Well-being Inequality in the Long Run: An International View

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Abstract
This paper provides a long-run view of inter-country well-being inequality based on a new dataset. Well-being inequality has declined over time. Trends in social dimensions alter the view on inequality derived from real per capita GDP. While in terms of income inequality increased until mid-twentieth century, in social dimensions inequality declined after World War I. The spread of mass primary education and health transitions were its main drivers. The gap between OECD and the *Rest* explains only partially the evolution of well-being inequality as the dispersion within the *Rest* gained weight over time.

Keywords: Well-being, International Inequality, Life Expectancy, Health Transition, Literacy, School Enrolment, Per Capita GDP

JEL Classification: I00, N30, O15, O50

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Introduction

In the last one and a half centuries, substantial gains across the board are observed for main dimensions of well-being (including per capita GDP, health, and education) (Maddison, 2006; Bourguignon and Morrisson, 2002; Morrisson and Murtin, 2009; Prados de la Escosura, 2015). How have these gains been distributed? Do inequality trends in different dimensions of well-being concur? Did the gap between the *West* and the *Rest* of the world contribute to international inequality?

This paper approaches long-run well-being inequality from a multidimensional perspective inspired in the *capabilities* approach.[1] The *capabilities* approach makes well-being dependent on a combination of *functionings* (or achievements) and *capabilities* (the ability to choose among alternative bundles of functionings)[2]. Thus, differences in well-being across countries over the long run will be assessed on a broad basis that includes not only the economic dimension (real per capita income), but also health (life expectancy at birth) and education (literacy and gross enrolment) dimensions. Moreover, human development, originally defined as 'a process of enlarging people's choices' (UNDP, 1990), which encompasses enjoying a healthy life, acquiring knowledge, and achieving a decent standard of living, will be addressed too.

An international view is provided on the basis of a large group of countries representing over 90 percent of the world population. The time span considered covers from 1870, at the time of the first globalization, the beginnings of mass primary education, and the eve of the epidemiological or first health transition, to 2007, when another phase of globalization, the spread of mass tertiary education, and a second health transition were taking place.

A caveat is needed. In the present state of the art, it is not possible to derive within-country inequality measures of the well-being dimensions considered for such a large country sample over the long run. The discussion will deal, then, with inter-

[1] Alternatives are the welfare economics approach which values various dimensions of quality of life, including health, education, environment, etc. in monetary terms (Nordhaus and Tobin, 1972; Becker et al., 2005; Jones and Klenow, 2016) and the Subjective Well-Being (SWB) approach, which places life satisfaction at its centre (Easterlin, 1974, Kahneman and Deaton, 2010; Veenhoven and Vengust, 2013).
[2] This paper is only inspired on the capabilities approach because, so far, I have been able to focus on achievements only. See Ivanov and Peleah (2010).

national inequality, in which national averages for each country will be used implicitly assuming that the distribution within each country is perfectly equal.

The paper is organized as follows. An overview of the empirical literature on multidimensional international inequality provides, in section II, hypotheses that will be explored in the long run. New measures of international well-being are computed from the original values of life expectancy, literacy, school enrolment, together with a historical index of human development (HIHD) are derived in Section III. Section IV presents long-run trends in international inequality for each well-being indicator that is further decomposed into the contributions of the gap between the *West* and the *Rest* and inequality within each of them. The last section concludes.

My results suggest that well-being inequality has declined over time. Trends in well-being dimensions challenge the view on long run inequality derived from real per capita GDP. Inequality in social dimensions declined after World War I, driven by the spread of mass primary education and the health transitions, while income inequality, increased until mid-twentieth century. The gap between OECD and the Rest only explains partially the evolution of well-being inequality as the dispersion within the rest of the world increased over time.

Debating International Differences in Well-being

Earlier quantitative assessments of international inequality were carried out on the basis of per capita GDP, focusing almost exclusively on the late twentieth century. A long-term deterioration in world distribution of income, led by a widening gap between developed and developing countries, was the prevailing consensus up to the 1980s (Theil 1979, 1989). Berry, Bourguignon, and Morrisson (1983) challenged this view pointing out that large countries were the main determinants of the exhibited trends.[3] Later, Milanović (2005) showed that international population-weighted inequality ('Inequality 2', in his typology) fell in the second half of the twentieth century while unweighted inequality ('Inequality 1') experienced a sustained increase until 2000.

