

Globalisation as Regression Residual:  
A Theory-Based Approach to Measuring Globalisation

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ABSTRACT: This paper offers a fresh approach to measuring globalisation that is more consistent with major theoretical treatments of the term than are currently used measures. Two distinct levels of analysis for studying globalisation are identified: worldwide and national. The first represents the overall degree of globalisation of the world as a whole while the second represents the degree of globalisation of any particular country. These are often, but need not be, construed in economic terms. Worldwide globalisation is defined in this paper as the degree to which the international variability in international connectivity measures can be traced specifically to national engagement in worldwide systems. As a corollary, national globalisation is defined here as the deviation of a country's international connectivity from what would be expected for a country of its size and level of development. These conceptual definitions yield surprisingly simple and easily implemented operational definitions for globalisation. World Bank data are used to illustrate the trajectories of worldwide and national trade globalisation over the period 1970-2007 using a constant panel of 93 countries representing 85% of the world's population, though the proposed measurement methods can equally well be applied to non-economic data.

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#### **Introduction**

For all the excitement generated by the study of globalisation, there is little agreement on just what globalisation is; Smith (2001) goes so far as to suggest that a common definition may be neither desirable nor productive. Though theorists have formulated a wide variety of definitions of globalisation, empirical studies have generally focused on a single conceptual definition of globalisation, trade openness, typically operationalised as foreign trade divided by gross domestic product (GDP): what Bartleson (2000) terms "globalization as transference." This trade concept of globalisation has been studied for the world as a whole (Bairoch 2000, Chase-Dunn et al 2000) as well as for many panels of individual countries.

Theorists, however, have not generally conceptualised globalisation as trade. For most globalisation theorists, globalisation is a broad, all-pervasive social force that has been reshaping the world in recent decades. Theorists have pointed to the emergence of global forms of economic organisation (Gereffi and Korzeniewicz 1994; Ritzer 1993), global forms of political organisation (Fukuyama 1992; Boswell and Chase-Dunn 2000), global culture (Tomlinson 1999; Featherstone 1990), and even global anti-globalisation resistance movements (Brecher et al 2000, O'Brien et al 2000). Globalisation has become a master variable for understanding social change -- but, specifically, social change that is global in scope. The level of analysis in globalisation theory is generally the world as a whole: the world is globalising, dragging people, organisations, communities, polities, and societies along with it.

On the other hand, empirical researchers, especially social scientists working in a regression framework, have largely ignored the plethora of theoretical treatments of

globalisation's effects on the world and focused instead on measuring the correlation (if any) between countries' levels of exposure to the larger world-economy and specific national outcomes. Globalisation in this literature is generally operationalised as trade globalisation, though sometimes as true trade openness (lowness of barriers to trade) or as foreign investment. This was already the case at the time of Guillen's (2001) major review, and is even more so now. A practical incentive for using these operationalisations of globalisation is that they are widely available across countries and time periods. The level of analysis in the empiricist literature on globalisation is generally the country: countries are more or less exposed to the wider global economy, with positive or negative implications for society.

Clearly, there is a lack of correspondence in levels of analysis between a body of globalisation theory that is generally worldwide in scope and an empirical literature research that is generally national in scope. A unified framework is needed to bridge the gap between these worldwide and national conceptualisations of globalisation. Ideally, such a framework would facilitate the operationalisation of both national and worldwide globalisation measures using the same underlying concepts and data, distinguishing between levels of analysis using appropriate measurement models. As things stand today, globalisation theory in sociology is not sufficiently held accountable to systematic empirical testing, while empirical research on globalisation is too often theoretically misguided or simply atheoretical. A well-considered coupling of theory and methods is the key to resolving these difficulties and moving toward clearer, more clearly falsifiable theories of globalisation.

