13	Gin-dex 14	Gin-dex 21	Gin-dex 22	Gin-dex 23	Gin-dex 24	PCW	K	KW
North America	3.085	2.323	0.040	0.229	0.890	0.453	0.006	0.038	0.674	4.534	5.738
West Europe	2.321	2.299	0.644	1.064	0.669	0.448	0.105	0.178	0.646	4.637	6.018
East Asia	2.959	1.119	0.095	0.184	0.853	0.218	0.015	0.031	−0.111	2.039	2.534
Latin America	1.370	0.584	−0.134	−0.393	0.395	0.114	−0.022	−0.066	−0.247	1.817	2.200
South Asia	0.785	−0.410	0.658	0.338	0.226	−0.080	0.108	0.056	−0.254	1.661	1.711
Middle East&North Africa	1.181	0.278	0.790	0.491	0.341	0.054	0.129	0.082	−0.270	1.942	2.196
East Europe	0.687	0.319	0.578	0.843	0.198	0.062	0.095	0.141	−0.330	2.255	2.667
Sub-Saharan Africa	−0.153	−0.540	1.789	1.190	−0.044	−0.105	0.293	0.199	−0.356	1.864	2.042
South East Asia	0.748	0.611	0.534	0.187	0.216	0.119	0.087	0.031	−0.416	2.707	3.464
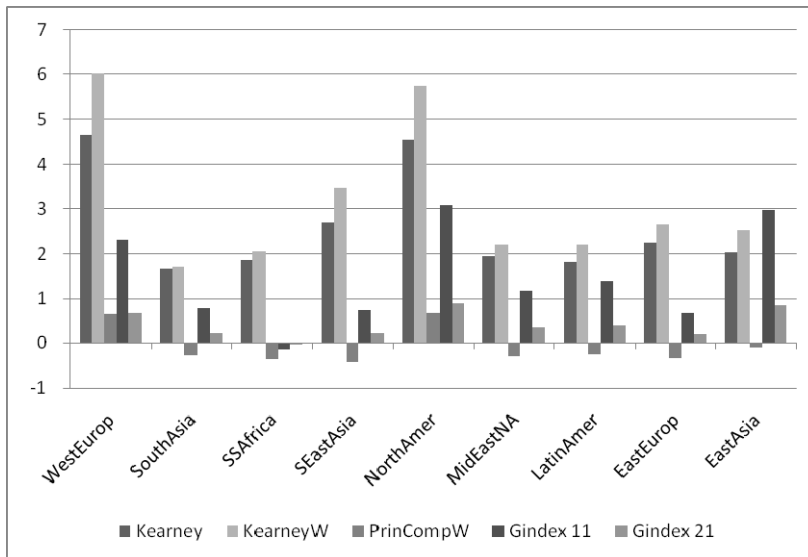
Fig. 2. Globalization indices by regions

In Table 5C, the development of the average values of different indices over time from 1995 to 2001 is displayed. It compares the same indices used in Table 5A and 5B. Most indices reflect the effects of the financial crisis in 1997/8 with a declining result. Gindex11 dropped from 1.438 to 1.348 during 1997–1998, while Gindex21 dropped from 1.415 to 0.398 during the same period. After 1998, the globalization index has recovered

gradually while indices based on the GDP growth rate show a major drop in 2001. Fig. 3 describes the development of indices over time by comparing the five different indices of temporal patterns. It should be noted that, the level difference is attributed to the method of computation and normalization of the indicators. The indices should be comparable by ranking countries.

Table 5C

The development of globalization indices over time

year	Decomposed new indices				Composite new index				Benchmark indices		
	Gindex 11	Gindex 12	Gindex 13	Gindex 14	Gindex 21	Gindex 22	Gindex 23	Gindex 24	PCW	K	KW
1995	1.444	0.767	0.703	0.668	0.416	0.149	0.115	0.112	−0.198	2.724	3.406
1996	1.351	0.798	0.842	0.754	0.389	0.156	0.138	0.126	−0.177	2.85	3.528
1997	1.438	0.916	0.755	0.695	0.415	0.178	0.124	0.116	−0.143	2.905	3.619
1998	1.348	0.767	0.531	0.438	0.389	0.15	0.087	0.073	−0.079	2.755	3.358
1999	1.361	0.899	0.601	0.567	0.392	0.175	0.099	0.095	0.023	2.830	3.473
2000	1.437	0.914	0.762	0.836	0.414	0.178	0.125	0.140	0.196	2.798	3.481
2001	1.606	1.149	−0.102	0.010	0.463	0.224	−0.017	0.002	0.379	3.028	3.661

