

# Macro-Equality Measures to Study and Compare Equality in Well Being among Populations of Different Subdivision Areas of a Country or Group of Countries, with Global Examples

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Previous researches concerned mainly with micro-equality issues. We believe that macro-equality issues are, as well, important to address the variations in well being between linked subdivision areas. This includes equality in services distribution and other shared benefits. Macro-equality levels also reflect the micro-equality levels in places where different ethnics and population groups live in different subdivision areas of a country. Inequality of wellbeing among different subdivision areas proved to initiate conflicts between marginalized areas and the federal governments. This paper concerns with: first, development of a measure of macro equality with comparability validity to compare well being levels among populations of different subdivision areas of a country or group of countries; Second, addressing a method to evaluate trend of equality in well being among these units using the correlation coefficient statistic. This developed index and method had been used in a paper to study the poverty variation and trends through population of Sudan states presented in 2015 IARIW-CAPMAS Conference in Cairo. In this paper we are going to expand the application of these indices for global countries, to introduce more concepts in this respect and to present a worksheet model that monitors equality development to reach specific equality levels.

## Objectives

First: to throw more light on the definition of concept of macro-equality and to differentiate between level of macro-variability and macro-equality. Variability concerns with disparities among what we call independent units while equality deals with linked units. Independent units are units that free from any inter-beneficial commitments; that is to say not sharing any kind of services or well being for example countries. However some countries might have some links which could be described as linked units. On the other hand Linked Units are units that are tied by inter-beneficial commitments for example states and other subdivisions of a country.

Second: to introduce an index with comparability validity that measures and compares macro-equality as well as macro-variability through subdivisions areas or countries. It is well known that the standard deviation statistic measures variability. However, this

statistical measure lacks validity of comparability. It cannot compare between dispersion levels of different variables unless the means of these variables are the same. To solve this problem we found that when the percentages of values of units of different variables are considered the means of values of these percentages are equal as far as the numbers of units in these variables are equal. We call this mean the standardized mean (SM), and the standard deviation of the percentages of units the standardized standard deviation (SSD). Hence the macro-equality index  $MEI = SM - SSD$  with lower limit equals zero and upper limit equals SM.

Third: to show how the correlation coefficient statistic (CC) can be used to evaluate the macro-equality trend among units through time, and accordingly to develop a mechanism to monitor strategies of macro-equality control. This could be done by calculating the correlation coefficient of the relationship between (the values of a variable referred to a base year time) and (the differences between these values and values of the same variable referred to subsequent point of time). A significant CC in this respect indicates the level of improvement of equality through the two points of time. For a complete equality the CC value of this relationship would be -1; In this case the value of the tested variable would be the same for all units at the target time. For a complete inequality the CC value of the relationship would be 1. Accordingly, a macro-equality line can be defined to be the case when the CC value equals zero.

Forth; to develop a worksheet model that facilitates macro-equality monitoring through time. This model correlates the Macro-Equality Index values for different scenarios of distribution of wellbeing among tested areas at target time to the CC values of the relationships between the base year values and the differences between base & target values.

#### Frame of application

In this paper we are going to apply the developed macro-equality index and the usage of CC for evaluation of equality trend to study equality and variability of human development levels for two sets of countries. The first set is the European Union countries. As there are some links in socioeconomic benefits among the included countries, the macro-equality index compares, however, the level of equality of human development indicators among the member countries; and the CC evaluates the trend of these levels through time. The developed equality-development model would be applied here for different scenarios of HDI targets. This model tracks different trend of equality development tracks, measured by CC, that lead to specific equality levels measured by MEI. This includes the equality level that corresponds to macro-equality development of  $CC=0$ , which we referred to as macro-equality line. The second set is the world countries classified into four groups: Very High, High, medium and low Human Development

Countries. The equality index in this set compares the level of variability of human development indicators among the different groups of countries, as the countries in each group defined to be independent units.

#### Data

The indicators used here are the Human Development Index, life expectancy at birth, mean years of schooling and Gross National Income per capita. Data of these indicators for the world countries, including European Unity countries, are available from United Nations sources in its Web side. We are going to use in this paper the data referred to the years from 2010 to 2014.

The developed Macro-Equality indicator is used to find out and discuss: First; the equality levels in human development, longevity, knowledge and economic situation among European Unity countries. Second; the variability level of well being, measured by HDI, among countries of very high, high, median and low groups. The Correlation coefficient statistic is used to evaluate the trend of equality in well being among the European Unity and world countries between the year 2010 and 2014 and to use the developed worksheet model to study hypothetical trends among the European-Unity countries.