

MEASUREMENT OF GLOBALIZATION AND ITS RELATIONSHIP WITH INCOME INEQUALITY, POVERTY AND ECONOMIC GROWTH

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- Heshmati A. (2006), “Measurement of a Multidimensional Index of Globalization”, *Global Economy Journal* 6(2), Paper 1.
- Heshmati A. (2006), “The Relationship between Income Inequality Poverty, and Globalization”, in M. Nissanke and E. Thorbecke, “*The Impact of Globalization on the World’s Poor*”, Palgrave Macmillan, pp.59-93.
- Heshmati A. and S. Lee (2010), “The Relationship between Globalization, Economic Growth and Income Inequality”, *Journal of Globalization Studies*.

OUTLINE OF THIS PRESENTATION

- Definitions
- The research question and objectives
- The literature and methodology
- A composite globalization index
- The data
- Variations in globalization
- The link between globalization, inequality, poverty and growth
- Guidelines to modification of the index
- Summary and conclusions

DEFINITIONS:

MULTIDIMENSIONALITY OF INCOME AND INEQUALITIES

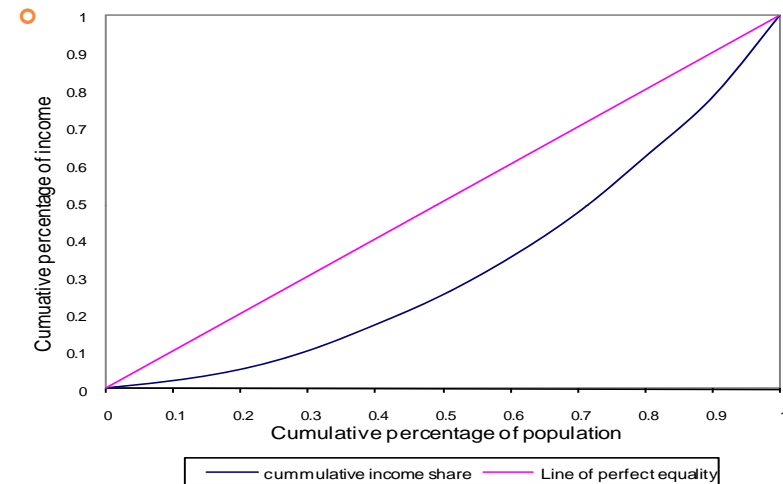
- **Income inequality** is just one dimension of inequality.
- **Other dimensions** include: inequality in education, opportunities, happiness, health, life-years, assets, ... Here the focus is on income inequality.
- **Different concepts of income:** gross income, expenditure, taxable, disposable, pre/post tax/transfer incomes, ...
- **Difference reference units:** household or family,, person, head of household, or the tax unit, ...
- **Different area coverage:** country, urban, rural, capital, cities and regions, ...
- The multidimensionality and complexity of income is an indicator of the many **consistency and quality problems** associated with the use of income databases.

INCOME INEQUALITY

- **Income inequality** refers to the inequality of the distribution of individuals, household or some per capita measure of income among the population of a country (Subramanian, 1997; Cowell, 2000).
- The Lorenz curve plots the cumulative share of income against the cumulative share of population used to define the **Gini coefficient**. The index lies in the interval 0 and 1.
- **Other measures** of inequality are: the range, the variance, the squared CV, the variance of log incomes, the absolute and relative mean deviations, Theil's two inequality indices (Anand, 1997).

5

Figure 1. The Lorenz diagram.



6

INCOME POVERTY

- World Bank produces **tables on Poverty** for developing countries. Consumption is preferred to income. It is more closely related to basic needs.
- Non-monetary **dimensions of poverty** are with respect to: health, nutrition, literacy, insecurity, powerlessness, ...
- One must make **adjustment** for differences in: size and needs of households, prices across regions and over time.
- **Poverty line** is the cut-offs points separating the poor from non-poor. It can be relative or absolute:
 - Relative in relation to 50% of the country's mean income.
 - Absolute defined as the cost of basic food needs.
- **The most common measures of poverty are:**
 - Incidence of poverty (headcount index) or share of population below poverty line,
 - Depth of poverty (poverty gap) how far off the poverty line,
 - Poverty severity (squared poverty gap) which accounts both for distance to poverty line and inequality among the poor.

7

MEASURES OF NATIONAL INCOME AND GROWTH

- **Gross Domestic Product (GDP)**
- **Gross National Income (GNI)**
- **GDP and GNI per capita**
- **GDP and GNI per working person**
- **GDP and GNI in national currency and in US\$**
- **GDP and GNI in current values**
- **GDP and GNI in fixed 2000 US\$**
- **GDP and GNI in PPP**
- **Growth in GDP and GNI**
- **Growth in GDP and GNI per capita**

8

GLOBALIZATION AND ITS CONSEQUENCES

- **Globalization** is defined as: free movements of goods, services, labour and capital across borders.
- It is a process by which the market economies have effectively spread across the globe.
- The development has brought the developed economies closer and strongly interrelated.
- There is a **large heterogeneity** in the degree of globalization process over time and across countries and regions (causing disparity in development and rising inequality).
- There is a **literature** on the historical perspective of globalization but its sources and consequences remain poorly understood.
- In order to reduce the **negative effects**, it is important to identify the sources of disparity and quantify their impacts.

9

GLOBALIZATION PERIODS AND FACTORS CAUSING INEQUALITY

- **Globalization Waves:**
 - The first wave of 1870-1913, convergence per capita income and wages took place.
 - The de-globalization period of 1913-1950, disparity between the richest and poorest widened.
 - The golden age of 1950-1973, rapid growth, stability and declining inequality.
 - The second wave of 1973 onwards, inequality has risen since the early-mid 1980s.
- **Traditional factors** causing inequality (land concentration, urban bias and inequality in education) are not responsible for worsening the situation.
- **New causes are:** liberal economic policy and their implementation.
- Land reform, expanding education and active regional policy are recommended **to reduce inequality**.

10

INEQUALITY INFLUENCES OF GLOBALIZATION

- **Lindert and Williamson (2001) and O'Rourke (2001)** state that source of increased world inequality could be poor government not globalization.
 - **James (2002)** analysis causes of globalization like transaction costs and focuses on ICT, technical change and FDI.
 - **Bhagwati (2000)** focuses on appropriate governance to manage globalization and its speed.
 - **Mahler (2001)** does not find evidence of a systematic relationship between main modes of globalization and distribution of income.
- Nayyar and Court (2002)** propose new structure of governance and reform of institutions to strengthen the governance needs of the world economy.
- Sutcliffe and Glyn (1999)** finds globalization misinterpreted and its quantitative extent exaggerated, inappropriate statistical measures is used, conclusions are drawn from little data, and no historical comparisons is possible.

11

VIEW OF THE WORLD'S EXPERTS ON GLOBALIZATION, GROWTH AND POVERTY (1)

- There is a special issue of *Journal of Policy Modeling* (2004) on "**Globalization, Growth and Poverty**" edited by Salvatore.
- **It addresses four basic questions:**
 - How rapidly is globalization proceeding?
 - Why does globalization give rise to such heated controversy?
 - Has globalizations led to increased growth and where?
 - Has globalization reduced poverty and where?
- **The purpose** is to have current view of the world's leading experts.
- **Two general conclusions** are that globalization led to:
 - Rapid growth of globalizers (open to trade and finance), and
 - A reduction of poverty in number of poor in Asia, but not in other parts of the world.

12

VIEW OF THE WORLD'S EXPERTS ON GLOBALIZATION, GROWTH AND POVERTY (2)

- **Gomroy and Baumol, "Globalization: Prospects, Promise and Problems"**. It may have painful consequence on some groups or nations. Increased competition enhances growth which benefit all nations in the long run.
- **Bhagwati, "Anti-Globalization: Why?"**. There are 2 main groups of critics:
 - Hard core protesters based on: combination of anti-capitalist, anti-corporation, anti-immigration, and anti-Americanism, and
 - Those regarding economic globalization as cause of many social ills like poverty and global deterioration of environment.
- **Stiglitz, "Globalization and Growth in Emerging Markets"**. Countries which managed well globalization process grow more rapid, but under the auspices of the IMF it may have adversely affected growth and increased poverty in some countries. Countries be aware of downside and potential risks and take advantage of benefits (China and Korea).
- **Intriligator, "Globalization and the World Economy: Potential Benefits and Costs and a Net Assessment"**. There are both positive (increased competition) and negative effects (international agreements).

13

VIEW OF THE WORLD'S EXPERTS ON GLOBALIZATION, GROWTH AND POVERTY (3)

- **Klein, "New Growth Centeres in the Globalized Economy"**. Examine how liberalization and globalization has led to rapid growth in China, India and Russia.
- **Barro, "Current Protectionism and the Benefits of Free Trade"**. American trade policy often leads to protectionism and subsidy, driven by interest groups. It slows down globalization process and growth.
- **Rodrik, "Globalization and Growth – Looking in the Wrong Places"**. Barriers to globalization are not traditional border type but institutional and jurisdictional (labour immobility).
- **Rogoff, "Extending the Limits of Global Financial Integration"**. It is wrong to believe that IMF makes crisis deeper. Excessive government borrowing is a cause of defaults (Argentina). (Island)
- **Tanzi, "Globalization and Fiscal Reforms in Developing Countries"**. Globalization creates pressures on developing countries to increase public spending to upgrade infrastructure, improve institutions and finance.

14

THE OBJECTIVES

- Investigate the usefulness of the **Kearney database** in the development of an index of globalization.
- Using the **same data** reproduce the Kearney non-parametric globalization index.
- Estimate an alternative **parametric index** using Principal Component Analysis.
- **Decompose the indices** and quantifies individual factors' contribution.
- Use the indices for over time, international and regional **comparisons**.
- In regression analysis, **study the link** between in equality, poverty, growth and globalization indices.
- Provide **guidelines** for a modified globalization index incorporating other relevant determinants.

15

A COMPOSITE GLOBALIZATION INDEX

- **The Kearney Index (K):**
- It uses 13 indicators and is composed of four components: economic integration, personal contact, technology and political engagement. It is based on normalization of the indicators and their aggregation:

$$GINDEX_{it} = \sum_{j=1}^J \sum_{m=1}^M \omega_{jm} \left\{ \frac{X_{jmit} - X_{jmt}^{\min}}{X_{jmt}^{\max} - X_{jmt}^{\min}} \right\}$$

- It is similar to the HDI. The weights are chosen on an ad hoc basis, equal weights ($w=1$) or differentiated weights ($w=2$). Weights should differ by countries and over time.
- **The Principal Component Index (PC):**
- It is a multivariate technique for examining relationships among indicators. Here the weights are estimated. It can be computed as a linear combination of the indicators:

$$Y_{it} = X_{it} \beta + E_{it}$$
- The two indexes can be used for comparisons and to study the causal relationship between globalization, inequality, poverty, growth, etc.

16

THE DATA

- The database is a small balanced panel data covering 62 countries for the period 1995-2000.
- The variables proxy the channels through which globalization affects the world.
 - Economic integration: trade, FDI, portfolio capital flows, and income payments and receipts.
 - Personal contact: international telephone traffic, travel and tourism, transfer payments & receipts.
 - Technology: internet users, internet hosts and secure internet servers.
 - Political engagement is based on the number of: embassies in the country, membership in international organizations, and participation in UN Security Council missions.
- The supplementary data include: population, GDP, income inequality, and poverty.
- Two inequality definitions are used: (i) Gini coefficient from recent year and (ii) mean of multiple periods.
- Four measures of poverty are used: (i) % below poverty line, (ii) % below \$1/day, (iii) % below \$2/day, and (iv) income share of 20% poorest.
- Four GDP measures: GDP, GDP/capita, GDP growth and GDP/capita growth

17

Table 1. Summary statistics, globalization data, 1995-2000, NT=62x6=372 observations.