Notes: Gindex11 – Gindex24 = Globalization index, K = Unweighted Kearney index, KW = weighted Kearney index, PCW = weighted principal component index based on the first four principal components. *Source:* Author's calculations.
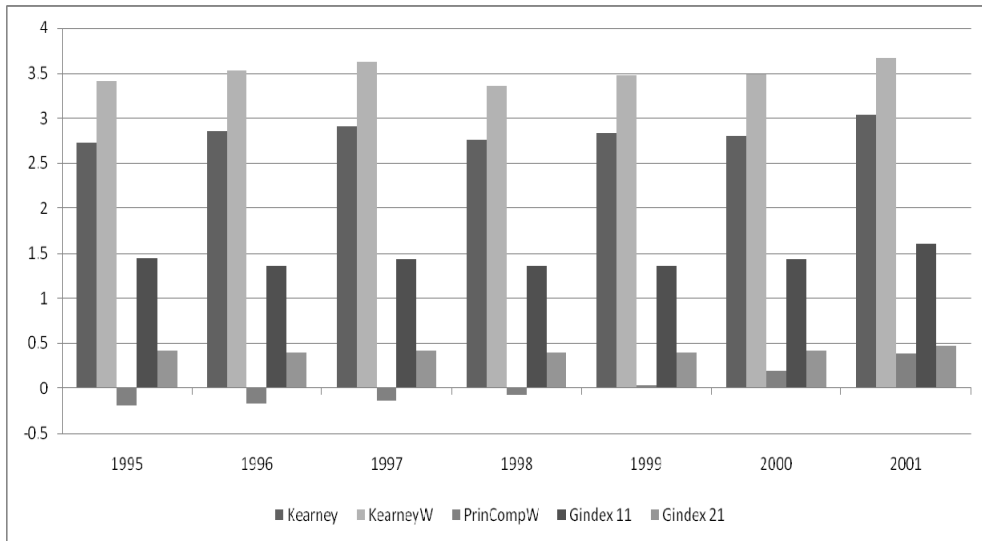

Fig. 3. Development of globalization indices over time

6.2. Correlation between Globalization Indices

Pearson correlation coefficients among different globalization indices including the benchmark indices are reported in Table 6. Positive and statistically significant coefficients indicate a positive correlation among the indices. The GDP level-based indices, such as Gindex11, Gindex12, Gindex21, and Gindex22, show a weak positive relationship with a time trend, while the GDP growth-related indices have a weak negative correlation with the time trend. Especially group-1 and group-2 indices show a coincidence with high significance depending on the data type. For instance, the correlation coeffi-

cients between Gindex11 and Gindex21 from the GDP level model are in unity. We can say that the indices Gindex11 and Gindex21 are exactly correlated.

By the data characteristic, the correlation among the aggregate indices of the similar data group are stronger (0.6 to 1.0) than the correlation among the different data group (–0.28 to –0.51). Gindex11 show a negative correlation relationship with different group indices (Gindex13, Gindex14, Gindex23 and Gindex24). Table 6 also reports the correlation between the proposed new globalization indices and the other indices serving as benchmarks. While Gindex12 and Gindex22 are highly correlated with Kearney (0.81) and weighted Kearney indices (0.84), the Gindex11, Gindex12, Gindex21 and Gindex22 globalization indices are highly and significantly correlated with the PCW index (0.61 and 0.68).