In this paper I offer a fresh approach to conceptualising and operationalising globalisation in empirical sociology. I begin by developing theory-based conceptual definitions of globalisation at both worldwide and national levels of analysis that can be productively operationalised in a unified empirical framework. I then present working operational definitions for globalisation at both levels that can be implemented using the

country as the unit of analysis. Next I estimate levels of globalisation for the period 1970-2007, first at the worldwide level of analysis, then at the country level of analysis. I conclude with an outline for further development of the concepts presented here. My goal throughout is to integrate theory and practice into a unified empirical framework for operationalising globalisation.

### **Defining Globalisation**

By the time of Guillen's (2001) classification and review of the globalisation literature, there were already dozens of competing definitions of the term "globalisation." Guillen himself offers a synthetic definition, drawing on Robertson (1992) and Albrow (1997) to define globalisation as "a process leading to greater interdependence and mutual awareness (reflexivity) among economic, political, and social units in the world, and among actors in general" (236). In other words, with globalisation sociological actors (individuals, organisations, states, etc.) around the world must increasingly take each other into account in making decisions and taking actions, despite the physical distances that may separate them. This is consistent with Giddens' (1990) influential characterisation of globalisation as a "reconfiguration of geography" (64). In effect, globalisation means that the effective distances that separate the peoples of the world are getting smaller every year.

Chase-Dunn (2006:82) gives this epochal conceptualisation of globalisation its own name -- "structural globalisation" -- and definition -- "the increasing worldwide density of large-scale interaction networks relative to the density of smaller networks." Holton (1998:35) takes a similar view that "it is not so much the sense of the world as a single place that matters as a sense of the interconnections that exist within that space." The problem with this theoretical approach, however, is that it makes globalisation near-impossible to operationalise and measure. In order to operationalise the kind of network conceptualisation

of globalisation seemingly called for by Giddens and Guillen, data on the connectivity of units -- the arcs of the network -- are required. Such data are scarce, incomplete, and computationally intractable: any network connecting, say, 100 countries (a best-case N for complete paired data) for a single time point would include 19,800 unique directed arcs. Given such parameters, it is unlikely that a globalisation operationalisation based on actual, literal interdependence could ever be widely used in empirical research.

To be practical, a conceptual definition of globalisation at the worldwide level of analysis must be operationalisable using data on individual countries, without requiring relational data between countries. One approach, in line with the broad thrust of globalisation theory in sociology, is to define worldwide globalisation as:

the degree to which the international variability in international connectivity measures (foreign trade, foreign investment, international travel, international calls, etc.) can be traced specifically to national engagement in worldwide as opposed to neighborhood systems

If "national engagement in neighborhood systems" can be operationalised using aggregate country-level data, worldwide globalisation can be operationalised indirectly as a residual -- i.e., as whatever is left over after participation in neighborhood systems has been factored out. It turns out that this challenge may be relatively easy to address.

Countries' levels of participation in neighborhood systems of international connectivity are highly conditioned on country size. Small countries must rely on their neighbors for many products and services that, in large countries, would be provided domestically. People in small countries are more likely to have local personal networks that happen to span international boundaries. In general, the average distance to an international border is simply smaller for small countries than for large countries. All this tends to suggest that it is reasonable to use country size as a proxy for neighborhood effects.

It should be emphasized that country size here is no more than a proxy for neighborhood effects, and to some extent a metaphorical one. Many countries, small and large, have no neighbors at all, while some large countries (e.g., China) have very many neighbors. The point is that even in a country with many neighbors, if it is large (e.g., China) most people's interactions will be with others within their own country. A full operationalisation of globalisation along the lines suggested above would take advantage of bilateral trade data to establish just how much of each country's trade is in fact short-distance trade.

The operationalisation of worldwide-level globalisation using residual variability after accounting for country size also yields a fortuitous byproduct: a framework for operationalising country-level or national globalisation. Countries' degrees of international connectivity vary due to both neighborhood effects and national engagement in global systems. Globalisation at the worldwide level of analysis is defined above as the residual proportion of variability in country international connectivity that can be traced to national engagement in worldwide systems. If worldwide globalisation is a sum of country residuals, it makes sense to define a country's relative degree of globalisation as its country-specific residual in the same analysis. In other words, a country's relative degree of national globalisation may be defined as:

a country's deviation in international connectivity from what would be expected for a country of its size

This approach to national globalisation has been explored by Babones (2007) and is developed more fully in this paper.