[3] The determinant role played by China and India in the international income distribution is a recurrent feature in later studies, cf. Firebaugh (1999), Bourguignon and Morrisson (2002), Milanović (2005), and Sala-i-Martin (2006), and will be addressed here too.

More recent research has focused on 'global' or 'world' rather than 'international' economic inequality (that is, income distribution among individuals, not just across countries' averages) as data on household surveys became widely available since the 1980s (Milanović, 2005). The new approach initially supported the view of a substantial increase in global inequality as widening inter-country income differentials more than offset the decline in within-country inequality (Korzeniewicz and Moran, 1997). The consensus was broken when Schultz (1998) showed that inequality had fallen since the mid-1970s, as the contraction in inequality across countries cancelled any increases in within-country inequality. Schultz's findings led to a new, less pessimistic consensus that challenged the view of a widening gap between the world rich and poor in the late twentieth century. Firebaugh (1999) also noticed a remarkable stability in world income distribution between 1960 and 1989 as the divergence in income growth favourable to rich countries was offset by the faster population growth in poor countries. For the post-1980 era, Milanović (2012) indicates that although the level of global inequality ('Inequality 3') has remained high, no clear trend appears.[4]

Long run inequality has received little quantitative attention due to data constraints. Bourguignon and Morrisson (2002), on the basis of 33 "trans-national" units, concluded that world inequality was much higher in 1992 than in 1820. This resulted from a rise in inequality from the early nineteenth century to the mid-twentieth century that tended to stabilize during the second half of the century. The main element behind long run world income inequality was the disparity across countries. Furthermore, within-country income distribution dominated world inequality during the nineteenth century, while cross-country income distribution prevailed during the twentieth century. More refined estimates by van Zanden et al. (2013) tended to confirm Bourguignon and Morrisson's findings. Income inequality among world inhabitants increased over the long run but mostly up to 1950, stabilising thereafter, and experiencing a moderate rise from 1980 onwards, while between-country inequality largely drove trends in global distribution.

[4] Dowrick and Akmal (2005) found, however, that inequality increased slightly between 1980 and 1993. Liberati (2015) confirmed Milanović's finding and pointed out a moderate decline in global inequality since the beginning of the twentieth-first century.

Per capita income is just one dimension of wellbeing and social scientists have also been looking at other dimensions of wellbeing such as health and education. Morrisson and Murtin (2013) provide a long run view of global education inequality on the basis of average years of schooling[5], finding a long-term reduction, which they mostly attribute to the expansion of literacy across the board.[6]

The long run evolution of health inequality has been only addressed by Bourguignon and Morrisson (2002) who estimated cross-country inequality for life expectancy at birth for scattered benchmarks and found a sustained increase in inequality between 1820 and 1910, that stabilized up to 1929, and, then, declined sharply down to 1970, remaining unaltered until 1990. An update of the estimates to 2000 shows a further decline in the 1990s (Morrisson and Murtin, 2005). Thus, the late twentieth century levels of inequality were similar to those of the early nineteenth century.[7] Goesling and Firebaugh (2004) found a decline in the 1980s that was reverted during the 1990s and largely attributed the increase in health inequality to the different pace at which life expectancy expanded across countries and, in particular, to its decline in Sub-Saharan Africa. Goesling and Baker (2008) stressed the uneven diffusion of health knowledge, practice, and technology across countries that, Edwards (2011) observes, translated into steady, or even growing, international inequality in adult longevity between 1970 and 2000.

Whether to look at different dimensions of well-being individually or to resort to multidimensional indices presents a dilemma. On the one hand, the interpretation of individual indices is straightforward and that provides an advantage. On the other, if individual indices show conflicting tendencies, drawing general conclusions on its evolution becomes impossible (Decancq et al., 2009). This has led to constructing composite indicators in which two main approaches, welfare and capabilities, can be distinguished.

[5] Morrison and Murtin (2013) use Bourguignon and Morrisson's trans-national units or "large" countries (32 rather than 33, in this case).

[6] Goesling and Baker (2008) observed the declining dispersion of schooling years since 1980 and also attributed to the globalization of formal schooling.

[7] Goesling and Firebaugh (2004), on the basis of secondary literature, also hypothesised an inverted U shape evolution of health inequality over the last two centuries, starting from low levels that would have increased since the late nineteenth century and peaked in the Interwar years, to decline during the second half of the twentieth century.

