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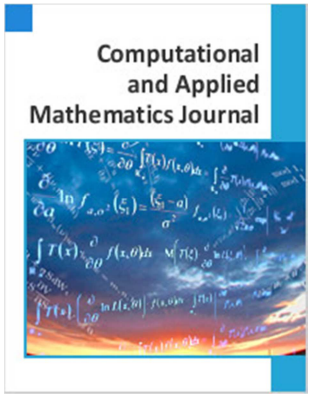

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National Index Theory: Chomskyan Globalization and Well-Being

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Abstract
Despite the plethora of socio-economic indexes, there has been little quality assurance of the unidimensionality of their component indicators. The present paper invokes reliability coefficient alpha, a standard of psychological testing, to develop unidimensional indexes of globalization and well-being. Under three axioms, populated-weighted alpha coefficients are computed from unobservable scores of 4.255 billion people in the G20 nations. These coefficients quality assure a regression of well-being on globalization over the same G20 population. The slope of this latent regression is computed from a population-weighted regression over our unidimensional indexes. This computation shows, without survey sampling or questionnaire interrogation, that decent globalization accounts for 86% of worldwide well-being.

1. Introduction

1.1. Globalization

Noam Chomsky [2, pp. 15-16, 35] raised the question, "globalization for whom"?

Adam Smith … observed that the "merchants and manufacturers" of England were "the principal architects" of state policy, and made sure that their own interests "were most peculiarly attended to," however "grievous" the effects on others … his observation … stands … alongside … the maxim of Thucydides that the strong do as they wish, and the weak suffer as they must.

The current version is called "globalization." Like most terms of political discourse, this term has two meanings: a literal meaning and a technical meaning employed for doctrinal warfare. In the literal sense, "globalization" means … international integration – economic, cultural, political – that serve the interests of people: real people, of flesh and blood. But in the doctrinal system … the term "globalization" in its technical sense, *refers* to a particular form of international economic integration, with a mixture of liberal and protectionist measures and many related to investor rights, not trade, all designed to serve the interests of investors, financial institutions, and other centers of concentrated state-private power – those granted the rights of super-persons by the courts. (Italics mine.)

Technical globalization has also been described by Varoufakis [3], who portrayed the United States as *The Global Minotaur,* receiving foreign capital and controlling the world economy since the Bretton Woods Conference near the end of World War II (http://en.wikipedia.org/wiki/Bretton_Woods_system). Recent sophisticated attempts to tighten global control were reported by Greenwald [4]: the 2009 Quadrennial Intelligence Community Review—provided by NSA whistleblower Edward Snowden … recommends "a multi-pronged, systematic effort to gather open source and proprietary information through overt means, clandestine penetration (through physical and cyber means), and

counterintelligence". In particular, the … report envisions "cyber operations" to penetrate "covert centers of innovation" such as R&D facilities.

These 2009 recommendations have been codified by presidential policy directive 20 [5]:

Barack Obama has ordered his senior national security and intelligence officials to draw up a list of potential overseas targets for US cyber-attacks. ... The 18-page, Presidential Policy Directive 20 issued in October last year but never published, states that what it calls Offensive Cyber Effects Operations (OCEO) "can offer unique and unconventional capabilities to advance US national objectives around the world with little or no warning to the adversary or target and with potential effects ranging from subtle to severely damaging". … It says the government will "identify potential targets of national importance where OCEO can offer a favorable balance of effectiveness and risk as compared with other instruments of national power". … In the presidential directive, the criteria for offensive cyber operations in the directive is not limited to retaliatory action but vaguely framed as advancing "US national objectives around the world". Obama further authorized the use of offensive cyber attacks in foreign nations without their government's consent whenever "US national interests and equities" require such nonconsensual attacks.

The global reach of this directive was emphasized by Greenwald [4]:

the NSA was caught spying on plainly financial targets such as the Brazilian oil giant Petrobras; economic summits; international credit card and banking systems; the EU antitrust commissioner investigating Google, Microsoft, and Intel; and the International Monetary Fund and World Bank.

Greenwald [6] (p. 138) summarized:

The reasons for economic espionage are clear enough. When the United States uses the NSA to eavesdrop on the planning strategies of other countries during trade and economic talks, it can gain enormous advantage for American industry.