The indirect conceptualisation of worldwide-level globalisation as the degree to which the international variability in connectivity is not attributable to neighborhood effects may not be intuitively (or linguistically) satisfying, but it is theoretically sound. It is also

methodologically convenient, in that it leads directly to a meaningful conceptualisation of national globalisation as a country's excess international connectivity not explained by neighborhood effects. Operationalising globalisation as a residual at both the national and worldwide levels is conceptually complex, but as demonstrated below it is empirically straightforward.

### **Operationalisation and Measurement**

The approach taken here is thus to operationalise worldwide globalisation indirectly as the degree of international variance in international connectivity indicators that cannot be explained by country-specific attributes like population, geographic size, and level of development. In mathematical terms, this means defining worldwide globalisation as:

$$G = \sum(y_i - \hat{y}_i)^2 / \sum(y_i - \tilde{y})^2$$

where  $y_i$  is the observed value of a international connectivity measure (like trade as a percentage of GDP) for each country  $i$ ,  $\hat{y}_i$  is the predicted value of the international connectivity measure for country  $i$  based on its size, and  $\tilde{y}$  is the mean value of the international connectivity measure across all countries. This definition is equivalent to 1 minus the  $R^2$  of a regression of international connectivity on the international connectivity measure (for example, trade).

National globalisation can be operationalised as the residual degree of international connectivity on a given indicator that cannot be explained by country size. In mathematical terms, this means defining national globalisation for a given country as:

$$g_i = (y_i - \hat{y}_i) / \sqrt{[\sum(y_i - \hat{y}_i)^2/N]}$$

where  $N$  is the number of countries in the regression and all other terms are defined as above. In other words,  $g$  is the country's standardised deviation from its expected international connectivity, which may be positive (more globalised) or negative (less globalised). A value

of  $g=0$  means that a country is neither more nor less globalised than average. Since  $g$  is a relative measure of national globalisation, it can only be used to rank countries by national globalisation within a given sample of countries, not to measure changes in countries' levels of globalisation over time.

In this demonstration study, the connectivity measure ( $y$ ) is operationalised using trade as a percentage of GDP taken from the World Bank's World Development Indicators (WDI) 2010 database. Country land area and population (also from the WDI) are used to operationalise country size. These data are available for the years 1970-2007 for a balanced panel of 93 countries representing 85% of the world's population in 2010 (data are not yet available for 2008-2010 for most countries). The values of  $G$  for any given year is measured using  $1 - R^2$  from the regression of trade on population and surface area for that year for the panel of 93 countries, while  $g_i$  for country  $i$  in any given year is the country's standardised residual from that same regression analysis. All data are logged.

## Results

The trajectory of worldwide globalisation (" $G$ ") from 1970-2007 is plotted in Figure 1. Also plotted in Figure 1 are the trajectory of world trade as a percentage of world GDP (1970-2007) and the dates of the four major financial crises that occurred over the period. The collapse of the gold standard is not marked because it was a continuous process occurring throughout the late 1960s and early 1970s (though it did reach a head in 1971). Both series rise throughout the time period, but  $G$  is more volatile. There is no obvious relationship between either  $G$  or trade and crises. The two Latin American crises were both accompanied by a downturn in  $G$ , but the much larger Asian financial crisis saw no such downturn. Unfortunately, it is too early to tell what affect the current crisis may have on  $G$ .

National globalisation ("g") is a relative measure, not an absolute measure, since by construction at any one point in time there must be a balance of more-globalised and less-globalised countries. Consequently, annual rankings of g are reported here for a series of country examples. The country for which g is most obviously superior to trade as a percentage of GDP is China (Figure 2). In the raw trade series China today is only the 50th most globalised country (out of 93). This seems wholly out of line with reality, and is due to the fact that China is a large country. For such a large country, China actually trades an enormous amount, and this is reflected in its rank on g. Using g to operationalise globalisation, China ranks 6th, up from 88th at the start of the period. China's recent rise has been associated with Mexico's decline, from a post-NAFTA high of 14th to 44th (Figure 4).