Table 6

Correlation matrix of all globalization indices

		Decomposed indices				Composite indices				Benchmark indices		
	year	Gindex11	Gindex12	Gindex13	Gindex14	Gindex21	Gindex22	Gindex23	Gindex24	PCW	K	KW
1	2	3	4	5	6	7	8	9	10	11	12	13
year	1											
Decomposed indices												
Gindex11	0.0290	1										
	0.5492											
Gindex12	0.0759	0.6108	1									
	0.1169	0.0001										
Gindex13	–0.1786	–0.5139	–0.2040	1								
	0.0002	0.0001	0.0001									
Gindex14	–0.1409	–0.2811	0.1243	0.8614	1							
	0.0035	0.0001	0.0101	0.0001								
Composite indices												
Gindex21	0.0290	1.0000	0.6108	–0.5139	–0.2811	1						
	0.5492	0.0001	0.0001	0.0001	0.0001							
Gindex22	0.0759	0.6108	1.0000	–0.2040	0.1243	0.6108	1					
	0.1169	0.0001	0.0001	0.0001	0.0101	0.0001	0.0001					
Gindex23	–0.1787	–0.5139	–0.2040	1.0000	0.8614	–0.5139	–0.2040	1				
	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001				
Gindex24	–0.1409	–0.2811	0.1243	0.8614	1.0000	–0.2811	0.1243	0.8614	1			
	0.0035	0.0001	0.0101	0.0001	0.0001	0.0001	0.0101	0.0001	0.0002			
Benchmark indices												
PCW	0.3234	0.6143	0.6834	–0.1058	0.1800	0.6143	0.6834	–0.1058	0.1800	1		
	0.0001	0.0001	0.0001	0.0288	0.0002	0.0001	0.0001	0.0287	0.0002			
K	0.0347	0.4315	0.8111	0.1615	0.4531	0.4315	0.8111	0.1614	0.4531	0.8086	1	
	0.4745	0.0001	0.0001	0.0008	0.0001	0.0001	0.0001	0.0008	0.0001	0.0001		
KW	0.0175	0.4084	0.8368	0.1860	0.4691	0.4084	0.8368	0.1859	0.4691	0.7690	0.9915	1
	0.7173	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	

Notes: p-values are given under the coefficients. Gindex11 – Gindex24 = Globalization index, K = Unweighted Kearney index, KW = weighted Kearney index, PCW = weighted principal component index based on the first four principal components. *Source:* Author's calculations.

In summary, globalization indices proposed in this study have some distinguishing characteristics compared with the previous indices. Our model is based on a multifaceted analysis including international economy, technology transfer, world politics and personal interactions, while previous studies are often based on single and trade-related factors. We tried to distinguish the characteristics of the indices and their development over time and across regions based on up-to-date available data. We suggest a new globalization index based on the economic development measures such as GDP, GDP per capita, GDP growth and growth in GDP per capita which are the most representative variables to show the economic feature of countries or their populations. In the new indices, the contribution from each indicator, the shares of individual components and the aggregate composite index are configured by their relationship with each economic development level and growth rate variables. For the matter of sensitivity analysis, two different methods, decomposed and composite models estimated iteratively, are used to compute the new globalization index and its variations. The Gindex11 – Gindex14 and Gindex21 – Gindex24 indices can be recognized as globalization indices and are used to investigate the estimation of their impacts on the economic growth of the countries. A high correlation between proposed indices and the previous globalization indices suggest that there is a close link between globalization and economic growth.

7. The Impacts of Globalization on Income Inequality

In this section we discuss the specification and estimation results from our attempt to establish the possible relationships between globalization and income inequality accounting for regional heterogeneity among the sample countries.

7.1. Specification of the Relationship

The relationship among globalization, economic growth and inequality has been a focal point of recent studies. In order to be able to deal with the issue, as described above, we extended the data set and the previous globalization index models. We extended the Kearney database to cover the period 1995–2001 and the GDP data are obtained from the World Development Indicator database. The data is a balanced panel data of 61 developed and developing countries in 7 years. In this section we tried to examine the relationship by regression analysis of globalization index and the income inequality as follows:

$$GINI_i \; = \; \alpha_0 + \alpha_1 GIN\hat{D}EX_i + \sum_j \gamma_j REGION_{ji} + u_i \qquad (7)$$

where GINI is Gini coefficient, GINDEX is globalization index, REGION is regional location dummy variables, u is an error term and the subscript i is representing country. In should be noted that, due to the unavailability of data on inequality over time, a cross sectional approach is used here.