The pioneer in addressing international inequality within a capabilities framework, Ram (1992), noticed a discrepancy between the high level of income inequality and the low level of human development inequality. Earlier, on the basis of the Physical Quality of Life Index, Ram (1980) had noticed a sustained decline in well-being inequality over 1950-1970, at odds with the simultaneous rising trend observed for income. Later, Noorbakhsh (2006) observed slow inequality reduction in human development during the last quarter of the twentieth century. In the only long run perspective available on human development, Morrisson and Murtin (2005) observed that the evolution of inequality for a slightly modified version of the UNDP HDI had an inverted U-shape with a turning point in 1930.[8]

Also inspired in Sen's capabilities approach, and on the basis of 'achievement indices' (see next section) for different social indicators (infant mortality rate, life expectancy at birth, and daily calorie and protein supply), Hobijn and Franses (2001) disputed the view that standards of living converged in the late twentieth century suggesting an increase in unweighted inequality that resulted from a widening gap between Core and Periphery since the 1960s.[9]

To sum up, the main stylized fact that can be established about the long-run evolution of multidimensional well-being is a long-term rise in international inequality that peaked by the early-twentieth century and, then, gave way to a decline. This is at odds with the evolution of income inequality in which the rise would have peaked by 1950 and stabilised thereafter. Can this depiction of the evolution of international well-being inequality be confirmed using a more rigorous conceptual approach and a more comprehensive database?

Measuring Well-being

How progress in non-economic dimensions of well-being is measured constitutes a far from negligible matter. Usually original values of social variables (life

[8] More recently, Rijpma (2017) has constructed a comprehensive index of well-being over the last two centuries on the basis of a wide range of indicators (income, health, education, political institutions, freedom, inequality, and personal security) and using a latent variable model. This composite index shows more intense improvement and stronger convergence over time than GDP per head. Also, Decancq et al. (2009) using a flexible multidimensional index of well-being showed a decline in unweighted inequality over 1975-2000.

[9] This conclusion was disputed by Neumayer (2003), who rejected Hobijn and Franses 'achievement indices' to assess inequality and using the original values of a set of social variables (life expectancy, infant survival, education enrolment, literacy, and telephone and television availability), restated the view of a reduction in inequality between 1960 and 2000.

expectancy, height, or literacy) are employed (Acemoglu and Johnson, 2007; Becker et al., 2005; Bourguignon and Morrisson, 2002; Morrisson and Murtin, 2013; Hatton and Bray, 2010; Lindert, 2004). Non-income well-being indicators, such as life expectancy, height, infant mortality, or literacy, and enrolment rates, have, unlike GDP, asymptotic limits that reflect biological or physical maxima. This means that the use of original values for comparisons over space and time introduces biases, as the range of variation is very narrow, forcing smaller gains (both absolute and relative) as their levels get higher (Sen, 1981; Dasgupta, 1990; Cornia and Menchini, 2006). This objection is particularly relevant when an attempt at measuring the distribution of such variable across countries and over time is made, as the use of original values unavoidably leads towards convergence.

A transformation would be, then, required to measure their changes within upper and lower bounds. A possibility is a linear transformation, such as the one used in the United Nations Development Programme's (UNDP) index of human development, which reduces the size of the denominator and, thus, widens the index's range. Indices for each dimension (I_x) are computed according as,

$$I_x = (x - Mo) / (M - Mo), \qquad [1]$$

x being the observed value of a given dimension of welfare, and *Mo* and *M* the minimum and maximum values (goalposts). The index varies within 0 and 1.

However, using linearly transformed values does not solve the problem as absolute changes of identical size result in smaller measured improvement for the country with the higher initial level (Sen, 1981; Kakwani, 1993).[10] Consider, for example, two improvements in life expectancy at birth, one from 30 to 40 years and another from 70 to 80 years. These increases are identical in absolute terms, but the second is smaller in proportion to the initial starting level.

Valuing equally identical increases in absolute terms at low and high levels may raise ethical objections, though. However, as Dasgupta (1990: 23) pointed out, 'Equal increments are possibly of less and less ethical worth as life expectancy rises to 65 or 70 years and more. But we are meaning performance here. So it would seem that it

[10] As Decancq et al. (2009) put it, the problem of spurious convergence remains, nonetheless, with a concave transformation as "it dampens the effect of increasing values at the higher end of the distribution" (p. 17).

becomes more and more commendable if, with increasing life expectancy, the index were to rise at the margin. The idea here is that it becomes more and more difficult to increase life expectancy as life expectancy rises'. Such view is shared by Sen (1981: 292), who asserted, "as longevity becomes high, it becomes more of an achievement to raise it further". Moreover, giving more weight to saving the life of younger over older people implies an arbitrary value judgement (Deaton, 2006).