Variable	Mean	Median	Std Dev	Minimum	Maximum
A. Economic integration					
Trade	0.7774	0.6750	0.5053	0.1570	3.4750
Foreign direct investment (w=2)	0.0426	0.0285	0.0501	0.0000	0.3307
Portfolio investment (w=2)	0.0575	0.0229	0.1498	0.0000	1.6693
Income payments and receipts	0.0899	0.0604	0.0986	0.0055	0.7821
B. Personal contacts					
Intl telephone traffic (w=2)	97.4325	44.2450	128.9096	0.9000	707.4600
Intl travel and tourism (w=1)	0.8056	0.3480	1.0561	0.0030	6.3610
Transfer payments & receipts (w=1)	0.0335	0.0266	0.0298	0.0000	0.1504
C. Technology					
Internet users (w=2)	0.0639	0.0178	0.1011	0.0000	0.5944
Internet hosts (w=1)	0.0126	0.0016	0.0272	0.0000	0.2950
Secure internet servers (w=1)	0.0111	0.0010	0.0294	0.0000	0.2830
D. Political engagements					
Embassies in country (w=1)	71.6129	68.5000	34.1968	13.0000	172.0000
Membership in intl org. (w=1)	48.8065	47.8000	10.3816	6.0000	77.0000
Particip. in UN SC missions (w=1)	0.2512	0.2220	0.2051	0.0000	0.7780

Note: w=weight attached to an indicator.

Table 2
Pearson correlation coefficients, NT = 372.

	Year	Economic	Personal	Tech- nology	Political	K	KW	PC1	PCW
Year	1.0000								
Economic	-0.1380 0.0076	1.0000							
Personal	0.0399 0.4423	0.5871 0.0001	1.0000						
Technology	0.1150 0.0265	0.2906 0.0001	0.3446 0.0001	1.0000					
Political	0.0046 0.9282	0.0312 0.5475	0.0243 0.6403	0.3952 0.0001	1.0000				
K	0.0010 0.9832	0.7119 0.0001	0.6840 0.0001	0.7576 0.0001	0.5523 0.0001	1.0000			
KW	-0.0082 0.8746	0.7630 0.0001	0.6863 0.0001	0.7550 0.0001	0.4738 0.0001	0.9909 0.0001	1.0000		
PC1	0.2946 0.0001	0.6395 0.0001	0.6327 0.0001	0.7127 0.0001	0.3947 0.0001	0.8774 0.0001	0.8842 0.0001	1.0000	
PCW	0.2314 0.0001	0.3759 0.0001	0.3313 0.0001	0.6712 0.0001	0.7975 0.0001	0.8156 0.0001	0.7840 0.0001	0.8392 0.0000	1.0000

Notes: K=Unweighted Kearney index, KW=weighted Kearney index, PC1=unweighted (first) principal component index, PCW=weighted principal component index based on the first three principal components. p-values are given under the coefficients.

19

VARIATIONS IN THE GLOBALIZATION INDEX

- Country heterogeneity in globalization:
- Four indices (K, KW, PC1, PCW), are computed for each of the 62 countries and 6 years. The countries are ranked by the PC1 and weighted Kearney index.
- The results show that: Uganda, Iran, Morocco, Sri Lanka and Kenya are ranked as least globalized compared to Ireland, Singapore, Switzerland, Sweden and Netherlands ranked as the five most globalized.
- The low rank is often due to the consequences of war and economic sanctions. Internal and external conflicts seem effectively reduce the countries' globalization process.
- The highly ranked countries share similar components distribution.
- Several exceptions: Russia (30) has a very high political factor. France (14) has the highest political factor. Korea is ranked 35, China 42, India 49 and Taiwan 55.
- There are minor changes in the ranking when different indices are compared.

20

Table 3A
Globalization index by country, ranked by the first principal component (PC1)

Rank 1	Country	Economy	Personality	Technology	Political	K	Rank2	KW	PC1	PCW	Gini	Mgini
1	Ireland	2.477	1.899	0.560	1.510	6.446	1	8.643	3.726	3.887	36.962	36.80
2	Singapore	2.729	1.551	0.920	0.734	5.935	2	8.575	3.181	3.197	38.115	42.49
3	Switzerland	1.545	1.746	0.999	1.689	5.979	3	8.137	3.050	3.996	33.100	33.20
4	Sweden	1.444	0.900	1.346	2.178	5.868	4	7.941	2.735	4.074	33.663	38.14
5	Netherlands	1.892	0.927	0.807	1.577	5.202	6	7.125	2.506	3.725	32.200	32.10
6	Canada	0.872	0.825	1.467	2.434	5.598	5	7.170	2.456	4.101	30.050	30.83
7	USA	0.436	0.275	2.400	2.531	5.641	8	6.739	2.391	4.299	40.425	38.65
8	Norway	0.874	0.836	1.699	1.685	5.094	7	6.881	2.289	3.615	39.422	30.74
9	Finland	0.790	0.731	1.752	1.818	5.091	9	6.586	2.260	3.682	31.500	29.33
10	Denmark	1.242	1.000	0.903	1.925	5.069	10	6.529	2.228	3.666	35.525	34.04
33	Croatia	0.547	0.873	0.111	0.594	2.125	34	2.727	0.608	2.242	30.067	25.68
34	Russian Fed.	0.322	0.090	0.032	2.168	2.613	30	2.801	0.585	3.190	39.575	34.14
35	Korea Rep.	0.478	0.258	0.322	1.058	2.116	35	2.698	0.560	2.635	31.600	34.18
36	Mexico	0.550	0.235	0.041	1.122	1.947	40	2.340	0.520	2.750	51.978	51.08
37	Tunisia	0.441	0.507	0.005	1.288	2.241	39	2.407	0.510	2.598	40.410	44.92
58	Kenya	0.196	0.495	0.003	1.459	2.153	48	2.173	0.255	2.511	51.000	60.69
59	Sri Lanka	0.406	0.597	0.006	0.721	1.730	56	1.872	0.178	2.138	34.400	40.40
60	Morocco	0.234	0.599	0.003	0.953	1.789	57	1.841	0.166	2.313	-	-
61	Iran	0.085	0.049	0.002	1.055	1.191	62	1.203	0.076	2.532	42.900	45.59
62	Uganda	0.221	0.824	0.001	0.619	1.664	58	1.799	0.036	2.008	39.200	37.19

Notes: K=Unweighted Kearney index, KW=weighted Kearney index, PC1=unweighted (first) principal component index, PCW=weighted principal component index based the first three principal components. Gini and mgini are the recent period and mean multiple period Gini coefficients. Rank1 and Rnk2 are rank orders by PC1 and KW.

Figure 1
Unweighted Kearney globalization index (K) decomposed by its components.

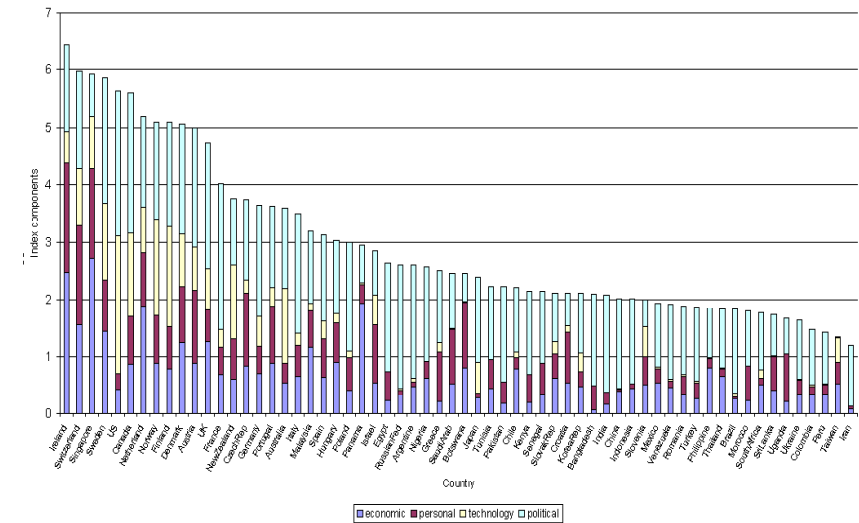
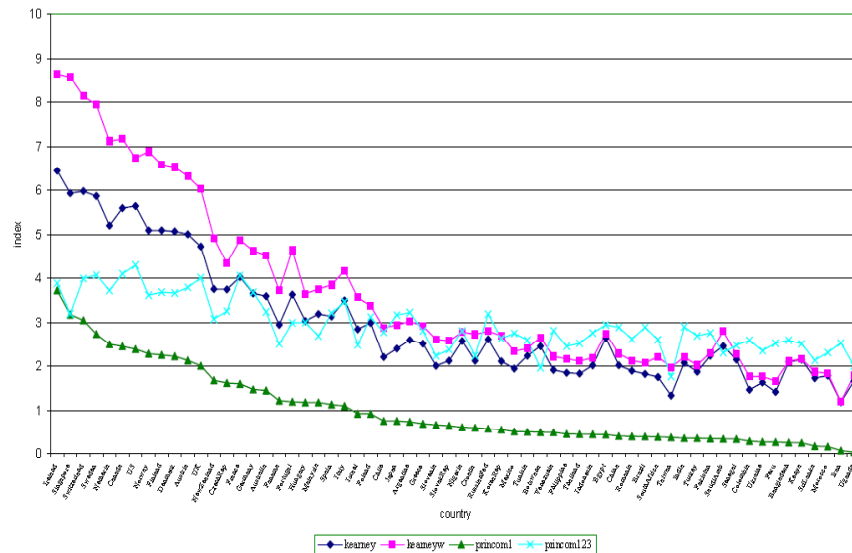


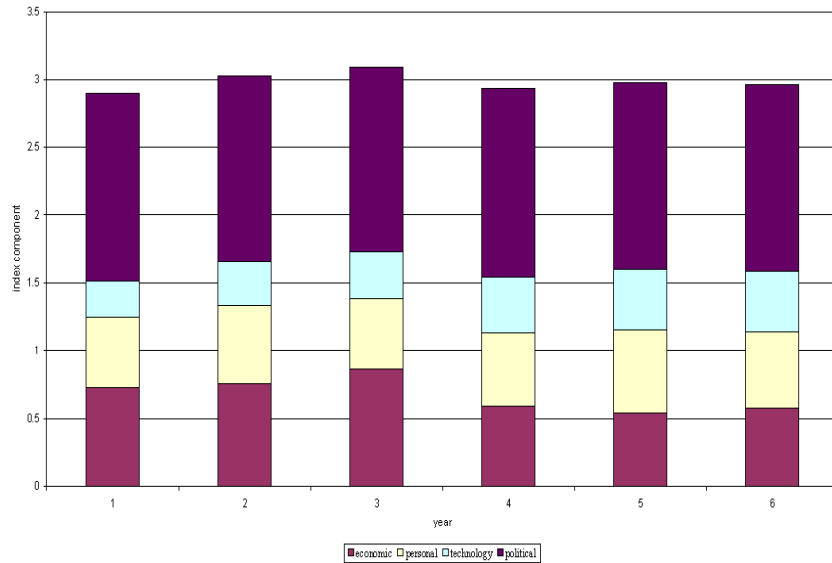
Figure 2. Globalization indices by country.