Western discourse is dominated by technical globalization in the military-industrial-media-academic complex (http://janoberg.wordpress.com/tag/mimak). Chomsky [2, p. 38], however, insisted that:

the answer to the question, globalization for whom? depends on which meaning of the term we choose: the literal meaning or the technical meaning that is standard in public discourse. If we mean "globalization" in the technical sense, then … it will be globalization in the interests of the principle architects of policy. The interests of the people may be helped or harmed, but that is incidental. … Today, popular struggles in Latin America show real promise of serving as an inspiration to others worldwide, in a common quest for globalization in a form that should be the aspiration of decent people everywhere.

The present study uses a modification of the Swiss Economic Institute's KOF index as a proxy for Chomskyan globalization. (KOF is an acronym for "Konjunktur-forschungsstelle", which means Economic Research Institute). The KOF index approximates the literal meaning of globalization more closely, and is more widely used, than other measures of this construct [7].

1.2. Well-Being

Chomsky [2, pp. 36-37] noted:

Clinton administration analysts concluded that "globalization of the world economy" will lead to a "widening economic divide" along with "deepening economic stagnation, political instability, and cultural alienation," … a likely consequence of the recommended programs of U. S. aggressive militarism, just as a " widening divide" is the anticipated consequence of the specific version of international integration that is misleadingly called "globalization" and "free trade" in the doctrinal system.

Aly [8] views this century's economic, political, and cultural turbulence as the major causal factors in the Arab Spring and the Occupy Wall Street demonstrations in the United States. These international movements cry out for an alternative measure of globalization and the assessment of its impact on global well-being.

The venerable and continuing approach to well-being measurement has been based on the interrogation of individuals in survey samples. The questionnaire measurement of life quality launched the social indicators movement in the 1970s with papers and books by Levy and Guttman [9] and Andrews and Withy [10, 11]. The burgeoning survey industry, however, has been shadowed by long-standing skepticism about the incremental benefit of subjective indicators over and above objective indicators already in use [12] [13] [14] [15]. The host of problems associated with subjective survey measurement point up the pitfalls of survey sampling, which may not be needed in the first place (cf. Lyberg et al. [16] and Section 6 below).

Here we replace subjective indicators of well-being with objective indicators that index this construct. However, despite the prominence of objective indexes in business, government, academia, and media, there has been little investigation of the unidimensionality of their component indicators. The present paper invokes the well-known coefficient alpha to assess the unidimensionality of national socio-economic indexes. These indexes, generated here from individual scoring without individual data, enable a regression over unobservable distributions of their humanly experienced impacts. This regression reveals the effect of Chomskyan globalization on well-being without survey sampling or questionnaire interrogation.

1.3. The Study Plan

The present study reaches out to the nations of the G20: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, UK, and USA. This global evaluation replaces survey data with national indicators for

assessing sovereign performance.

Section 2 lays down three axioms supporting a population-weighted alpha coefficient that assesses the unidimensionality of a national index. Sections 3 and 4 describe quality assured indicators that make up our globalization and well-being indexes. These indicators and indexes overlay latent population distributions of human experience. Section 5 shows that the slope of personal well-being on personal globalization may be computed as the slope of a population-weighted regression over their national indexes. This computation reveals a close relationship between Chomskyan globalization and well-being. Section 6 emphasizes the advantages of population computation over sample estimation and anticipates the discovery of new uinidimensional indexes from the meta-aggregation of Big Data.

2. A Population-Weighted Coefficient Alpha

We generalize the reliability coefficient alpha, used in psychological testing [17] [18] [19] [20], to countries c = 1, …, C, each with population size N_c. Axioms 1 and 2 and corollary 1 address J national indicators. Corollaries 2 and 3 address the composite index derived from these indicators. Axiom 3 produces a computed coefficient alpha that assesses the unidimensionality of this index.

Existential axiom 1. Individual ci's unobservable values X_{cij} (j = 1, …, J) reside in a 2-level population running over i = 1, …, N_c in countries c = 1, …, C.

First-moment axiom 2. Country c's observed indicator j is the mean $X_{cj} = \Sigma_i X_{cij}/N_c$.

Indicator corollary 1. The population's observed indicator j is $X_j = \Sigma_c N_c X_{cj}/\Sigma_c N_c$.