Australia's g trajectory is also included for comparison (Figure 5). Australia's level of g has been low and steady throughout the study period. Its g rank, however, is higher than its trade rank, because Australia is more integrated into international networks than it could be, though the results suggest that it is still less integrated than would be expected for a country its size. While this low result (72nd) and the downward trend throughout the 2000s may seem out of step with Australia's mining boom, it reflects the fact that Australia's economy is relatively isolated from the larger world-economy. Trade is important to Australia, but not anywhere near as important as it is to, say, Canada or Germany. The absolute decline in Australia's trade as a percentage of GDP since 2001 illustrates the fact that Australia's economic growth over the past decade has been driven mainly by domestic productivity gains, not iron and coal exports.

## **Conclusion**

This is, obviously, preliminary work. The worldwide and national globalisation measures proposed here ("G" and "g") are an attempt to better measure what globalisation

theorists mean when they use the word. They address some serious shortcomings with existing measures. For example, technological changes may be leading to ever-increasing levels of international trade, but there is no arithmetic reason why this should make  $G$  go up. The fact that  $G$  has risen since 1970 indicates that not only the volume, but the structure of international trade is changing. This sounds a lot more like "globalisation." Similarly, the (very common) use of trade as a national globalisation indicator in statistical analyses may produce perverse results if by this measure of globalisation both China and Mexico fall below average when compared to other countries. The residual  $g$  approach restores both countries to more reasonable levels.

The next phase of this research project will involve several extensions of the basic concept presented here:

- Monte Carlo investigation of the properties of  $G$  and  $g$  for sub-samples of countries -- are these indicators robust to missing data?
- Extension of  $G$  and  $g$  measures to earlier waves of globalisation -- is  $G$  calculated for 10 or 15 countries before WWI comparable to  $G$  in the post-WWII period?
- Extension of  $G$  and  $g$  to other international connectivity measures -- is  $G$  for trade comparable to  $G$  for investment, immigration, etc?
- Comparison of the residualisation approach with the now-common multiple indicator approaches -- do multiple residualisations tell us more than multiple raw indicators?

Of particular interest will be to see how all of these globalisation measures behaved during the global financial crisis. At the beginning of the crisis, all the talk was of "de-globalisation" as world trade collapsed in 2008. Trade, however, quickly rebounded. Still open is the question of the fate of globalisation broadly construed. Is the world still globalising, or is it now Balkanising? This question can probably only be answered through a careful examination and

comparison of many different approaches to measuring globalisation at both the worldwide and country levels.

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Figure 1. Residual "G" versus Simple Trade, 1970-2007