In equation (7) three different types of Gini inequality measures are used for the matters of sensitivity analysis. The three measures are: Wgini, Mgini, and Gini which represent population weighted Gini inequality, mean Gini over time and most recent

year Gini values. Globalization index, GINDEX, is defined as the aggregated composite based indices, group-2, as described in Sections 5 and 6.

7.2. The Globalization-Inequality Estimation Results

The estimation results for the 3 Gini coefficient measures regressed on 7 globalization indices (K, KW, PCW and Gindex21 – Gindex24) with and without controlling for unobservable regional heterogeneity are reported in Tables 7A–7C. The estimation result from regression of the population weighted inequality (Wgini) on globalization indices is reported in Table 7A. The result based on the second definition where Mgini is defined as mean years of inequality is reported in Table 7B. Finally, the result based on an alternative definition where Gini is defined as the most recent year of inequality is reported in Table 7C.

The results from each index without regional dummy variables are displayed in Model A1–A8 of Table 7A, Model B1–B8 of Table 7B, and Model C1–C8 of Table 7C. The results from the index including unobservable regional effects are shown in Model A8–A14 of Table 7A, Model B8–B14 of Table 7B, and Model C8–C14 of Table 7C. As we can see, the impacts of globalization estimated in 7 different ways (K, KW, PCW and Gindex21 – Gindex24) on income inequality measured in three different ways (Wgini, Mgini, and Gini) in the form of regression analysis are reported in Tables 7A, 7B and 7C.

After having controlled for unobserved regional effects captured by adding regional location variables into the model specifications, the explanatory power of the models increases from under 0.10 to over 0.80. However, the globalization indices turn out to be statistically insignificant in the later. The change in significance level can be due to the correlation between regional inequality and regional level of globalization which make the effects of globalization on income not easily distinguished from the unobservable regional effect.

In the models of Table 7A, the results of Model A1 – Model A7 describe the inequality between countries by different indices. Most coefficients except in Model A4 and Model A6, GDP value-related indices, are negative and statistically significant. The negative estimated coefficients indicating a negative relationship between globalization and income inequality interpreted as increased globalization reduces inequality within the countries. All models estimated based on the previous indices show negative coefficients such as –2.154, –1.486, and –5.301. Especially, Model A5 and Model A7 using new globalization index which show very high negative values, while the coefficients of Model A4 and Model A6 are statistically insignificant. In particular, the growth in per capita GDP can have a higher effect on income inequality. However, the adjusted R-square values are very low, 0.09 in Model A1 and 0.016 in Model A4. It means that globalization explains only a small fraction of income inequality. The models with a negative coefficient on inequality are highly significant in statistical meaning, while the ones with positive values are not statistically significant.

In the model incorporating regional dummies, the estimation results show that the different regional effects on inequality can be recognized as a regional heterogeneity in an economic perspective.[3] The result shows the highest effects in the cases of regions 3

and 8 which are Latin America and sub-Saharan Africa. South East Asia (region 6) also shows high values. These areas have highly and statistically significant values while the others do not. The reference region here is North America.

Table 7B shows results based on regressions with mean Gini values labeled as Model B1 to Model B14. The indices used in the models are same as those used in Table 7A. The estimated effects and the signs are not changed much, and the statistical significance levels are also similar with the results for population-weighted Gini reported in Table 7A. Only some regional variables show higher significance values than the previous results. We can see the regression results with the Gini index in Table 7C, which also shows the negative relationship between globalization and income inequality measured as inequality in the most recent years. While most indices including Model C5 and Model C7 show negative values, all models including regional dummies, do not show any significant values in the relation between globalization and inequality. Again, regardless of definition of inequality or globalization, the regional effect absorbs most of the unobserved effects and it explains most variation in inequality.

In summary, the three different regression models reported in Table 7A, 7B and 7C show similar results concerning the relationships between globalization and income inequality. Although inequality cannot be described entirely by only globalization, we can observe evidence of negative relationships between the two variables. In this study, in addition we provide a picture of the development of globalization over time with new globalization indices based on economic growth; we show the presence of unobserved regional heterogeneity in the globalization progress. According to the result from the comprehensive and systematic regression analysis, we can conclude that globalization is positively linked to economic growth, while it has a negative relationship with economic inequality in a restricted sense.