THE DEVELOPMENT OF GLOBALIZATION

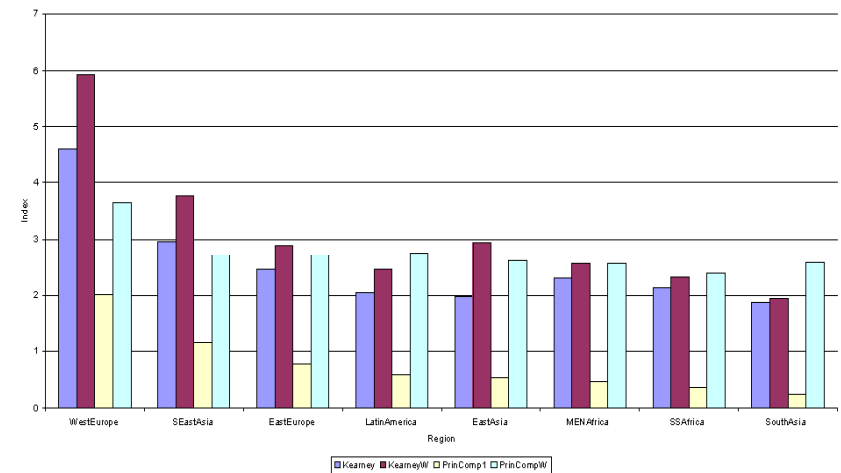
- One should weight the countries by their shares of aggregate GDP (or population) to provide a more accurate picture of changes in the globalization process.
- In terms of total GDP produced, size of population and total trade it provide a good coverage of globalization.
- Despite the short period and biased sample towards developed countries, it provides a partial picture of the development and distribution of the index.
- The economic integration is increasing 1995-97, declines in 1998 and remains constant.

Figure 3. Development of unweighted Kearney index of globalization (K) over time.



REGIONAL HETEROGENEITY IN GLOBALIZATION

Figure 4. Globalization indices by regions.



THE LINK BETWEEN GLOBALIZATION AND INEQUALITY

- Income inequality may depend on a number of internal and external factors. Globalization is one main external factor.

Specification of the relationship:

In analysing the link between globalization and income inequality estimate and testing of the relationship by the model:

$$GINI_i = \beta_0 + \beta_1 GINDEX_i + \sum_j \gamma_j REGION_{ji} + u_i$$

$$GINI_i = \beta_0 + \sum_m \beta_m GINDEX_{mi} + \sum_j \gamma_j REGION_{ji} + u_i$$

- GINI** is defined in two different ways: (i) the most recent observation, and (ii) mean of multi-periods.
- The GINDEX** is defined in four ways: (i) Kearney, (ii) weighted Kearney, (iii) first principal component, and (iv) weighted PC indices.

Table 5A
Least squares parameter estimates of the impact of the Kearney globalization index on the most recent years of income inequality (GIN)

Explanatory variables	Unweighted Kearney globalization index (K)								Weighted Kearney (KW)	
	Model A1	Model A2	Model A3	Model A4	Model A5	Model A6	Model A7	Model A8	Model A9	Model A10
Intercept	45.8642*	37.5410*	34.2443*	34.9793*	38.4699*	33.4670*	34.1586*	32.4668*	45.2898*	39.4501*
Log K globalization index	-7.4923*						-0.6478****			
Log KW globalization index									-6.9937*	-3.4690
Log economic integration		-1.2966****				3.7486**		2.1313		
Log personal contact			-4.2817*			-4.5780*		-3.3735*		
Log technology				-1.3914*		-1.2088**		0.9879***		
Log political engagement					-0.6328****	-0.4893****		0.3044****		
Middle East & North Africa							4.6848****	9.3241*		3.4092****
East Asia							0.7517****	0.1785****		-5.8351****
South East Asia							8.7789*	8.6782*		7.5161**
South Asia							2.7820	8.1049**		0.8502****
Latin America							18.5843*	17.5835*		13.2485*
Sub-Saharan Africa							15.1725*	21.0475*		12.7544*
East Europe							-3.1210****	-1.0805****		-9.1353*
Industrialized countries (reference)										
R-square adjust	0.1119	0.0968	0.1804	0.0988	-0.0145	0.2774	0.6381	0.6834	0.0957	0.6870
F-value	8.4300*	0.6000****	13.9000*	7.5400*	0.1500****	5.3400*	14.000*	12.5800*	7.2000*	17.1900*
RMSE	8.6873	9.2495	8.3457	8.7480	9.2651	8.1027	5.5458	5.1870	8.7734	5.1599
Number of observations	60	60	60	60	60	69	60	60	60	60

Notes: Significant at less than 1% (*), 1-5% (**), 5-10% (***), and greater than 10% (****) level of significance. The square of weighted and unweighted Kearney globalization indices in Models A1 and A9 are insignificant indicating absence of U-shaped relationship between inequality and globalization. RMSE is root mean square error.

Source: Author's calculations.

The Empirical Globalization-Inequality Relationship

- **Results show that:** globalization reduces income inequality. At most it explains 7-11% of the variations in inequality among the countries.
- In a **simultaneous inclusion** of the four components, personal contacts and technology transfers reduce inequality, economic integration increases inequality, but political factor has no effects.
- **Accounting for regional heterogeneity** captures most variations in inequality. The explanatory power increases from 0.11 to 0.64.
- It is difficult to **separate the effects** of globalization from regional-specific effects not necessarily associated with the inequality impacts of globalization.

29

The Link between Globalization and Poverty

- In similar way we model the **poverty-globalization relationship** as:

$$POVERTY_i = \lambda_0 + \lambda_1 GINDEX_i + \sum_j \eta_j REGION_{ji} + v_i$$

$$POVERTY_i = \lambda_0 + \sum_k \lambda_k GINDEX_{ki} + \sum_j \eta_j REGION_{ji} + v_i$$

- POVERTY is defined in four different ways: (i) share below poverty line; % below \$1/day; % below \$2/day; and the income share of the 20% poorest.
- The GINDEX is defined as: K, KW, PC1 and PCW.

30

Table 6
Least Squares parameter estimates of the impact of unweighted Kearney globalization index (K) on poverty

Explanatory variables	% population below poverty line		% population below \$1 per day		% population below \$2 per day		Share of 20% poorest of national income or consumption	
	Model C1	Model C2	Model C3	Model C4	Model C5	Model C6	Model C7	Model C8
Intercept	45.9115 *	42.8558 *	18.9551 ***	0.6890 ****	48.9832 *	12.4785 ****	5.2204 *	8.3772 *
Log K globalization index	-23.4127 ***	-20.7256 ***	-8.1328 ****	2.0192 ****	-22.7321 ****	-1.6524 ****	-1.3508 **	0.1029 ****
Middle East & North Africa	-	-12.1044 ****	-	0.0862 ****	-	8.3839 ****	-	-1.7002 **
East Asia	-	-23.6639 ***	-	8.1132 ****	-	16.5746 ****	-	-1.5520 ****
South East Asia	-	-3.7445 **	-	4.2234 ****	-	19.6980 ****	-	-2.6117 *
South Asia	-	5.8022 ****	-	18.5577 **	-	45.9763 *	-	-0.6390 ****
Latin America	-	3.3624 ****	-	8.3663 ****	-	12.6077 ****	-	-5.4438 *
Sub-Saharan Africa	-	13.7536 ***	-	36.5491 *	-	53.3331 *	-	-3.8369 *
East Europe (reference)	-	-	-	-	-	-	-	-
Industrialized countries (reference)	-	-	-	-	-	-	-	-1.1481 ****
R-square adjusted	0.0914	0.2979	-0.0153	0.3707	0.0138	0.4104	0.0540	0.5231
F-value	3.8200 ***	2.7000 **	0.4400 ****	4.1100 *	1.5200 ****	4.6800 *	4.3100 **	8.9600 *
RMSE	13.6133	11.9663	18.4079	14.4924	27.8032	21.4981	2.1579	1.5322
Number of observations	29	29	38	38	38	38	59	59

Note: Significant at less than 1% (*), 1-5% (**), 5-10% (***), and greater than 10% (****) level of significance. RMSE is root mean square error.

Source: Author's calculations.

The Empirical Globalization-Poverty Relationship

- **Results show that:** globalization explains 9% of the variations in poverty. It indicates a negative but weak relationship between globalization and poverty defined as poverty line or share of the 20% poorest. No significant negative relationship with \$1 and \$2/day are found.
- When controlling for **regional heterogeneity**, it captures most variations in poverty. The R2 increases from 0.09 to 0.30 and from 0.05 to 0.52.
- Again it is difficult to **separate the effects** of globalization from regional-specific effects not associated with the poverty impacts of globalization.

32

Guidelines to Possible Extensions and Improvements of the Globalization Index

- The index is a **partial index**. It should incorporate new components: financial markets, social, environment, etc
- **Incorporate issues**: wages and employment, skill biased technological change, trade volume and direction, movement of skilled labour, health effects, business concentration, power of MNC, shift in power, and cultural uniformity.
- **Weights**: to allow for country/regional- and time-varying weights. Investigate the axiomatic index properties.
- Perform **sensitivity analysis**: functional forms and weights.
- **Estimation**: investigate the direction of causality and simultaneity, pooling/grouping countries.
- **Heterogeneity**: the sample is dominated by industrialized countries.
- **Data**: to expand the data to include more developing and transition countries. To compare before/after globalization.
- **Comparisons**: the new index can be used for international and regional comparisons and in evaluation of impact of the globalization on welfare.

33

Summary and Conclusions

- The index components showed: **large variations** among countries and regions.
- Internal and external **conflicts** effectively reduce countries globalization.
- Mean globalization by regions shows that **technology factors** play an important role in the ranking.
- A breakdown of the index provides possibilities to identify **sources of globalization** and associate it with economic policy measures.
- **The index explains** only 7-11% of the variations in income inequality and 9-30% of variations in poverty. Personal contacts and technology reduce inequality, while economic integration increases inequality. Regional heterogeneity explains most of variations in inequality and poverty.
- The current version of the index is a simple and a partial measure. Suggested several **improvements**.
- **Panel data** can improve our understanding of the temporal patterns of globalization and its international and regional variability. Data availability is a problem.

34

The Relationship between Globalization, Economic Growth and Income Inequality

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Journal of Globalization Studies

35

THE NEW INDEX OF GLOBALIZATION

$$(1) \log EG_{it} = a_o + a_1 \log ECON_{it} + a_2 \log PERS_{it} + a_3 \log TECH_{it} + a_4 \log POLI_{it} + u_{it}$$

$$(2) \log Comp_{it} = \sum_{j=1}^{J-1} b_j \log X_{jit} + (1 - \sum_{j=1}^{J-1} b_j) \log X_{Jit}$$

$$(3) \log EG_{it} = a_o + a_1 \log Index_{it} + u_{it}$$

$$(4) \log Index_{it} = \sum_{j=1}^{J-1} b_j \log X_{jit} + (1 - \sum_{j=1}^{J-1} b_j) \log X_{Jit}$$

$$(5) Gindex1_j = a_o + a_1 ECON_i + a_2 PERS_i + a_3 TECH_i + a_4 POLI_i$$

$$(6) Gindex2_j = a_o + a_1 INDEX, \quad j = 1, 2, 3, 4$$

$$(7) GINI_i = \alpha_0 + \alpha_1 GINDEX_i + \sum_j \gamma_j REGION_{ji} + u_i$$

36

Table 4
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	
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	3.463	0.457	5.133	0.457	6.104	2.291	5.983	2.268	
a2	-0.948	0.318	2.533	0.318	2.438	1.597	3.320	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	0.417	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	0.218	3.091	0.733	0.339	1.156	0.933	g5	-0.076	0.065	0.321	0.052	-0.076	0.187	0.326	0.224
b3	-0.736	0.394	-2.864	0.394	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	0.223	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	0.846	0.730	-0.397	0.783	-0.284	0.447	0.447	g8	0.317	0.063	0.439	0.063	-0.092	0.189	0.071	0.197
d1	1.520	0.583	0.920	0.583	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	0.465	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	0.043	1.853	1.975	1.191	2.230	1.533	g11	0.287	0.069	0.278	0.046	-0.052	0.295	-0.553	0.298
e2	-0.141	0.030	-3.580	0.030	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		0.054	Adj R-Sq	0.820		0.784		0.071		0.054	
RMSE	0.668		0.668		3.350		3.316		3.316	RMSE	0.668		0.668		3.350		3.316	
# of obs	427		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

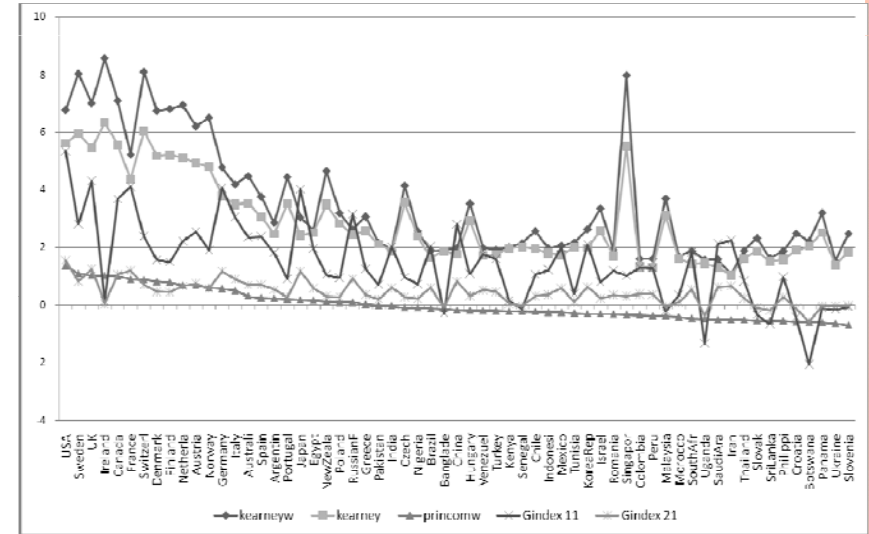


Table 5A
Globalization indices by country, ranked by the weighted principal component (PCW)

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	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	0.304	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
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
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	Slovak	-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.