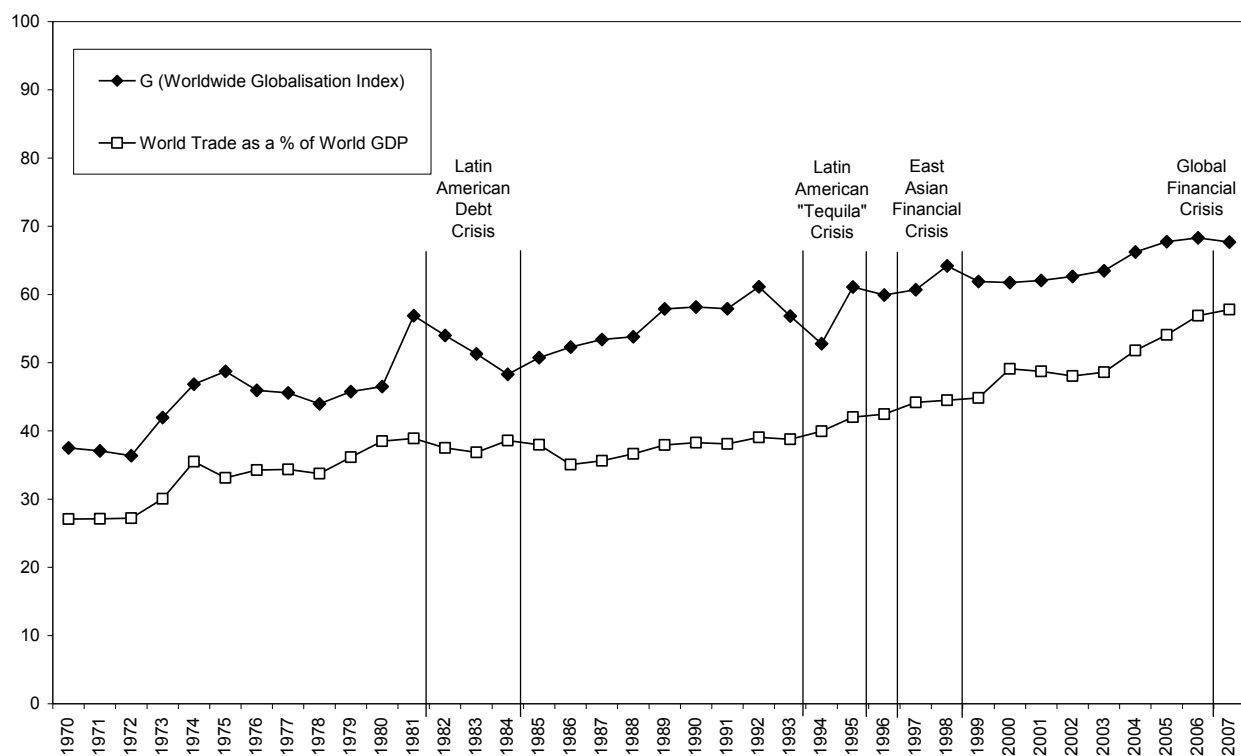


Figure 2. Residual "g" Rank versus Simple Trade Rank for China, 1970-2007

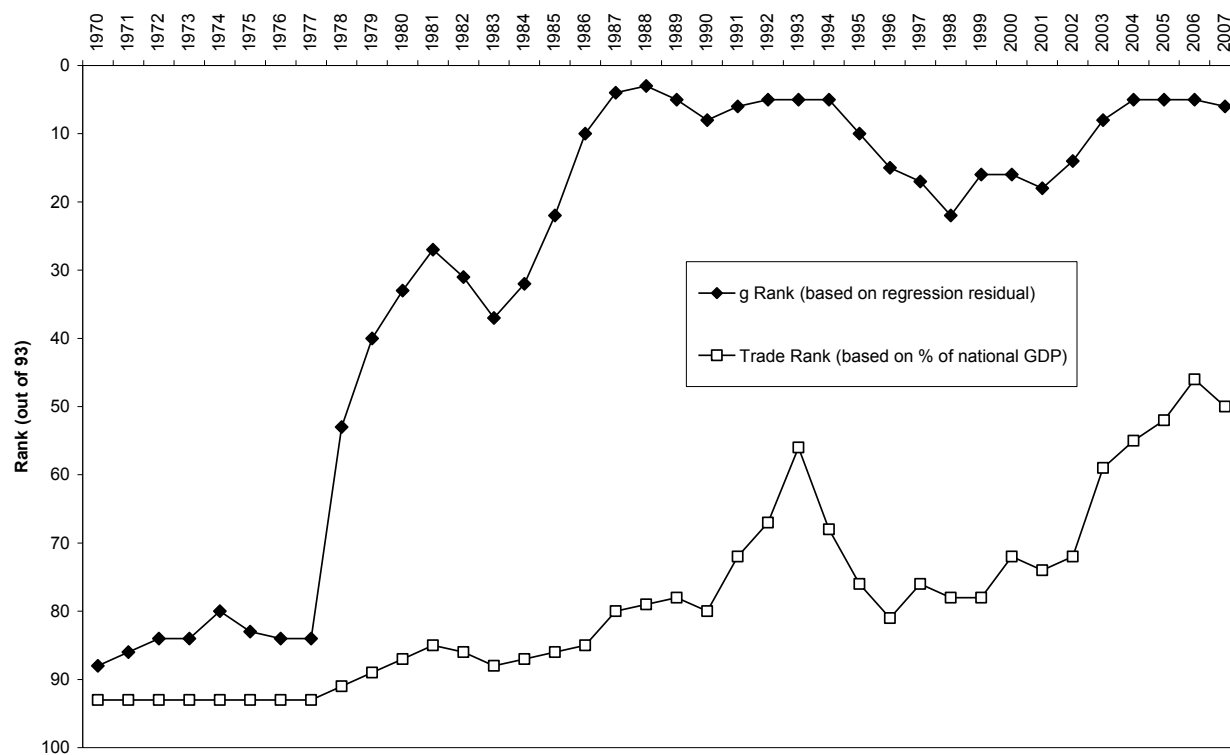