Score corollary 2. Individual ci's unobservable score is $X_{ci} = (X_{ci1} + \ldots + X_{ciJ})/J$.

Index corollary 3. Country c's observed index is the mean $X_c = \Sigma_j X_{cj}/J = \Sigma_i X_{ci}/N_c$.

Under these axioms and corollaries the unobservable population coefficient alpha may be written as

$$A = [(J/(J-1)]\{1 - [\Sigma_j\Sigma_c\Sigma_i(X_{cij} - X_j)^2/J^2\Sigma_c\Sigma_i(X_{ci} - X)^2]\}, \quad (1)$$

where $X = \Sigma_c N_c X_c/\Sigma_c N_c$ (cf. Bechtel [20, p. 255] [21, p. 628]).

Our task is now to compute the unobservable alpha coefficient in (1). First, partition the sums of squares in (1) as

$$\Sigma_j\Sigma_c\Sigma_i(X_{cij} - X_j)^2 = \Sigma_j\Sigma_c\Sigma_i(X_{cij} - X_{cj})^2 + \Sigma_j\Sigma_c\Sigma_i(X_{cj} - X_j)^2 \quad \text{and} \quad (2a)$$

$$\Sigma_c\Sigma_i(X_{ci} - X)^2 = \Sigma_c\Sigma_i(X_{ci} - X_c)^2 + \Sigma_c\Sigma_i(X_c - X)^2. \quad (2b)$$

Next set

$$\omega_j = \Sigma_c\Sigma_i(X_{cij} - X_{cj})^2/\Sigma_c\Sigma_i(X_{cj} - X_j)^2 \text{ for } j = 1, \ldots, J \text{ and} \quad (3a)$$

$$\omega = \Sigma_c\Sigma_i(X_{ci} - X_c)^2/\Sigma_c\Sigma_i(X_c - X)^2. \quad (3b)$$

as the ratios of the within-to-between country sums of squares in (2a) and (2b). Then, write the sums of squares in (1) as $\Sigma_j(1+\omega_j)\Sigma_c\Sigma_i(X_{cj} - X_j)^2$ and $(1+\omega)\Sigma_c\Sigma_i(X_c - X)^2$, giving

$$A = [(J/(J-1)]\{1 - [\Sigma_j(1+\omega_j)\Sigma_c\Sigma_i(X_{cj} - X_j)^2/J^2(1+\omega)\Sigma_c\Sigma_I\,(X_c - X)^2]\}.$$

Homogeneity axiom 3. The ratios of the within-to-between country sums of squares in (3a) and (3b) are homogeneous, i.e. $\omega_1 = \ldots = \omega_J = \omega$.

It may be shown that axiom 3 gives a one-way J-variate analysis of variance (cf. C. R. Rao [22], Sections 8c and 8d) *with the stipulation* that the within-country covariance matrix is equal to ω times the observable between-country covariance matrix. Thus, under axiom 3 we have C unobservable J-variate populations, with mean vectors equated to national indicators and within-country covariance matrix known up to multiplication by ω. This implies that the total covariance matrix of the G20 population is (1+ω) times its between-country covariance matrix.

Under axiom 3

$$A = [(J/(J-1)]\{1 - [\Sigma_j\Sigma_c N_c(X_{cj} - X_j)^2/J^2\Sigma_c N_c(X_c - X)^2]\} \quad (4)$$

computes the unobservable population coefficient in (1) from J national indicators X_{cj} and their composite national indexes X_c. Formula (4) assesses the unidimensionality of 4.255 billion scores X_{ci} in the G20. Because the within-country covariance matrix of the G20 nations is known up to multiplication by ω, Formula (4) is invariant over small to large variation in this 2-level population.

3. Quality Assured Globalization (J=5)

The KOF Index of globalization was inspired by *Visions of Governance for the 21st Century* in Cambridge, MA, USA [23]. It was introduced in 2002, published in 2006 [24], and updated and detailed in 2008 [25].