Table 7A
The effect of globalization on population weighted income inequality, N=59

	ModelA1	ModelA2	ModelA3	ModelA4	ModelA5	ModelA6	ModelA7	ModelA8	ModelA9	ModelA10	ModelA11	ModelA12	ModelA13	ModelA14
Intercept	44.6057***	43.6325***	38.4674***	40.6556***	40.4487***	38.3487***	40.3275***	34.4922***	34.1085***	31.9977***	31.6489***	33.1478***	32.3271***	32.4453***
K	-2.154***							-1.0834						
KW		-1.4855***							-0.7207					
PCW			-5.3011**							-2.5705				
Gindex21				-4.0481							0.7436			
Gindex22					-11.6890**							-3.9648		
Gindex23						0.2542							-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*	7.4293*	7.9643*	6.9243*	7.3043*	7.9557*
region5								8.2634*	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***	11.3099***
region7								5.5232	5.3395	5.5652	6.3989	4.7514	6.1935	6.0683
region8								17.1576***	16.3921***	16.7169***	18.0139***	16.0650***	18.1308***	18.2337***
region9								3.9628	3.6593	3.0947	1.2850	2.0597	1.4020	1.9255
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**	19.400	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***							-1.0994						
KW		-1.4427**							-0.7224					
PCW			-5.0363**							-2.6219				
Gindex21				-4.0151							0.2556			
Gindex22					-11.2046**							-3.6535		
Gindex23						-0.1068							-3.7955	
Gindex24							-20.3859**							-6.5015
region2								-6.4811*	-6.6231*	-7.2924**	-6.5514*	-7.2888**	-6.4181*	-6.0024*
region3								17.0066***	17.0084***	16.8333***	17.3671***	16.8634***	17.1080***	16.6232***
region4								7.2893*	7.0427*	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***	18.0064***	18.0453***
region9								3.5278	3.1884	2.6570	0.7184	1.5114	1.0126	1.6274
Adj R-Sq	0.0858	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	ModelC9	ModelC10	ModelC11	ModelC12	ModelC13	ModelC14
Intercept	44.9817***	43.9106***	38.5530***	40.0902**	40.6080***	38.2263***	40.1636***	33.2547***	32.9315***	32.2062**	30.6273***	32.7538***	32.2198***	32.2474***
K	-2.2568***							-0.4846						
KW		-1.5973***							-0.9624					
PCW			5.6390**							-0.5530				
Gindex21				-3.9402							2.0385			
Gindex22					-12.1428**							-2.2343		
Gindex23						2.4711								3.0247
Gindex24							-17.6331**							6.6290
region2								-1.6885	-1.7585	-1.9143	-0.4578	-2.1419	-2.0330	-1.8627
region3								19.9246***	19.9441***	19.9566***	20.9600***	19.7391***	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**	9.8227**	10.0400**
region7								4.1016	4.0688	4.2057	5.5629	3.6191	4.0054	4.2686
region8								16.4931***	16.4646***	16.4482***	18.4127***	15.8614***	15.7440***	16.4773***
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	8.9338	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.

SUMMARY OF RESULTS

- The relationship between 4 different growth measures and measures of globalization is estimated in one step using aggregate and decomposed globalization indices.
- Estimation results are sensitive to parameters identification restrictions, growth definitions and decomposition of the globalization index.
- Ranking of the countries (and regions) by level of globalization is sensitive to the growth and globalization definitions (and population weights).
- Globalization reduces income inequality, but it is difficult to separate regional and globalization effects.

Thank You for Your
Attention!

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Article 1

Measurement of a Multidimensional Index of Globalization

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Measurement of a Multidimensional Index of Globalization

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Abstract

In this article we present two composite indices of globalization. The first is based on the Kearney/Foreign Policy magazine and the second is obtained from principal component analysis. They indicate which countries have become most global and show how globalization has developed over time. The indices are composed of four components: economic integration, personal contact, technology and political engagement, each generated from a number of variables. A breakdown of the index into major components provides possibilities to identify sources of globalization and associate it with economic policy measures. The empirical results show that a low rank in the globalization process is due to political and personal factors with limited possibility for the developing countries to affect. The high ranked developed countries share similar patterns in distribution of various components.

KEYWORDS: globalization, economic integration, indices, principal component

1. INTRODUCTION

Economists define globalization as the free movement of goods, services, labour and capital across borders. However, the free movement of goods and production factors is often restricted for various security, political and economic reasons over time and across countries. Globalization¹ is a process by which the western market economies have effectively spread across the globe. Although it does not constitute a new phenomenon, it is viewed as a means of integration of markets, nations and technologies to a degree never witnessed before in a way that is enabling individuals and corporations to reach around the world farther, faster, deeper and more economically than ever before. Some groups of scholars and activists view globalization as an ideological project of economic liberalization that subjects states and individuals to more intense market forces. As a result, the anti-globalization movement has been growing in size and their opposition.

Globalization causes rapid changes in trade relations, financial flows, and the mobility of labour across the world and has brought the (developed) national economies closer together and made them more strongly interrelated. However, there is a large heterogeneity in the degree of the process of globalization over time and across countries and regions. This heterogeneity causes disparity in development and urges the need for research to find the sources of disparity and quantification of its magnitude and impacts. The relationships between inequality and several channels through which globalization affects world inequality have been investigated. Measures of globalization are needed by which such relationships can be quantified. In particular, the literature on the historical perspective and the descriptive nature of globalization and its impact on inequality amongst nations has been growing.

Globalization has its roots in the second half of the nineteenth century. The period 1870-1913 is classified as the first wave of globalization; the years, 1913-50, is called the de-globalization period; the period, 1950-73 is called the golden age of globalization; and the period since 1973 is called the second wave of globalization (see O'Rourke and Williamson, 2000; O'Rourke, 2001; Maddison, 2001; Williamson, 2002). In recent years, research on the link between globalization and world inequality and poverty has been intense (Cornia and Court, 2001; Lindert and Williamson, 2001; Talbot, 2002; Babones, 2002; Beer and Boswell, 2002; Bornschier, 2002; and Bergesen and Bata, 2002). Globalization has other dimensions that produce different impacts and can be looked at from different perspectives. James (2002) analyses the causes of globalization in terms of transaction costs. Bhagwati (2000) focuses on trade and

¹ See Sklair (1999) and Woods (1998) for a discussion of competing conceptions, main approaches to, definitions, debates and implications of globalization.

FDI and suggests that appropriate governance is needed to manage globalization. Milanovic (2002) shows that the effects of openness on income distribution depends on a country's initial income level. Seshanna and Decornez (2003) note that during the last 40 years the world economy has become more unequal and polarized. Mahler (2001) finds little evidence of a systematic relationship between any of the main modes of economic globalization and the distribution of income of households in developed countries.

A vast amount of literature on various aspects of the recent wave of globalization is developing. Several special issues of journals have been published on globalization. Editorial introductions to these special issues are provided by Woods (1998), Manning (1999), Bata and Bergesen (2002a, 2002b) and Bevan and Fosu (2003). In addition, a number of books on the issue have been published. Dollar and Collier (2001) and the World Bank (2002) explore the relationships among globalization, growth and poverty; James (2002) analyses technology, globalization and poverty; Aghion and Williamson (1998) examine the relationships among globalization, growth and inequality; and Khan and Riskin (2001) limit their study to development in China and focus on history and policies. Tausch and Herrmann (2002) analyse globalization and European integration. Agénor (2003) examines the extent to which globalization affects the poor in developing countries. Collier and Dollar (2001) estimate the decline in poverty in developing countries. Collier and Dollar (2002) find that the level of poverty and the quality of policies do matter. Yusuf (2003) lists a number of factors that are relevant as a source of growth to both poor and rich countries. Mussa (2003) gives an overview of the challenges faced by the international community because of globalization. The 'flying-geese' paradigm of catch up growth is applied by Ozawa (2004 and 2005) to explain the Japan's postwar process of structural transformation and industrial upgrading. Heshmati and Tausch (2006) discuss the EU's Lisbon development strategy, globalization and the structures of global inequality.

Despite the great importance that is placed on the globalization process of the world economy, its sources and consequences remain poorly understood. Thus the construction of an index of globalization is an important step in this direction to be able to quantify its sources and impacts. Kearney (2002, 2003) constructed a database and constructed a simple composite globalization index. The index is composed of economic, personal contact, technology and political components. Using a smaller set of countries, Lockwood (2004) finds the ranking of countries to be sensitive to the way the indicators are measured, normalized and weighted. There are two alternative approaches to the Kearney index for computing an index of globalization; using principal component analysis (Heshmati, 2003) or factor analysis (Andersen and Herbertsson, 2003). Agénor (2003) used trade and financial openness to compute a simple economic globalization index. Recently

Lockwood and Redoano (2005) presented an index of globalization that measures the economic, social and political dimensions of globalization.

The objective of this paper is to investigate the usefulness of the recently-created database by Kearney in the development of an index of globalization. The index is based on the economic integration, personal contact, internet technology and political engagement of countries. The main contributions of this paper are as follows: First, using the same data, the study produces a globalization index that is comparable to the one introduced by Kearney. Second, an alternative but less restrictive globalization index is obtained using principal component analysis. Third, countries are compared by their integration in the world economy. A decomposition of the indices into underlying components quantifies the contribution of individual factors to the integration. Fourth, the indices are used for comparisons among and within regions, in addition to the international level of globalization and its development over time. The indices are expected to serve as useful tools in evaluation of the impact of globalization on the welfare of nations and regions. The hope is to generate interest and research on important issues like analysis of the globalization process and evaluation of its impacts on developing economies. Finally, given our experience, we provide guidelines for the creation of a globalization database that is based on international data and for the computation of a modified globalization index that incorporates the more relevant determinant factors.

This study is organized as follows. Section 2 provides a brief description of how the index of globalization is constructed. In Section 3, the data are described and the variables used in the analysis are defined. Section 4 contains a discussion of the results. In Section 5, guidelines on possible extensions and for future research are presented. Section 6 contains a summary and conclusions.

2. A COMPOSITE GLOBALIZATION INDEX

Creation of a comprehensive globalization database and construction of a globalization index that is multidimensional and decomposable is an important issue. Such an index will be useful tool in quantification of the extent and evaluation of the impacts of globalization. In this section, two non-parametric and parametric globalization indices are introduced.