Table 7A

The effect of globalization on population weighted income inequality, N = 59

	Model A1	Model A2	Model A3	Mod-elA4	Model A5	Model A6	Model A7	Model A8	Model A9	Model A10	Model A11	Model A12	Model A13	Model A14
Intercept	44.6057***	43.6825***	38.4674***	40.0556***	40.4487***	38.3487***	40.3275***	34.4922***	34.1095***	31.9977***	31.6489***	33.1478***	32.3271***	32.4453***
K	−2.1541***													
KW		−1.4855***						−1.0834	−0.7207					
PCW			−5.3011**							−2.5705	0.7436			
Gindex21				−4.0481								−3.9648		
Gindex22					−11.6890**									
Gindex23						0.3542							−2.8243	
Gindex24							−20.1492**							−5.2734
region2								−4.7512*	−4.8900	−5.5478	−4.4984	−5.6040	−4.7617	−4.4044
region3								17.7956***	17.7944***	17.6858***	18.3762***	17.6224***	17.9297***	17.5270***
region4								7.7484*	7.5445*	7.4299*	7.9643*	6.9243*	7.9343*	7.9557*
region5								8.3594*	7.9653*	7.6745*	5.6296	6.5864	5.6312	5.6966
region6								12.0308***	11.9765***	10.5232***	11.7808***	10.9138***	11.5099***	11.3097***
region7								5.5232	5.3395	5.5652	6.3989	4.7514	6.1935	6.0683
region8								17.1576***	16.9921***	16.7169***	18.0139***	16.0650***	18.1308***	18.2337***
region9								3.9628	3.6589	3.0947	1.2850	2.0597	1.4020	1.9235
Adj R-Sq	0.0958	0.0977	0.0742	0.0159	0.0812	−0.0175	0.0774	0.7142	0.6898	0.6861	0.6800	0.6834	0.6811	0.6839
F Value	7.1500***	7.2800***	5.6500**	1.9400	6.1200**	0.0000	5.8600**	17.1000***	15.3300***	15.0900***	14.7000***	14.9100***	14.7600***	14.9400***
RMSE	8.9192	8.7999	8.9140	9.1902	8.8803	9.3450	8.8986	5.0145	5.1595	5.1903	5.2404	5.2129	5.2316	5.2084
# of obs	59	59	59	59	59	59	59	59	59	59	59	59	59	59

Note: Significant at less than 1 %(***), 1–5 %(**), 5–10 %(*) level of significance. Adj R-Sq means adjusted R-square. RMSE is root mean square error. *Source:* Author's calculations.

Table 7B

The effect of globalization on mean years of income inequality, N = 59

	ModelB1	ModelB2	ModelB3	ModelB4	ModelB5	ModelB6	ModelB7	ModelB8	ModelB9	ModelB10	ModelB11	ModelB12	ModelB13	ModelB14
Intercept	44.4904***	43.5785***	38.5122***	40.0910***	40.4120***	38.4417***	40.4573***	35.2615***	34.8507***	32.7286***	32.8019***	33.8166***	33.0788***	33.2197***
K	-2.0972***													
KW		-1.4427**						-1.0994	-0.7224					
PCW			-5.0363**							-2.6219				
Gindex21				-4.0151							0.2556			
Gindex22					-11.2046**							-3.6535		
Gindex23						-0.1068							-3.7955	
Gindex24							-20.9859**							-6.5015
region2								-6.4811*	-6.6231*	-7.2924*	-6.5514*	-7.2888**	-6.4181*	-6.0024*
region3								17.0066***	17.0084***	16.8933***	17.3671***	16.8694***	17.1080***	16.6232***
region4								7.2893*	7.0827*	6.9652*	7.2499*	6.5140	7.5947*	7.5817*
region5								7.9152*	7.4869*	7.2307*	5.1632	6.0292	5.1383	5.2217
region6								11.4209***	11.3575***	9.8868**	10.8490***	10.3240***	10.9592***	10.6897***
region7								5.0605	4.8814	5.1012	5.6363	4.3875	5.8265	5.6432
region8								16.7598***	16.5962***	16.3093***	17.1810***	15.7707***	18.0054***	18.0453***
region9								3.5278	3.1884	2.6570	0.7184	1.5114	1.0126	1.6274
Adj R-Sq	0.0958	0.0885	0.0632	0.0146	0.0709	-0.0175	0.0829	0.7142	0.7128	0.7094	0.7026	0.7059	0.7057	0.7094
F Value	7.1500***	6.6300**	4.9100**	1.8600	5.4300**	0.0000	6.2400**	17.1000***	17.0000***	16.7300***	16.2200***	16.4700***	16.4500***	16.7300***
RMSE	8.9192	8.9552	9.0786	9.3113	9.0411	9.4618	8.9826	5.0145	5.0265	5.0562	5.1153	5.0869	5.0889	5.0568
# of obs	59	59	59	59	59	59	59	59	59	59	59	59	59	59