The index is produced by the KOF Swiss Economic Institute at ETH Zurich, who defines globalization as:

the process of creating networks of connections among actors at multi-continental distances, mediated through a variety of flows including people, information and ideas, capital and goods. Globalization is conceptualized as a process that erodes national boundaries, integrates national economies, cultures, technologies and governance and produces complex relations of mutual interdependence. (http://globalization.kof.ethz.ch/)

Bechtel [1] lists the sub-indicators of the six indicators in Table 1 that make up the KOF Index. The Swiss Federal Institute of Technology describes the standardization of these indicators [26]:

each of the variables … is transformed to … a scale of one to hundred, where hundred is the maximum value for a specific variable over the 1970-2012 period and one is the minimum value. Higher values denote greater globalization. The data are transformed according to the percentiles of the original distribution.

Formula (4) returns an unacceptably low alpha of .281 for the KOF index. The deletion of the indicator *political globalization* in the KOF composite reveals a striking spike in

unidimensionality to .842. Therefore, we employ the five remaining indicators in Table 1 as our proxy for Chomskyan globalization.

Table 1. *Components of the KOF Globalization Index.*

Indicator	Sub-indicators
Actual flows in % GDP (j =1)	Trade, Foreign direct investment, stocks, Portfolio investment, Income payments to foreign nationals
Low restrictions (j = 2)	Hidden import barriers, Mean tariff rate, Taxes on international trade, Capital account restrictions
Personal Contact (j = 3)	Telephone traffic, Transfers, Foreign population, International letters
Information Flows (j = 4)	Internet users, Television, Trade in newspapers
Cultural Proximity (j = 5)	Number of McDonalds, Number of Ikea, Trade in books
Political Globalization (j = 6)	Embassies in country, Membership in international organizations, Participation in U.N. Security Council missions, International treaties

4. Quality Assured Well-Being (J=5)

Bechtel [1] found that KOF globalization reduces income inequality in Europe and mitigates its negative impacts on survey reported economic security, consumer demand, voter turnout, political trust, societal satisfaction, and well-being. Replacing survey data with macro indicators, and European data with G20 data, the present paper seeks a new index of well-being. Formula (4) was first applied to the tentative composite *{GDP per capita, consumption per capita, physicians per 1000 people, primary teacher-pupil ratio, secondary teacher-pupil ratio, GDP growth}*. Each of these national indicators was standardized to a mean 50 and standard deviation 10. However, the population-weighted alpha coefficient for this composite index was only .690. With the removal of *GDP growth*, Formula (4) returned a marked rise in coefficient alpha to .904. Growth as a necessity for well-being has also been repudiated by the Leeds UK Steady State Economy Conference [27], the United Nations Division for Sustainable Development [28], and the Annual Forum of The Progressive Economy Initiative [29]. Guided by this economic consensus, our new coefficient alpha, and the adage "healthy, wealthy, and wise", we select the remaining five indicators in the above composite as components of our well-being index.

5. Globalization's Impact on Well-Being

5.1. Regressing Unobservable Scores

In Section 2 overwrite X by G, then by Q, and set J = 5 and C = 19. Next, under corollary 2, write the G20 population regression of well-being scores on globalization scores:

$$Q_{ci} = \kappa + \beta G_{ci} + \varphi_{ci} \ (i = 1, \ldots, N_c, c = 1, \ldots, 19). \quad (5)$$

In (5) φ_{ci} is specification error, and the slope is OLS identified by

$$\beta = \Sigma_c\Sigma_i(G_{ci} - G)(Q_{ci} - Q)/\Sigma_c\Sigma_i(G_{ci} - G)^2, \quad (6)$$

where $G = \Sigma_c N_c G_c / \Sigma_c N_c$ and $Q = \Sigma_c N_c Q_c / \Sigma_c N_c$ are the means of the latent G20 population distributions.

The slope β and R^2 for regression (5) follow from

Homogeneity lemma 1. Under axiom 3 and G and Q substitutions for X, ratios of within-to-between country sums of squares and products are

$$\omega = \Sigma_c\Sigma_i(G_{ci} - G_c)^2/\Sigma_c\Sigma_i (G_c - G)^2 = \Sigma_c\Sigma_i(Q_{ci} - Q_c)^2/\Sigma_c\Sigma_i (Q_c - Q)^2 = \Sigma_c\Sigma_i(G_{ci} - G_c)(Q_{ci} - Q_c)/\Sigma_c\Sigma_i(G_c - G)(Q_c - Q).$$