2.1 The Kearney index

Kearney (2002, 2003) is the first attempt to construct a database and to compute a composite globalization index. The index is a simple combination of forces driving the integration of ideas, people, and economies, worldwide. It is composed of four major components: economic integration, personal contact,

internet technology, and political engagement, each being generated from a number of determinant variables. The total number of variables used in the computation of the globalization index is 13.²

The index quantifies economic integration by combining data on four key variables, namely trade, foreign direct investment, portfolio capital flows, and income payments and receipts. It gauges technological connection by accounting for internet users, internet hosts, and secure servers. The index assesses political engagement by taking stock of the number of international organizations and UN Security Council missions in which each country participates and the number of foreign embassies that each country hosts. Personal contact is charted by looking at international travel and tourism, international telephone traffic, and across-borders money transfers. The overall globalization index (GINDEX) is based on normalization of individual variables and subsequent aggregation using an ad hoc weighting system as follows:

$$(1) \quad GINDEX_{it} = \sum_{j=1}^J \omega_j \left(\sum_{m=1}^M \omega_m \left(\frac{X_{jmit} - X_{jmt}^{\min}}{X_{jmt}^{\max} - X_{jmt}^{\min}} \right) \right)$$

where i and t indicate country and time periods; m and j are within and between major component variables; ω_m are the weights attached to each contributing X -variable within a component; ω_j are weights attached to each of the four component; and min and max are minimum and maximum values of respective variables across countries in a given year. The index is similar to the commonly-used index, the Human Development Index (HDI), which is based on educational attainment, life expectancy and real GDP per capita.³

2.2 The principal component index

The Kearney globalization index is a non-parametric index. In calculation of the index, the component's weights are chosen on an ad hoc basis. We consider this index a basic or benchmark index. In the basic index, each of the 13 determinants of the index are given equal weights ($\omega_m = 1$). In an alternative case, a number of variables were given double weights ($\omega_m = 2$). Ideally the weights should differ by countries and over time, ω_{mit} .

² The total number of variables is 36 including year of observation, country name, and country codes. The remaining variables reflect the direction of trade, FDI, travel, portfolio investment, and international calls.

³ For a review of the HDI, its components, criticisms on the index, alternative indices and suggestions for some improvements, see Noorbakhsh (1998).

An alternative but parametric approach is to use principal component (PC) or factor analysis to compute an index of globalization. In this paper, we adopt the principal component approach. PC analysis is a multivariate technique for examining relationships among several quantitative variables. It was originated by Pearson (1901) and further developed by Hotelling (1933). PC analysis has been used in many areas including the computation of an environmental index (Kang, 2002). Recently, Agénor (2003) used trade and financial openness to compute a simple globalization index based on PC analysis.

Given a dataset with p numeric variables, at most p principal components can be computed; each is a linear combination of the original variables with coefficients equal to the eigenvectors of the covariance matrix. The eigenvectors are taken with unit length. The principal components are sorted by descending order of the eigenvalues, which are equal to the variance of the components. The first (last) component has the largest (smallest) variance of any unit length linear combination of the determinant variables. This method gives a least squares solution to the following model:

$$(2) \quad Y_{it} = X_{1it}\beta_1 + X_{2it}\beta_2 + \dots + X_{jit}\beta_j + e_{it}$$

where X_j ($j = 1, 2, \dots, J$) are factor scores, β_j is the factor pattern and the e_{it} s are the residuals. We minimize the sum of all the squared residuals, distances from the point to the first principal axis. In the least squares case, the vertical distance to the fitted line is minimized.

The two globalization indices, Kearney and PC Analysis, used in this study, indicate which countries have become most globalized and quantify the state of inequality in globalization among countries and regions. It shows how globalization has developed for different countries and regions over time. A breakdown of the index into major components provides possibilities to identify sources of globalization. It is valuable to associate this information with economic policy measures to bring about desirable changes in national and international policies. The indices can also be used to study the causal relationship between globalization, inequality, poverty, growth and a number of other variables frequently found in the development literature, such as openness, wages, and trade liberalization.

3. THE DATA AND INDEX COMPONENTS

The database created by Kearney⁴ is unique and the first of its kind to serve as a basis for computation of a globalization index. These data are a small balanced panel, covering 62 countries, observed for the period, 1995-2000, and was originally collected from national sources and international organizations and financial institutions such as the World Bank, the International Monetary Fund (IMF) and the International Telecommunication Union (ITU). Kearney fills gaps in the data from other sources like the Economist Intelligence Unit (EIU) and Netcraft.com. For example, all data on Taiwan are obtained from the EIU. Taiwan is not included in the World Bank and the IMF data bases.

The variables on economic integration, personal contacts, internet technology, political engagement are expected to proxy the channels through which globalization affect individual countries and each factor contributes to the quantification of a multidimensional globalization index.

The data on economic integration consist of four variables: trade, foreign direct investment, portfolio capital flows, and income payments and receipts. The data originate from the IMF and International Financial Statistics (IFS) databases. All four variables are given as a share of GDP. The trade variable includes total trade and it is measured as the sum of goods (imported and exported) and services (credits and debits). FDI is measured as an aggregate of inflows and outflows of FDI. Portfolio flows are measured as the sum of portfolio inflows and outflows. The last variable, income payments and receipts, includes the compensation of non-resident employees and income earned and paid on assets held abroad.

The second component on personal contact consists of three variables: international telephone traffic, international travel and tourism, and transfer payments and receipts. The telephone traffic variable is defined as the per capita sum of incoming and outgoing calls. It is obtained from the ITU and the World Telecommunication Indicators databases. The travel and tourism variable is defined as the sum of travellers in and out of a country as a share of its population. It originates from the World Development Indicators and the World Tourism Organization. The receipt of transfers and payments are obtained from the IMF and is measured as the sum of in-transfer and out-transfer payments as a share of GDP.

In measurement of the technological component there is a complete reliance on the internet. The internet technology component builds on three

⁴ Information on the data sources is available at web sites: www.foreignpolicy.com and www.atkearney.com.

variables: internet users, internet hosts and secure internet servers. The first two variables are obtained from the ITU and World Telecommunication Indicators databases, while data on secure internet servers are obtained from Netcraft.com surveys. The internet user variable is measured as a share of the population, while internet hosts and secured servers are measured per capita.

The last component, political engagement, is based on three variables including the number of embassies in the country, the number of memberships in international organizations, and the number of UN Security Council missions undertaken during a calendar year. These are obtained from the Europe World Yearbook, Central Intelligence Agency (CIA) and various UN sources. Similar to the technology component, the political component is to be considered a poor proxy of political perspectives of globalization.

Summary statistics of the variables are given in Table 1. From Table 1, we observe large variations among variables underlying the calculation of the index and its components. The distribution of the index components is not uniform. This is particularly evident in the case of the internet technology component with a large dispersion and with the sample mean significantly higher than the median. In the case of the political component, the mean and median values almost overlap. The range of the PC-based index differs from those of Kearney-based weighted and unweighted indices due to the normalization of the Kearney-based indices.

Correlation coefficients among various index components are presented in Table 2. As expected, the various components are positively and mostly significantly correlated among themselves. The economic integration component is negatively correlated over time, while technology is positively correlated with time. The remaining personal and political components, as well as the two weighted and unweighted globalization indices, are not correlated with time. Application of different weights does not change the rank of the countries much. The overall index is much dominated by political engagements and economic integration index components.⁵

4. VARIATIONS IN THE GLOBALIZATION INDEX

Variations in the globalization indices and their components can be decomposed into changes among counties, within regions, among regions and changes over time. The rest of the analysis is based on country and regional heterogeneity in globalization and its development over time.

⁵ Personal and internet technology variables are very likely to cause the economic component. Alternative combinations of the factors into economic and non-economic components should be possible. Investigation of the nature of their causal relationship is outside the scope of this study.

4.1 Country heterogeneity in globalization

Using the formulae in equations (1) and (2), the two globalization indices are computed for each of the 62 countries and for the six years of observation. Following Kearney's approach, a number of economic, personal and technology factors are given higher weights than others (see Table 1). The countries are ranked by the heterogeneously weighted index in descending order in Table 3. For matters of sensitivity analysis, the Kearney index with equal weights is used as a benchmark model. In order to conserve space, we report only the mean of the three indices by country in Table 3.

The results show that Iran, Peru, Ukraine, Colombia and Uganda are ranked as the five least globalized countries, compared with Ireland, Singapore, Switzerland, Sweden and Canada, which rank as the five most globalized countries. Croatia, Egypt and Nigeria are among the sample average globalized countries. Iran's low rank is due to the consequences of the long period of engagement in war with Iraq and the ongoing economic sanctions, resulting in low economic, personal and technology components to the overall globalization index. Internal and external conflicts seem to effectively harm the globalization process of the country. The low rank is due to political and personal factors with limited possibilities for the country to control. The high ranked countries share similar patterns in the distributions of the various components.

Minor deviations are the low economic factor in the case of Canada and US, the low political factor in the case of Singapore and the low technology factor in the case of Ireland. Several exceptions can be found, such as the Russian Federation. Russia is allocated a very high political factor which is crucial for its rank (30) and France, ranked as 14, has also the highest political factor. The same is true for China, which, despite its participation in Security Council missions and a high number of embassies around the world, is ranked only 42. Taiwan is ranked as the 55th globalized country despite its high economic development. The weighted index values decomposed by the underlying four components, and ranked by country, are reported in Figure 1.

Unlike the Kearney-based indices, the PC-based index is positively correlated (0.29) over time. It is highly correlated with weighted technological (0.73) and personal (0.72) components and with the other two Kearney unweighted (0.88) and weighted (0.88) indices. For details see Table 2 and Figure 2.⁶ One might suspect an overemphasis on the political component. For the matter

⁶ For the principal component analysis, we identified three eigenvalues exceeding one; 4.5862, 2.6419 and 1.3622. The proportions of the total variance explained by these principal components are: 0.3528, 0.2032 and 0.1048. The cumulative proportion of total variance explained is 0.6608.

of sensitivity analysis, the four component weighted Kearney index (weighted4) is computed by excluding the political component (weighted3). There are some changes in the rank of a number of countries. The winners of adding the political component are the US, France, Italy, Argentine, the Russian Federation, Egypt, India and Pakistan, while Singapore, Israel, Botswana, Taiwan and Saudi Arabia and Iran are among the politically disadvantaged countries.

The rank of countries by degree of globalization, based on the method of principal component analysis, changes somewhat compared with those based on the weighted⁷ Kearney index (Table 3). Among the 10 most globalized countries, Canada 5 (6), Netherlands 6 (5), Norway 7 (8) and the US 8 (7) swap positions, where the number after the countries indicates their positions based on the Kearney weighted index, while the number in parenthesis indicates positions based on the PC index. The transition of the least globalized countries is somewhat higher than that of the most globalized ones. Ideally one should report the transition steps over time for the selected index in a form of transition matrix. Later, we discuss changes in the indices over time. Here, the focus is on comparing the period mean ranks of different indices.

4.2 Regional heterogeneity in globalization

The mean globalization by regions is presented in Table 4. The ranking of regions differs depending on whether the identical or different weighting system is applied. As a result of attaching a higher weight to the internet technology factor, sub-Saharan Africa, with relative a low technology component, switches its position with East Asia to a lower rank. Based on equal weights, the South Asian region is identified as the least globalized region. The low level of globalization is very much determined by the low level of the technology factor. This picture is shared with the Latin American region.

The ranking based on the principal component analysis is similar to that of the Kearney-based weighted index. An exception is the swap in position between the Middle East and North Africa (-0.569) and Latin American (-0.438) regions.

The regions, East Europe, Middle East and North Africa, and Latin America, are allocated a medium average level of globalization. However, they differ by individual index components. For instance, Latin America is advantageous in economic integration, while the Middle East and North Africa

In order to conserve space, the results from the second and the third principal component analysis components are not reported here. Those can be obtained from the author upon request.

⁷ If the number of components is not given, the weighted Kearney index refers always to the weighted four component index (weighted4), i.e., the index includes the political component.

and sub-Saharan Africa enjoy better personal contacts. However, in terms of political engagements, they share a very close and low position.