Note: Significant at less than 1 %(***), 1–5 %(**), 5–10 %(*) level of significance. Adj R-Sq means adjusted R-square. RMSE is root mean square error. *Source:* Author's calculations.

Table 7C

The effect of globalization on population recent year income inequality, N = 59

	ModelC1	ModelC2	ModelC3	ModelC4	ModelC5	ModelC6	ModelC7	ModelC8	Model C9	Model C10	Model C11	Model C12	Model C13	Model C14
Intercept	44.9817***	43.9106***	38.5530***	40.0902****	40.6080****	38.2259***	40.1696****	33.2547****	32.9315****	32.2052****	30.5273****	32.7538****	32.2198****	32.2474****
K	-2.2568***							-0.4846						
KW		-1.5273***							-0.2624					
PCW			-5.6990**							-0.5530				
Gindex21				-3.9402							2.0385			
Gindex22					-12.1428**							-2.2343		
Gindex23						2.4711							3.0247	
Gindex24							-17.6931**							0.6290
region2								-1.6885	-1.7585	-1.9143	-0.4578	-2.1419	-2.0330	-1.8627
region3								19.9246***	19.9441***	19.9566***	20.9660***	19.7991***	20.1450***	20.0925***
region4								6.0928	6.0044	5.9850	7.0729	5.6480	5.6368	5.9722
region5								5.2948	4.9263	4.5199	4.0117	4.6098	4.1131	4.0811
region6								10.3643**	10.2842**	9.8718**	11.3401**	9.8189**	9.8827**	10.0400**
region7								4.1016	4.0688	4.2057	5.5629	3.6191	4.0054	4.2686
region8								16.4991***	16.4546***	16.4482***	18.4127***	15.8614***	15.7440***	16.4779***
region9								1.9159	1.5710	1.0757	1.0323	1.1706	0.3849	0.5644
Adj R-Sq	0.1173	0.1045	0.0887	0.0142	0.0892	-0.0159	0.0558	0.6379	0.6369	0.6359	0.6409	0.6368	0.6376	0.6356
F Value	8.7000***	7.7700***	6.6400**	1.8400	6.6800**	0.0900	4.4300**	12.3500***	12.3100***	12.2500***	12.5000***	12.3000***	12.3400***	12.2400***
RMSE	8.6961	8.7586	8.8359	9.1897	8.8334	9.3288	8.9938	5.5698	5.5770	5.5853	5.5462	5.5778	5.5720	5.5872
# of obs	59	59	59	59	59	59	59	59	59	59	59	59	59	59

Note: Significant at less than 1 %(***), 1 – 5 %(**), 5 – 10 %(*) level of significance. Adj R-Sq means adjusted R-square. RMSE is root mean square error. *Source:* Author's calculations.

8. Summary and Conclusions

In this study, we proposed a new globalization index and its variations estimated parametrically based on representative economic variables, including aggregate and per capita-based GDP. The indicators forming the index components are obtained from those applied in previous studies including economic integration, personal contact, technology and political engagement. In the proposed model, which is an economic growth model, we first estimated the contribution of each indicator to the different globalization components, and then estimated the share of each component to the composite globalization. The coefficients are non-linearly estimated in an iterative estimation procedure. Two sets of models are estimated. In the first decomposed model, the different index components are estimated separately using the sub-field indicators, while in the second set one single composite index is estimated using all 13 indicators jointly. Different globalization indices based on different weights and different economic variables form a strong basis for a comprehensive and systematic sensitivity analysis of the economic growth and globalization relationships in a parametric single-step estimation procedure.