Figure 3. Residual "g" Rank versus Simple Trade Rank for Mexico, 1970-2007

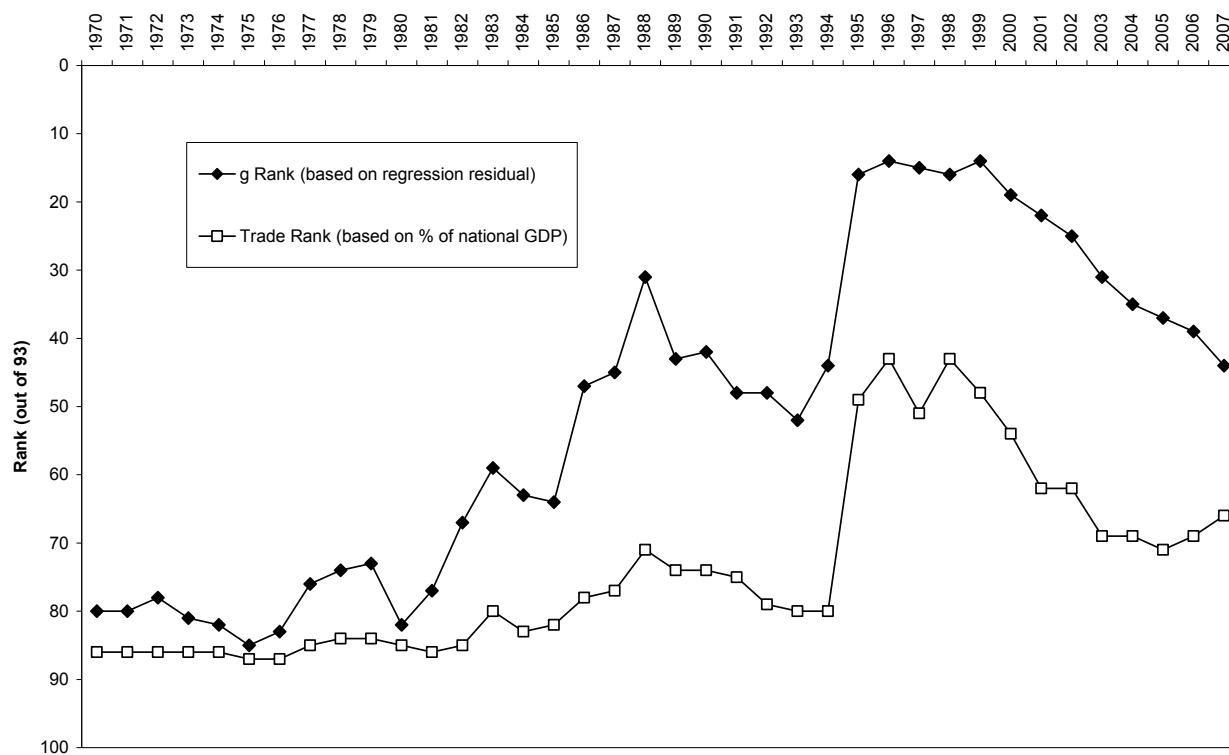


Figure 4. Residual "g" Rank versus Simple Trade Rank for Australia, 1970-2007