The East Asian region shows a relatively low economic integration but higher internet technology diffusion. The globalization is found to be limited by relatively low personal contacts and political engagements. The economic integration for East Asia and North America is lower than expected due to the way it is measured. The FDI, trade, capital flows and income payments and receipts are all measured as shares of GDP, neglecting the level differences. Using share of GDP is advantageous for poor regions such as the sub-Saharan Africa and South Asia.

The East European region is showing progress in all four components, but yet it has a low technology diffusion. These countries have not been able to attract foreign investors or benefits from the relocation of West European plants and production in response to their low wages despite a relatively highly educated labour force.

The West European and North American⁸ regions take the positions of the highest globalized economic and geographic regions. The technology and political components are higher for North America, while Western Europe enjoys a higher economic integration and personal contacts. The economic integration component for the South East Asian region is higher than for North America, while the remaining three components are lower.

The South East Asian countries differ by the degree of globalization; the index for Singapore is four times that of Thailand, due mainly to the economic integration component. A similar large dispersion is found among countries in the West European region, where Ireland receives a score that is 10 times higher than that of the lowest ranked country, Greece. Surprisingly, Japan is placed lower than many East European countries. Its score is determined by the low levels of economic integration that are influenced by negative inflow of FDI and personal contacts components. The economic component does not account for much of the postwar economic success of Japan and its evolving institutions, industrial upgrading, economic performance and policies analysed in detail by Ozawa (2005). As mentioned previously, in measurement of economic integration one should account for the levels of the economic variables, not only their weight relative to GDP.

⁸ In order to reduce the number of regions to a manageable level given the small sample size, Australia, and New Zealand are added to the North American regions consisting of USA and Canada.

4.3 The development of globalization over time

Based on individual country and time-varying index observations we have computed the mean index and its components for each year of observation from 1995 to 2000. These are reported in Table 5 and Figure 3. Ideally, this should be weighted by the countries' share of aggregate GDP (or population) of the world to provide a more accurate picture of the temporal changes in the globalization process. Despite the weighting limitation and the short period of observation, it yet provides a partial picture of the development and distribution of the globalization process. In terms of total GDP produced, size of population and total trade, the included countries provide a satisfactory coverage of globalization. Major economies and highly populated countries are included in the sample.

The unweighted economic integration component increased during 1995 to 1997 from 0.73 to 0.86. It declined sharply to 0.60 in 1998 and remained below this level until 2000. The time pattern of the globalization index is largely influenced by economic integration. Similar patterns are found when economic integration, personal contact and internet technology components are given different weights. The economic integration consists of variables that are largely defined by trade and capital flows. The decline is a consequence of the East Asian financial crisis of 1997/98 and crisis in the emerging Russian and Brazilian markets in 1998. These crises resulted in major decline in the capital flows to the emerging markets and high volatility in the East Asian financial markets.

The PC index continuously increased over time, and is to be preferred as it is not restricted by assumption of the same weights or different weights chosen arbitrarily (see Table 5). Personal contact picks up in 1999. It varies in the interval 0.52 and 0.61 with no systematic trend. The technology component continuously increased from 0.27 to 0.44. The political component is constant over time and, as expected, does not change over a short period.

The average annual changes in the index components and composite indices, reported in Table 6, confirm the discussion about temporal development of the variables. However, the mean percentage annual changes neglect variations over time among countries. The neglected between country variation is quite high as a share of the total variation. The presence of extreme observations⁹ increases the percentage changes. Due to the increasing patterns of the principal component index over time, its percentage changes over time are all positive. The highest rates are found in 1995/96 and 1997/98.

⁹ Outlier or extreme observations include some transition countries (Czech Republic), countries engaged in war (Iran) or countries with financially unstable economies (Turkey).

5. GUIDELINES TO POSSIBLE EXTENSIONS

There is a growing literature on the link between globalization and a number of indicators such as income inequality, poverty and growth. However, with the exception of a partial view in studies like Mahler (2001) and Agénor (2003) who looked at the relationship between inequality and the main modes of globalization (trade, FDI and financial openness), the lack of a properly defined globalization index has not allowed statistical estimation and testing of the relationship.

5.1 Current state of art of the indices

The globalization index in this paper is defined in three different ways: the unweighted and weighted Kearney-based indices and the PC index. In the unweighted case, all underlying factors are given identical weights. The assumptions of equal weights are very strong and it might have major implications for the index, its interpretation and the ranking of countries. For instance tourism, natural resources and innovation in manufacturing have different implication for different countries and their globalization. In order to avoid the assumption of equal weights, a number of factors on an ad hoc basis are given double weights. The principal component index is based on the first principal component of the same factors. The non-parametric Kearney index performed better than the parametric principal component index in capturing the effects of financial crises, although, unlike the PC index, it suffers from the ad hoc assignment of weights in aggregation of the components.

The indices in above serve as a major first step forward to measure a proper composite index of globalization. There exist three other indices introduced by Andersen and Herbertsson (2003), Dreher (2005) and Lockwood and Redoano (2005). Andersen and Herbertsson use factor analysis to measure a globalization index as an alternative to the simple measure of openness based on trade for 23 OECD countries for the period 1979 to 1990. The index is based on nine indicators related to exchange, FDI, trade and capital flows. The Dreher and the Lockwood and Redoano indices cover economic, social and political integration. Dreher uses five-years averages for an unbalanced panel of data for 123 countries during 1970-2000 and the results suggest that globalization promotes growth. Lockwood and Redoano, using an unbalanced panel of data for countries covering the period from 1982 to 2001, obtain results that suggest the ranking of the countries is sensitive to the way the indicators are measured, normalized, and weighted. The indices here are superior to the above indices due to its country coverage, large number of indicators and the sensitivity analysis made.

5.2 An extended index of globalization

Despite progress made in construction of a globalization index, several essential improvements are still necessary. The index should take an axiomatic approach that sets out its desirable properties and provide a family of indexes that fulfil such properties. Improvement should involve the identification of the key dimensions of globalization; in its current form it is just a partial index. The index should fully quantify globalization. In addition to economic and social integration, personal contact, political engagement, and technology diffusion it should incorporate several other relevant components. These could include some measure of cost-benefit analysis of integration, separation of micro and macro aspects of globalization effects, impacts on standards of living, environmental aspects, wage inequality, skill biased technological change, foreign trade volume and its direction, democracy and conflict, financial markets, access to information and flows of information, the directions of movement of skilled labour between countries, female labour participation, issues of child labour, business concentration, power of multinational corporations, shift in power and cultural uniformity effects. The economic component does not seem to be performing well. In computation of economic integration, one should account for levels of the indicators as well as their shares relative to GDP.

In the Kearney's measure of the technological component there is a complete reliance on the internet technology. It does not reflect technology in a broad meaning. Technology is an important component and a complement to the economic integration. Various aspects of non-internet technology such as the role of inward foreign investment, fees on foreign-owned patents, numbers of engineers and scientists, investment in R&D, innovations, patents registered, technological capability and spillover effects, as well as skill should be accounted for in the measurement of the technology component of globalization. Among other relevant factors are the capital intensity, population growth and skill requirements. If capital per worker contributes to development, then population growth rates might be a relevant variable. Increase in skill requirements also imposes serious educational burden making the efficiency of the educational system very important to development.¹⁰

A specification, though based on a complete and representative index, still suffers from a number of problems like the direction of causality, simultaneity and bias due to omitted variables. Testing for poolability of the data and application of switching and non-linear regressions would be desirable to group countries into different classes of globalization levels. Industrialized countries dominate the current sample, with different characteristics than developing

¹⁰ I would like to thank an anonymous referee for pointing out the role of colonialism and several of the issues discussed in this paragraph.

countries. The over-weighting of the advanced industrial countries in the sample may result in biased changes in the mean globalization over time. In analysis of the impacts of globalization, the use of switching regression is important to account for differences in responsiveness by level of development, as there is indication that globalization enriches rich countries, at the expense of poor countries. The phenomenon of colonialism's (or lack of) contribution to economic development would be another aspect to incorporate in the index and to test.

The sample of countries should be expanded to include more developing and transition countries. In analysis of the impacts of globalization, panel data static and dynamic estimation approaches should ideally be used. This would enable researchers to control for unobservable country-specific effects and to model the temporal patterns of key variables like inequality, growth, globalization and country-specific rate of (skill-biased) technological change. Access to panel data would also enable identification of globalization effects by performance comparison of countries over time, before and after globalization and by the use of matching techniques to construct counterfactuals. This would provide valuable information on globalization, its consequences and redistributive policies to counteract the negative impacts.

Quantification of globalization is a new field and quite scarce. There is need to account for several dimensions and identify new ones as well as to test for their relevance in computation of an index of globalization. Measurement issues play an important role in empirical research, and a new index would differ from the ones presented above in a number of ways. First, it would incorporate more components and be modelled non-parametrically as well as parametrically where the weights are estimated rather than chosen on an ad hoc basis. Second, it would compute disaggregated principal component analysis and allow for time variation. Third, the index should be designed in such a way that it can further be used for international, regional and within-region comparisons and in the evaluation of the impact of globalization on the welfare of nations and sub-groups of population within countries and regions. Fourth, one should perform sensitivity analysis of the composite index by examining functional forms and assessment and consistency of weights given to each factors. These are important issues in the understanding of how globalization functions and as a guide to policy formulation and evaluation.

The identification of major determinants of globalization, quantification of their effects on the ranking of countries are key issues forming the basis on which policy options can be provided. Since rich countries benefit most from the fruits of globalization, developing countries need advantageous and non-protectionist policies to effectively compete in the international markets. Analysis will help in identifying ways for a fair treatment of products, services and people that enables poor countries to benefit from globalization to a greater extent than they do

currently. To reduce the negative effects on inequality and the poor from increased openness and globalization, these need to be accompanied by comprehensive redistributive policies and an improvement in social protection in developing countries.

The World Bank and the UN should create a new dataset. This new database could serve as a source for researchers conducting empirical research on globalization and its relation with other macro variables such as inequality in wages, income or health, poverty and economic growth.¹¹ The modified composite globalization index would differ from the one above by incorporating more components like financial markets, institutions, environment, democracy, conflict, labour market, public policy and cultural differences be modelled non-parametrically as well as parametrically where the weights are estimated rather than chosen on an ad hoc basis. This will improve analysis of the determinants of globalization by paying more attention to the country sample, measurement problems, data issues and data sources.

6. SUMMARY AND CONCLUSIONS

This study presents an index that quantifies the level and development of the globalization process to rank countries. The index is composed of four main components: economic integration, personal contact, internet technology diffusion, and political engagements, each developing differently over time. The Kearney-based index, which is nonparametric, is compared with the alternative parametric principal components index. In the former, weights are assigned on an ad hoc basis to each indicator and factor component, while in the latter they are estimated. The Kearney index, despite its limitations, performed better in capturing the effects of the financial crises in 1997/98. However, the two indices differ less in the performance when looking at the variations in globalization across countries or regions.

The results show that internal and external conflicts seem to effectively reduce the globalization prospects of countries. The low rank of countries is often associated with political and technology factors that several developing countries are unable to address. The high-ranked countries share similar patterns in various index component distributions. The mean globalization by region shows that technology factors play an important role in the ranking of regions. This breakdown of the index into major components provides possibilities to identify sources of globalization and associate it with economic policy measures to bring about desirable changes in national and international policies.

¹¹ For discussion of data issues and databases used in analysis of growth, poverty, inequality, growth and globalization, see Heshmati (2005).

Although the current version of the index quantifies the level of globalization well, it has certain limitations and the results should be interpreted with caution; it is to be considered as a simple and partial measure. We have addressed a number of extensions to overcome several of the shortcomings, which concern an axiomatic approach to set out the desirable properties of the index, identification and incorporation of more dimensions or components and the use of non-parametric and a parametric estimation of the index to avoid the choice of weights attached to each index component on an ad hoc basis. The use of panel data will certainly shed light on the temporal patterns of globalization and its regional variability.