We measured the globalization status of countries by the new globalization indices and used the reference indices including non-parametric Kearney and parametric principal component analysis as benchmarks. While globalization scores and ranks of country are changed by the applied index, we can check the globalization level and its relationships with economic development measured as the aggregate country or per capita at both level and growth rates. The proposed new indices show somewhat different ranks among the country compared with the benchmarks indices, which shed light on various and sensitively measured features in globalization. The globalization indices are also differently developed and progressed over time and across countries. The globalization index, based on aggregate economic development, has recovered gradually since 1998 while the per capita GDP-based indices show a significant drop in 2001.

In the simple correlation coefficient calculation among the different indices, group-1 models, which are based on decomposed measurement, and group-2 models, which are based on composite measurement, we observe a high association due to the same economic development variable type employed. Through the correlation analysis between newly proposed parametrically estimated indices, based on economic development and previous globalization indices not accounting for economic development, we suggest that there is a close relationship between globalization and economic development and growth.

We also investigate the relationship between globalization and inequality through regression analysis. Three different inequality measures are used to examine the relationship with the proposed globalization indices. When regional dummy variables are included in the model specification to capture an unobserved regional effect, the explanatory power of the models is increased, while the globalization indices turn out to be statistically insignificant. All models based on previous globalization indices show a negative association between inequality and globalization, while the proposed per capita GDP-based indices show much higher negative relationships. The low adjusted R-square values in the restricted models suggest that the relationship between inequality and economic growth-based globalization to be weak. In contrast, the coefficients of aggregate GDP-based indices are not significant. The three different analysis models

between globalization and inequality show a similar result in respect to the estimated effects.

In this study, with an estimation of new globalization indices based on the economic development and growth variables, we tried to provide a picture of the globalization development over time and its heterogeneous nature across countries. Although economic growth and inequality cannot be described completely by only globalization, we can check the partial and unconditional relationships between the two. The result suggests a positive link between economic growth and globalization, but a negative relationship between inequality and globalization. With the use of various measures of economic development such as GDP and GDP per capita and their growth rates, the three inequality variables provide several alternative formulations of models to show the various aspects of globalization and its effects on income inequality.

It is worth mentioning that there are several limitations in this study which needs further research. One limitation is that the estimation of globalization index indicators and components based on economic development is highly non-linear. Thus, the estimated indices are sensitive to the determinants of the globalization index and its composite or decomposed formulations. This sensitivity has strong implications on the development and variations among countries and their ranking. Another limitation is that we lack data on inequality for each country over time. The unbalanced inequality data led to the use of a cross sectional analysis in investigating the inequality-globalization relationship neglecting their dynamic relationships. A third limitation is that the data include the Asian financial crisis but not the current global economic crisis. An extension of the data would enable us to compare the effects of the two crises, their similarities and countries heterogeneous responses to the two crises. A last limitation is that in the estimation of globalization indices based on the level of economic development and growth rates we do not control for determinants of economic growth. Estimation of the new globalization index conditional on determinants of economic growth would allow a more accurate estimation of a composite index.

NOTES

[1] There is no data available for Taiwan post 2000. It was excluded from the sample.

[2] The 13 sub-components are: trade, FDI, portfolio capital flows, income payments and receipts, international telephone traffic, international travel and tourism, transfer of payments and receipts, internet users, internet hosts, secure internet servers, the number of embassies in a country, the number of memberships of international organizations, and the number of UN Security Council meetings. See Kearney (2003) for a detailed description of the data sources.

[3] The regional dummies (region 2 – region 9) in the models represent unobservable regional effects associated with: East Europe, Latin America, Middle East and North Africa, North America, South East Asia, South Asia, Sub-Saharan Africa, and West Europe. North America is treated as reference region.