Nonetheless, the shortcomings of a linear transformation of original values become more evident when quality is taken into account. Life expectancy at birth, and literacy and schooling rates are just crude proxies for a "long and healthy life" (Engineer et al., 2009) and for access to knowledge, respectively, the aims of well-being in the capabilities approach.

Medical research concludes that healthy life expectancy increases in line (or even more than proportionally) with life expectancy at birth and that, as life expectancy raises, disability for the same age-cohort falls (Salomon et al., 2012; Mathers et al., 2001). In other words, the quality of life rises for each age cohort as life expectancy at birth increases.[11] Similarly, the quality of education, measured in terms of cognitive skills, grows as the quantity of education increases (Hanushek and Kimko, 2000; Altinok et al., 2014).[12] The bottom line is that more years of life and education imply higher quality of health and education during childhood and adolescence.

Unfortunately no historical information on health-adjusted life expectancy and quality-adjusted education measures is available for the pre-1990 years. In fact, whether an association between mortality and morbidity existed between 1870 and 1990 remains an unknown (Riley, 1990; Howse, 2006; Bleakley, 2007, 2010; Cutler at al., 2010). However, Kakwani's (1993) proposal of transforming social dimensions with a non linear function, in which achievements of the same absolute size have a larger

[11] The decline in age-specific disability as life expectancy at birth increases is compatible, however, with the recent finding that years lost to disability (YLD) rise with life expectancy because YLD tend to concentrate at the end of life (Salomon et al., 2012). So, perhaps, the view that while longevity increases, periods of ill-health can be longer, but are lived in better health and less disability, due to medical technologic advance (Manton, 1982), provides a more accurate depiction of the new scenario than Fries (1980) morbidity compression hypothesis (See the discussion in Fries et al., 2011 and Lindgren, 2016).

[12] The correlation between quality and quantity of education over 1965-2010 appears high at world scale but it declines when the sample is reduced to developed countries, which suggests the interpretation that as the quantity of education gets higher, quality increases become more than proportional (Altinok et al., 2014).

impact as the starting point is higher, may provide a short-cut method to derive proxies for healthy life expectancy and cognitive skills on the basis of crude figures for life expectation at birth and literacy and enrolment rates.[13]

Kakwani (1993) constructed a normalised index from an achievement function in which an increase in the standard of living of a country at a higher level implies a greater achievement than would have been the case had it occurred at a lower level,

$$f(x, Mo, M) = ((M - Mo)^{1-\varepsilon} - (M - x)^{1-\varepsilon}) / ((M - Mo)^{1-\varepsilon}), \quad \text{for } 0 < \varepsilon < 1 \quad [2]$$

$$= f(x, Mo, M) = (\log(M - Mo) - \log(M - x)) / \log(M - Mo), \quad \text{for } \varepsilon = 1 \quad [3]$$

where x is an indicator of a country's standard of living, M and Mo are the maximum and minimum values, respectively, and log stands for the natural logarithm.

The achievement function proposed by Kakwani (1993) is a convex function of x, and it is equal to 0, if $x = Mo$, and equal to 1, if $x = M$, ranging, thus, between 0 and 1. In this context, the linear transformation represents a particular case, for $\varepsilon = 0$, which yields expression [1] for each dimension of the index.[14]

How do the non-linearly transformed variables compare to the original o linearly transformed variables? The Kakwani transformation results in lower level but faster growing indices than the linear transformation (Prados de la Escosura, 2015). A more expressive way to show their difference is to observe how Kakwani transformation affects well-known empirical regularities such as, for example, the association between life expectancy and real per capita GDP proposed by Preston (1975). Figure 1a shows Preston's concave relationship between the original values of life expectancy at birth and real income per head so, initially, to increases in income correspond proportional increases in life expectancy but soon, that is, at relatively low

[13] Life expectancy at birth defined, by the UN, as "The average number of years that a newborn could expect to live, if he or she were subject to the age-specific mortality rates of a given period" http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/health/life_expectancy.pdf . The rate of adult literacy is defined as the percentage of the population aged 15 years or over who is able to read and write. The unadjusted enrolment rate is the percentage of population aged 5-24 enrolled in primary, secondary, and tertiary education that has been corrected for the pre-1980 era to obtain gross enrolment rates (GER). Since 1980 GER are available. See the discussion, sources, and procedures in Prados de la Escosura (2015).