A decomposition of the total variation in globalization into between and within country components is important. For data limitation reasons, this study focused on only the among-country variation. The within-country factors might explain much of the variance and, in particular, it can provide useful information about the distributional shifts within cohorts, across skill groups, and sectors and regions. Initial endowments and how countries integrate into the international economy determine the globalizations distributional effects. These are important issues in understanding how globalization functions and how to use the generated information in policy formulation and development evaluations.

In view of this, it must be noted that the simpler approach adopted here was mainly due to problems of data availability. Globalization is considered a possible source and deriving force of inequality differences across countries and over time. Identification and quantification of its effects will benefit the allocation of resources by policy-makers. This research not only measures but it also gives guidelines on how empirically to link globalization factors such as inequality, poverty and growth. Although it is in an early stage of development, the paper has identified several directions along which future advances can be made.

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Table 1. Summary statistics, globalization data, 1995-2000, NT=62x6=372 observations.

Variable	Mean	Median	Std Dev	Minimum	Maximum
<u>A. Economic integration</u>					
Trade	0.7774	0.6750	0.5053	0.1570	3.4750
Foreign direct investment ($w=2$)	0.0426	0.0285	0.0501	0.0000	0.3307
Portfolio investment ($w=2$)	0.0575	0.0229	0.1498	0.0000	1.6693
Income payments and receipts	0.0899	0.0604	0.0986	0.0055	0.7821
<u>B. Personal contacts</u>					
Intl telephone traffic ($w=2$)	97.4325	44.2450	128.9096	0.9000	707.4600
Intl travel and tourism ($w=1$)	0.8056	0.3480	1.0561	0.0030	6.3610
Transfer payments & receipts ($w=1$)	0.0335	0.0266	0.0298	0.0000	0.1504
<u>C. Technology</u>					
Internet users ($w=2$)	0.0639	0.0178	0.1011	0.0000	0.5944
Internet hosts ($w=1$)	0.0126	0.0016	0.0272	0.0000	0.2950
Secure internet servers ($w=1$)	0.0111	0.0010	0.0294	0.0000	0.2830
<u>D. Political engagements</u>					
Embassies in country ($w=1$)	71.6129	68.5000	34.1968	13.0000	172.0000
Membership in intl org. ($w=1$)	48.8065	47.8000	10.3816	6.0000	77.0000
Particip. in UN SC missions ($w=1$)	0.2512	0.2220	0.2051	0.0000	0.7780
<u>1. Unweighted Kearney index components</u>					
Economic integration	0.6770	0.5330	0.5850	0.0560	3.6580
Personal contacts	0.5570	0.4800	0.4270	0.0140	2.3470
Technology	0.3690	0.0880	0.5450	0.0000	2.6050
Political engagements	1.3770	1.3610	0.5400	0.0060	2.7010
Unweighted globalization index	2.9800	2.4370	1.4200	1.0690	7.9780
<u>2. Weighted Kearney index components</u>					
Economic integration	1.0070	0.7710	0.9130	0.0600	5.6580
Personal contacts	0.7240	0.5760	0.6160	0.0240	3.2780
Technology	0.5370	0.1480	0.7620	0.0000	3.2090
Weighted4 globalization index	3.6460	2.8250	2.0350	1.1680	11.0550
<u>3. Principal Component (PC) Analysis</u>					
First PC index	0.0000	-0.4310	1.0000	-1.0290	5.2500
Second PC index	0.0000	0.0950	1.0000	-4.2790	4.5530
Third PC index	0.0000	0.0430	1.0000	-6.8100	3.7200

Note: w =weight attached to an indicator.

Table 2. Pearson correlation coefficients, N = 372 observations.

	1	2	3	4	5	6	7	8	9	10	11
1. year	1.000										
2. economic	-0.138	1.000									
	0.008										
3. economicw	-0.165	0.989	1.000								
	0.001	0.001									
4. personal	0.040	0.587	0.559	1.000							
	0.442	0.001	0.001								
5. personalw	0.035	0.658	0.635	0.976	1.000						
	0.499	0.001	0.001	0.001							
6. technology	0.115	0.291	0.315	0.345	0.452	1.000					
	0.026	0.001	0.001	0.001	0.001						
7. Technologyw	0.144	0.299	0.322	0.358	0.463	0.993	1.000				
	0.005	0.001	0.001	0.001	0.001	0.001					
8. political	0.005	0.031	0.089	0.024	0.084	0.395	0.382	1.000			
	0.928	0.547	0.085	0.640	0.107	0.001	0.001				
9. gindex	0.001	0.712	0.730	0.684	0.770	0.758	0.757	0.552	1.000		
	0.983	0.001	0.001	0.001	0.001	0.001	0.001	0.001			
10.gindexw4	-0.008	0.763	0.785	0.686	0.783	0.755	0.761	0.474	0.991	1.000	
	0.875	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001		
11.princomp	0.295	0.639	0.642	0.633	0.723	0.713	0.728	0.395	0.877	0.884	1.000
	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	

Note: ...w indicates weighted index component. Principal component index (princomp) is based on the first principal component. p-values are given under the coefficients.

Table 3. Average globalization index by country, ranked by weighted Kearney index (gindexw4).

Rank	country	econ	econw	pers	persw	tech	techw	polit	gindx	gindexw4	pccomp	pcrank
1	Ireland	2.477	3.615	1.899	2.738	0.560	0.779	1.510	6.446	8.643	2.697	1
2	Singapore	2.729	3.947	1.551	2.530	0.920	1.365	0.734	5.935	8.575	2.152	2
3	Switzerland	1.545	2.432	1.746	2.677	0.999	1.339	1.689	5.979	8.137	2.022	3
4	Sweden	1.444	2.394	0.900	1.310	1.346	2.059	2.178	5.868	7.941	1.706	4
5	Canada	0.872	1.348	0.825	1.361	1.467	2.027	2.434	5.598	7.170	1.428	6
6	Netherlands	1.892	3.098	0.927	1.323	0.807	1.127	1.577	5.202	7.125	1.477	5
7	Norway	0.874	1.410	0.836	1.205	1.699	2.581	1.685	5.094	6.881	1.260	8
8	US	0.436	0.750	0.275	0.486	2.400	2.973	2.531	5.641	6.739	1.362	7
9	Finland	0.790	1.253	0.731	0.991	1.752	2.524	1.818	5.091	6.586	1.231	9
10	Denmark	1.242	1.825	1.000	1.421	0.903	1.359	1.925	5.069	6.529	1.199	10
11	Austria	0.890	1.372	1.272	1.733	0.761	1.126	2.081	5.005	6.313	1.104	11
12	UK	1.265	1.924	0.545	0.875	0.736	1.050	2.181	4.727	6.030	0.983	12
13	New Zealand	0.603	0.907	0.699	1.133	1.311	1.729	1.144	3.757	4.913	0.652	13
14	France	0.683	1.131	0.479	0.708	0.302	0.473	2.564	4.028	4.875	0.574	15
15	Portugal	0.883	1.435	1.008	1.203	0.335	0.598	1.404	3.630	4.641	0.170	19
16	Germany	0.712	1.162	0.472	0.716	0.513	0.793	1.960	3.657	4.631	0.449	16
17	Australia	0.535	0.883	0.354	0.535	1.309	1.712	1.396	3.594	4.526	0.427	17
18	Czech Rep.	0.833	1.189	1.281	1.400	0.225	0.347	1.410	3.749	4.346	0.591	14
19	Italy	0.649	1.048	0.544	0.694	0.210	0.333	2.096	3.499	4.171	0.073	23
20	Spain	0.635	1.051	0.676	0.825	0.297	0.444	1.530	3.139	3.850	0.104	22
21	Malaysia	1.159	1.500	0.642	0.751	0.145	0.261	1.244	3.190	3.756	0.153	21
22	Panama	1.943	2.607	0.322	0.415	0.039	0.061	0.642	2.947	3.725	0.196	18
23	Hungary	0.898	1.320	0.690	0.794	0.165	0.253	1.283	3.036	3.650	0.154	20
24	Israel	0.547	0.757	0.999	1.306	0.536	0.739	0.764	2.847	3.566	-0.101	24
25	Poland	0.412	0.639	0.565	0.632	0.124	0.214	1.891	2.991	3.376	-0.103	25
26	Argentina	0.473	0.829	0.091	0.124	0.056	0.090	1.981	2.600	3.024	-0.286	28
27	Japan	0.284	0.419	0.073	0.119	0.549	0.906	1.496	2.403	2.940	-0.266	27
28	Greece	0.223	0.310	0.861	1.075	0.154	0.256	1.278	2.515	2.919	-0.331	29
29	Chile	0.784	1.326	0.197	0.251	0.106	0.178	1.124	2.211	2.879	-0.266	26
30	Russian Fed	0.322	0.461	0.090	0.115	0.032	0.056	2.168	2.613	2.801	-0.444	34
31	Saudi ArabE	0.518	0.737	0.959	1.065	0.009	0.018	0.979	2.464	2.799	-0.682	52
32	Nigeria	0.617	0.819	0.305	0.307	0.001	0.001	1.653	2.576	2.781	-0.410	32
33	Egypt	0.242	0.321	0.496	0.511	0.005	0.010	1.904	2.647	2.747	-0.582	43
34	Croatia	0.547	0.788	0.873	1.164	0.111	0.180	0.594	2.125	2.727	-0.421	33
35	Korea Rep.	0.478	0.730	0.258	0.313	0.322	0.597	1.058	2.116	2.698	-0.469	35
36	Botswana	0.811	0.930	1.153	1.224	0.017	0.029	0.477	2.458	2.659	-0.524	38
37	Slovenia	0.510	0.634	0.490	0.717	0.514	0.767	0.500	2.014	2.618	-0.359	30
38	Slovak Rep.	0.631	0.820	0.412	0.512	0.209	0.370	0.875	2.127	2.576	-0.376	31
39	Tunisia	0.441	0.554	0.507	0.556	0.005	0.010	1.288	2.241	2.407	-0.519	37

Table 3. continuous.

Rank	country	econ	econw	pers	persw	tech	techw	polit	gindx	gindxw4	pccomp	pcrank
40	Mexico	0.550	0.835	0.235	0.314	0.041	0.068	1.122	1.947	2.340	-0.508	36
41	Pakistan	0.186	0.247	0.378	0.385	0.001	0.001	1.674	2.238	2.307	-0.675	51
42	China	0.393	0.647	0.043	0.047	0.009	0.017	1.577	2.022	2.289	-0.617	44
43	Senegal	0.350	0.456	0.535	0.555	0.003	0.006	1.263	2.151	2.279	-0.685	53
44	Venezuela	0.467	0.713	0.102	0.133	0.038	0.067	1.312	1.919	2.226	-0.528	39
45	SouthAfrica	0.507	0.844	0.123	0.155	0.145	0.230	0.985	1.759	2.215	-0.635	47
46	India	0.166	0.286	0.215	0.216	0.004	0.008	1.697	2.082	2.208	-0.667	49
47	Indonesia	0.451	0.619	0.069	0.072	0.006	0.012	1.492	2.018	2.195	-0.572	42
48	Kenya	0.196	0.209	0.495	0.500	0.003	0.005	1.459	2.153	2.173	-0.774	58
49	Philippine	0.802	1.086	0.161	0.185	0.013	0.025	0.876	1.852	2.172	-0.564	40
50	Romania	0.345	0.503	0.303	0.339	0.044	0.079	1.207	1.899	2.128	-0.624	45
51	Thailand	0.647	0.898	0.133	0.149	0.021	0.036	1.034	1.835	2.117	-0.569	41
52	Bangladesh	0.076	0.092	0.414	0.414	0.000	0.000	1.609	2.099	2.116	-0.769	57
53	Brazil	0.258	0.467	0.045	0.056	0.059	0.091	1.464	1.825	2.078	-0.629	46
54	Turkey	0.260	0.345	0.278	0.318	0.036	0.062	1.301	1.875	2.026	-0.667	50
55	Taiwan	0.530	0.740	0.372	0.502	0.427	0.725	0.010	1.339	1.977	-0.647	48
56	Sri Lanka	0.406	0.528	0.597	0.612	0.006	0.011	0.721	1.730	1.872	-0.851	59
57	Morocco	0.234	0.249	0.599	0.634	0.003	0.005	0.953	1.789	1.841	-0.863	60
58	Uganda	0.221	0.354	0.824	0.824	0.001	0.002	0.619	1.664	1.799	-0.992	62
59	Colombia	0.347	0.590	0.133	0.163	0.031	0.056	0.962	1.472	1.770	-0.732	54
60	Ukraine	0.349	0.444	0.240	0.273	0.010	0.017	1.033	1.632	1.766	-0.750	55
61	Peru	0.342	0.547	0.159	0.182	0.021	0.039	0.899	1.422	1.668	-0.754	56
62	Iran	0.085	0.087	0.049	0.057	0.002	0.005	1.055	1.191	1.203	-0.953	61

Note: w at the end of a variable indicates weighted4 index component. The principal component index (pccomp) is based on the first principal component.