REFERENCES

Aghion, P., and Williamson, J. G.
1998. *Growth, Inequality and Globalization: Theory, History and Policy*. Cambridge: Cambridge University Press.

Ajayi, S. I.
2003. Globalization and Africa. *Journal of African Economies* 12(1): 120–150.

Andersen, T. M., and Herbertsson, T. T.

2003. Measuring Globalization. *IZA Discussion Paper* 2003: 817.

Bata, M., and Bergesen, A. J.

2002a. Global Inequality: An Introduction (to Special Issue on Global Economy – Part I). *Journal of World-System Research* 8(1): 2–6.

2002b. Global Inequality: An Introduction (to Special Issue on Global Economy – Part II). *Journal of World-System Research* 8(2): 146–148.

Collier, P., and Dollar, D.

2001. Can the World Cut Poverty in Half? How Policy Reform and Effective Aid Can Meet International Development Goals. *World Development* 29(11): 1787–1802.

Dreher, A.

2006. Does Globalization Affect Growth? Evidence from a New Index of Globalization. *Applied Economics* 38: 1091–1110.

Dreher, A., Gaston, N., Martens, P., and Van Boxem, L.

2010. Measuring Globalization – Opening the Black Box. A Critical Analysis of Globalization Indices. *Journal of Globalization Studies* 1: 166–185.

Harrison, A. (ed.)

2007. *Globalization and Poverty.* Chicago – London: University of Chicago Press.

Hertel, T. W., and Winters, L. A. (eds.)

2006. *Poverty and the WTO: Impacts of the Doha Development Agenda*. Washington, D.C.: World Bank; Houndmills – New York: Palgrave Macmillan.

Heshmati, A.

2006a. Measurement of a Multidimensional Index of Globalization. *Global Economy Journal* 6(2), Article 1.

2006b. The Relationship between Income Inequality Poverty, and Globalization. In Nissanke, M., and Thorbecke, E. (eds.), *The Impact of Globalization on the World's Poor* (pp. 59–93). Houndmills – New York: Palgrave Macmillan.

2006c. The World Distribution of Income and Income Inequality: A Review of the Economic Literature. *Journal of World Systems Research* 12(1): 60–107.

Hoekman, B. M., and Olarreaga, M. (eds.)

2007. *Global Trade and Poor Nations: The Poverty Impacts and Policy Implications of Liberalization*. Washington, D.C.: Brookings Institution Press.

A. T. Kearney Inc., and the Carnegie Endowment for International Peace

2002. Globalization's Last Hurrah? *Foreign Policy* January/February: 38–51.

2003. Measuring Globalization: Who's Up, Who's Down? *Foreign Policy* January/February: 60–72.

Lindert, P. H., and Williamson, J. G.

2001. Does Globalization Make the World more Unequal? *NBER Working Paper* 8228. Cambridge, MA: National Bureau of Economic Research.

Mahler, V. A.

2001. Economic Globalization, Domestic Politics and Income Inequality in the Developed Countries: A Cross-National Analysis. *Luxembourg Income Study Working Paper* 273. Luxembourg: Luxembourg Research Institute.

Manasse, P., and Turrini, A.

2001. Trade, Wages, and 'Superstars'. *Journal of International Economics* 54: 97–117.

Mayer, J.

2001. Globalization, Technology Transfer, and Skill Accumulation in Low Income Countries. *WIDER Discussion Paper* 39. Helsinki: UNU-WIDER.

Miller, T. C.

2001. Impact of Globalization on US Wage Inequality: Implications for Policy. *North American Journal of Economics and Finance* 12(3): 219–242.

Mussa, M.

2003. Meeting the Challenges of Globalization. *Journal of African Economies* 12(1): 14–34.

Nissanke, M., and Thorbecke, E. (eds.)

2007. *The Impact of Globalization on the World's Poor: Transmission Mechanisms*. Studies in Development Economics and Policy. Houndmills – New York: Palgrave Macmillan.

Summers, L.

2006. The Global Middle Cries out for Reassurances. *The Financial Times* 29.10: 9.

Talbot, B.

2002. Information, Finance, and the New International Inequality: The Case of Coffee. *Journal of World-System Research* 8(2): 213–250.