Thus, the slope in (6) and its coefficient of determination may be written as

$$\beta = (1+\omega)\Sigma_c\Sigma_i(G_c - G)(Q_c - Q)/(1+\omega)\Sigma_c\Sigma_i(G_c - G)^2 = \Sigma_c N_c(G_c - G)(Q_c - Q)/\Sigma_c N_c(G_c - G)^2 \text{ and} \quad (7)$$

$$R^2 = \beta^2(1 + \omega)\Sigma_c\Sigma_i (G_c - G)^2/(1 + \omega)\Sigma_c\Sigma_i(Q_c - Q)^2 = \beta^2\Sigma_c N_c(G_c - G)^2/\Sigma_c N_c(Q_c - Q)^2. \quad (8)$$

In (7) and (8) summations run only over countries c = 1, …, 19. These population-weighted coefficients have no sampling variation because they are computed from N_c, G_c, and Q_c rather than from a survey sample.

5.2. Results

The populated weighted slope (7) of well-being on globalization is .554 with $R^2 = .858$. This extremely high R^2 in (8) indicates that Chomskyan globalization accounts for 86% of the variation in well-being as indexed here; i. e. our revised KOF index in Section 3 is a pervasive determinant of our new macro index of well-being in Section 4. This result confirms Bechtel's [1] finding that European globalization increases well-being as reported on survey-questionnaires.

Formulas (7) and (8) were computed from the Stata [19] command

regress WELL GLOBAL [fweight = popc],

where popc is the population of country c = 1, …, 19. Under axioms 1–3 the population-weighted slope (7) equals the slope of the unobservable regression (5) of Q_{ci} on G_{ci}.

6. Discussion

The present paper overrides "The central dogma of statistical inference, that there is a component of randomness in data …" [30, p. 9]. Neither denying nor quantifying uncertainty, we simply ignore it, substituting parameter computation for probabilistic estimation and hypothesis testing. This approach brings compelling advantages to social data science by replacing random variables by real variables and samples by finite populations. Hopefully, this new path will suggest further "statistical thinking and new foundational frameworks" that help sort out "the many philosophical issues

data science presents …" [31].

6.1. Replacing Survey Samples with Indexes

The population-weighted coefficient alpha in Formula (4) decouples index construction from survey sampling. This provides data science with a test for index unidimensionality. The resulting quality assured indexes in Sections 3 and 4 are regressed in Section 5, giving the slope and coefficient of determination in Formulas (7) and (8). Under axioms 1–3 these alpha, slope, and determination coefficients equal those of an unknowable 4.255 billion scores of "the stuff that cannot be measured" [32]. The postulated bi-variate population $\{Q_{ci}$ $G_{ci}\}$, with means equated to reliable macro indexes, is more palpable and plausible than assumed constructs hypothesized to be measured by survey items. Moreover, in most nations questionnaire scores derived from survey self-reports are not available.

Latent alpha, regression, and R^2 coefficients, revealed by the first moments of unknown population distributions, evade the host of issues daunting micro-data sampling. Unidimensionality and regression analyses of sampled micro data are beset by the unresolved competition between randomization-based and model-based sampling [33-35]. Both types of sampling face problems of measurement error [36-37], sampling error [37-38], unit nonresponse [39], missing data [40], and variance estimation [41-42]. Unit nonresponse alone threatens the entire survey industry due to the public's unwillingness to answer mail, telephone, or face-to-face questions [43]. National indexes, quality assured for unidimensionality, circumvent these pitfalls of survey sampling.

6.2. Conclusion

Quality assurance of national globalization and well-being indexes, G_c and Q_c, is provided by Formula (4) which verifies their unidimensionality. These indexes give a population-weighted regression slope (7) and coefficient of determination (8), computed from a 19 (countries) by 2 (variables) spreadsheet without recourse to probabilistic inference. This compression of 4.255 billion scores in the G20 population $\{G_{ci}$ $Q_{ci}\}$ is enabled by the interpretation of G_c and Q_c as first moments of the latent G_{ci} and Q_{ci} distributions.

The slope (7) and R^2 (8), brought by indicators in Sections 3 and 4, show Chomskyan globalization to be a powerful determinate of well-being. This result looks forward to new socio-economic indicators discovered from Big Data sets [44-48]. Such indicators, tested for unidimensionality, could bring indexes that guide policies of sovereign states, the United Nations, the World Bank, the International Monetary fund, and the New Development Bank in Shanghai.

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