Table 4. Globalization index by region, ranked by weighted globalization index.

Region	Economic		Personal		Technology		Political		GIndex	Principal
	UW	W	UW	W	UW	W	UW	UW		
West Europe	1.080	1.697	0.926	1.300	0.758	1.123	1.832	4.597	5.952	0.981
North America	0.612	0.972	0.538	0.879	1.622	2.110	1.876	4.648	5.838	0.967
South East Asia	1.158	1.610	0.511	0.737	0.221	0.340	1.076	2.966	3.763	0.120
East Europe	0.539	0.755	0.549	0.661	0.159	0.253	1.218	2.465	2.887	-0.259
Middle E&N Africa	0.374	0.494	0.640	0.732	0.099	0.141	1.198	2.311	2.564	-0.569
Latin America	0.645	0.989	0.161	0.205	0.049	0.081	1.188	2.043	2.464	-0.438
East Asia	0.421	0.634	0.187	0.245	0.327	0.561	1.035	1.970	2.464	-0.438
sub-Saharan Africa	0.450	0.602	0.572	0.594	0.028	0.045	1.076	2.127	2.318	-0.670
South Asia	0.184	0.248	0.331	0.337	0.003	0.005	1.351	1.868	1.941	-0.783

Note: Weighted (W) and unweighted (UW) index, Kearney (GIndex) and Principal component (Principal Comp.) globalization indices.

Table 5. Globalization index over time.

Year	Economic		Personal		Technology		Political		GIndex	Principal
	UW	W	UW	W	UW	W	UW	UW		
1995	0.726	1.120	0.522	0.682	0.266	0.364	1.380	2.893	3.546	-0.340
1996	0.760	1.156	0.576	0.745	0.316	0.450	1.374	3.026	3.725	-0.280
1997	0.861	1.313	0.522	0.677	0.349	0.492	1.359	3.091	3.841	-0.157
1998	0.595	0.865	0.543	0.715	0.404	0.585	1.388	2.929	3.553	0.021
1999	0.545	0.762	0.612	0.790	0.441	0.662	1.380	2.978	3.595	0.235
2000	0.577	0.828	0.566	0.736	0.438	0.669	1.381	2.961	3.614	0.521

Note: Weighted (W) and unweighted (UW) index, Kearney (GIndex) and Principal component (Principal Comp.) globalization indices.

Table 6. Percentage change in globalization index.

Year	Economic		Personal		Technology		Political		GIndex	Principal
	UW	W	UW	W	UW	W	UW	UW		
1995/1996	10.07	11.51	18.80	15.70	74.23	74.20	-0.02	5.43	6.15	45.08
1996/1997	16.93	19.52	-8.05	-8.05	32.25	27.12	-0.33	2.53	3.77	18.90
1997/1998	-28.19	-30.18	3.27	3.99	56.89	59.28	2.20	-5.23	-7.17	28.85
1998/1999	-9.41	-13.53	16.96	14.81	52.85	55.74	0.67	1.82	0.80	19.48
1999/2000	9.06	13.07	-6.79	-6.52	29.65	30.95	0.63	-0.55	0.41	19.54

Note: Weighted (W) and unweighted (UW) index, Kearney (GIndex) and Principal component (Principal Comp.) globalization indices.

Figure 1. Decomposition of the weighted four component globalization index ranked by the level of the index.

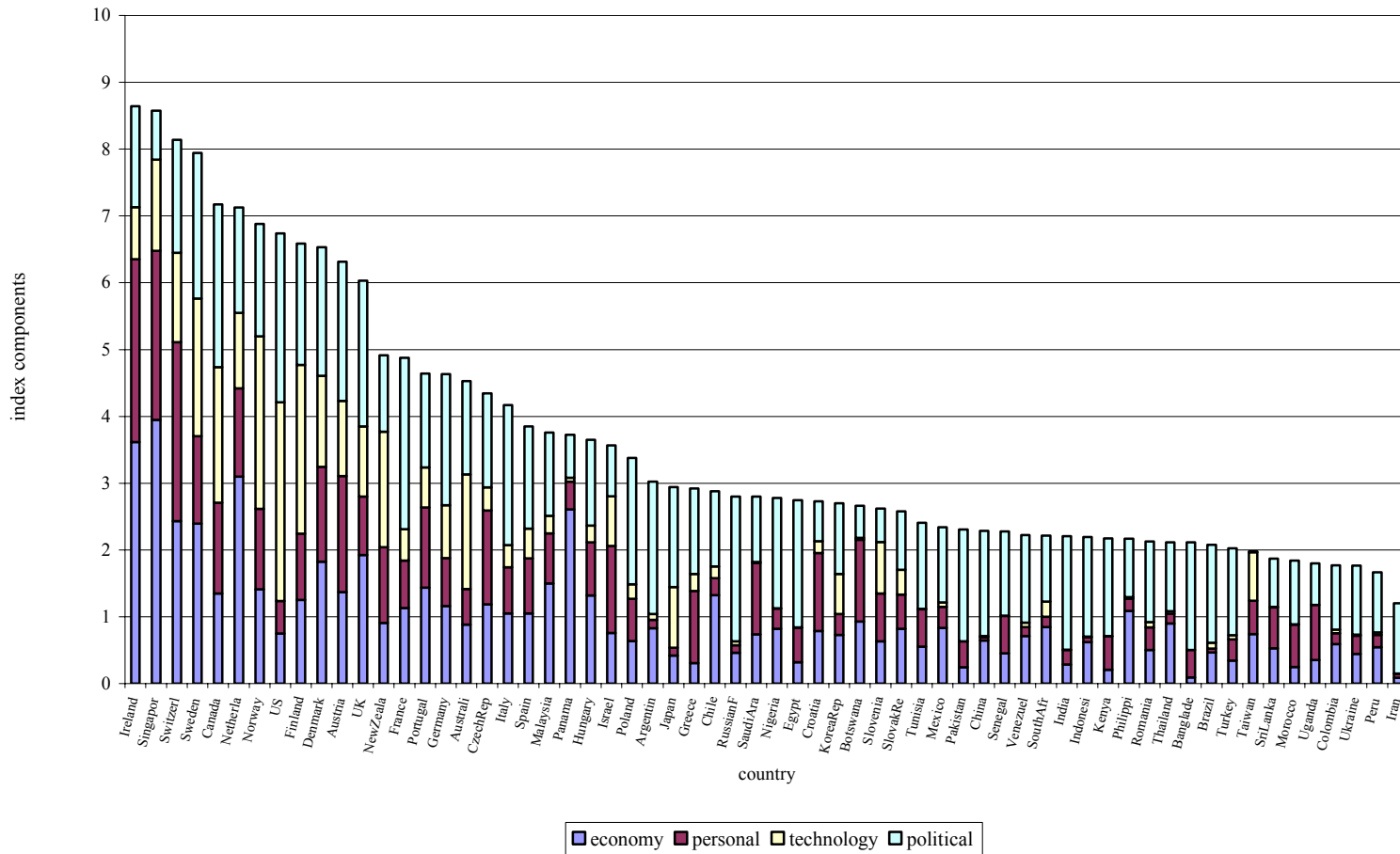


Figure 2. Globalization indices ranked by the level of the principal component index.

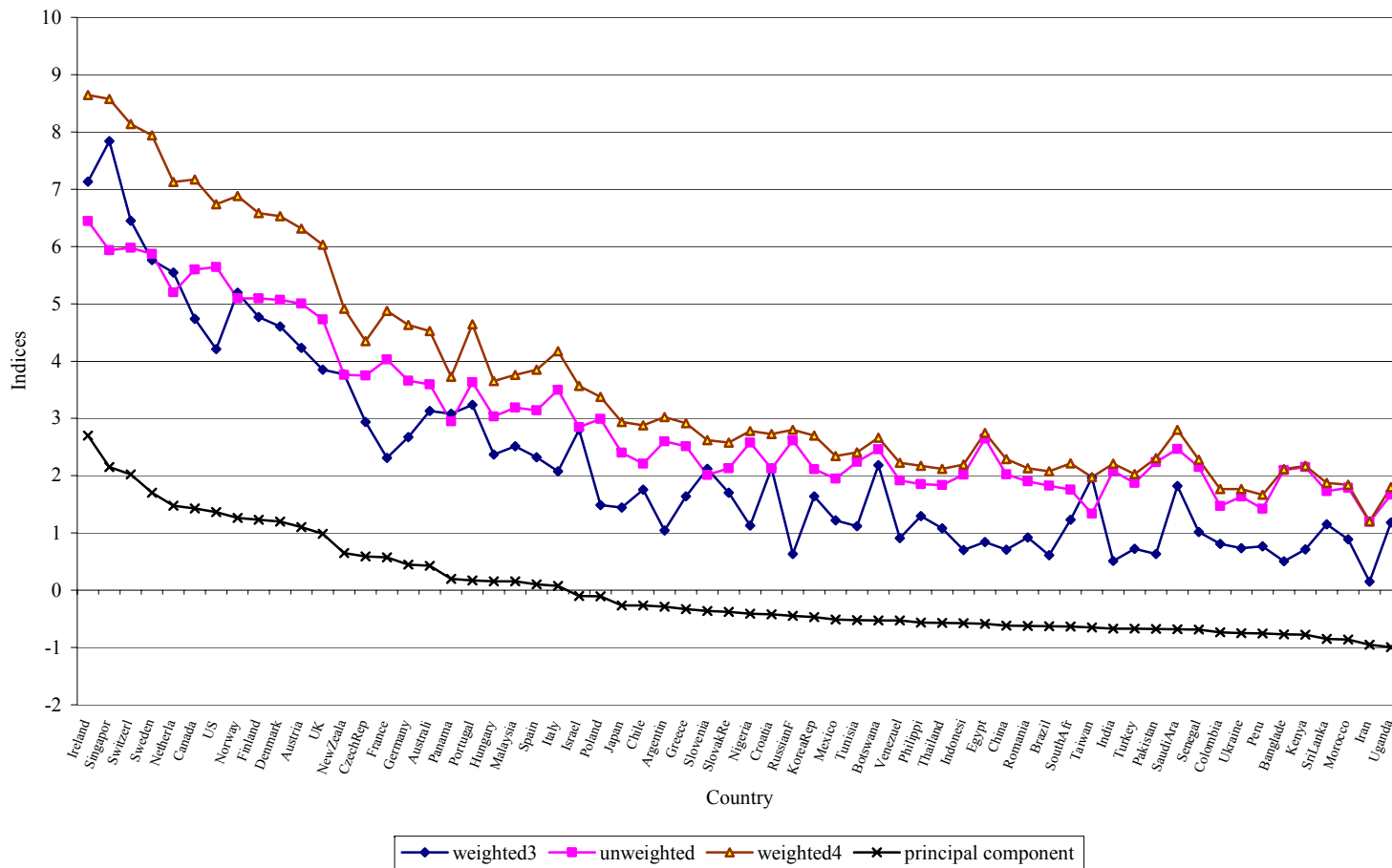


Figure 3. Development of the weighted four component globalization index over time.