[14] In the case of life expectancy, maximum and minimum values accepted are 83.2 and 20 years, respectively, while 0 and 100 will be the upper and lower bounds for adult literacy and gross enrolment (primary, secondary and tertiary) rates (UNDP, 2010). A 'floor' of 25 years has been assumed for of life expectancy at birth, while for education, the highest and lowest historical values have been set at 99 and 1 per cent, respectively. See the discussion, sources, and computation procedures in Prados de la Escosura (2015).

income levels –around Geary-Khamis 1990 $2,500, namely, the income per head in the U.K. by 1850 (Maddison Project, 2013)- the association flattens, so successive increases in income imply less than proportional increases in life expectancy. Deaton (2013) replicated the Preston Curve but replacing values of real per capita GDP with their logs to represent proportional changes, with the effect of reducing the concavity. However, when a Kakwani convex transformation of the original values of life expectancy at birth is introduced, a linear relationship emerges between the life expectancy index and real per capita GDP (in logs) that, at higher levels, shows convexity, suggesting that medical technology advances lead to more than proportional gains in health relative to income (Figure 1b). A question emerges from the discussion, if income and life expectancy are so closely correlated, should not their distribution over time evolve alongside?

Well-being inequality is also address here using a composite index, the Historical Index of Human Development (HIHD), which represents an alternative to the UNDP's conventional HDI (Prados de la Escosura, 2015). As the conventional (pre-2010) HDI, the HIHD includes life expectancy at birth, literacy and gross enrolment rates, and discounted per capita income (in logs) as proxies for a healthy life, access to knowledge, and other aspects of well-being, respectively (Anand and Sen, 2000).[15] The difference is that non-income variables are transformed non-linearly using expression [3], rather than linearly (as in the HDI), so increases of the same absolute size represent greater achievements the higher the level at which they take place. As regards the income dimension, it has been derived using expression [1] and per capita GDP in logs. Although a far from satisfactory solution, relaxing the assumption of diminishing returns to income would make per capita GDP –not having an asymptotic

[15] Data constraints prevented me from employing more comprehensive measures such as years of schooling. Barro and Lee (2013) provided a dataset of years of schooling for the population over 15 years old for 146 countries over 1950-2010, but the data for the pre-1950 period provided by Morrison and Murtin (2009) has half its coverage. Lee and Lee (2016) new dataset of years of education for 111 countries over 1820-2010 only covers the population between 15 and 64 years old. The HIHD actually follows the 'hybrid' HDI composition defined in the 2010 Human Development Report (UNDP, 2010). See the discussion in Prados de la Escosura (2015).

upper bound- the driver of the human development index, rendering the latter redundant.[16]

The HIHD has been obtained as a multiplicative combination of the transformed values of each dimension.[17] If we denote the non-linearly transformed values of life expectancy and education as *LEB* and *EDU*, and the adjusted *per capita* income as *UNY*, the historical index of human development is derived as,

$$HIHD = LEB^{1/3}\ EDU^{1/3}\ UNY^{1/3} \qquad [4]$$

International Inequality

Was international well-being inequality in 2007 higher than in the early stages of the first globalization? Were there distinctive phases in the evolution of international inequality over the long run? How do different dimensions of well-being compare? What were the main drivers of inequality?

The overview of the literature on international well-being inequality provides hypotheses mostly derived from studies that address inequality in social dimensions using their original values (or their linear transformation). As it has been shown, this approach tends to bias the results in favour of convergence. Such spurious tendency is mitigated here, if not totally suppressed (see Hobijn and Franses, 2001), by resorting to Kakwani non-linear transformation of health and education dimensions. Therefore, the results presented in this section should provide a more accurate picture of inequality trends in well-being and, especially, in its social components.

Alternative inequality measures are chosen, as they differ in their sensitivity to different parts of the distribution. Thus, for Atkinson class A(ε) indices (in which ε represents an inequality aversion parameter usually ranging from 0.5 to 2.5), the larger ε, the more sensitive the index is to differences at the bottom of the distribution. Here I will accept ε=2. The Gini coefficient is more sensitive to the middle (mode) of the

[16] See Zambrano's (2011a, 2011b) theoretical justification for the introduction of diminishing returns to income. For an alternative proposal excluding the log transformation of income, see Ravallion (2012).

[17] Since all dimensions are considered indispensable they are assigned equal weights (UNDP, 2010). Upper and lower bounds and maximum and minimum levels for life expectancy and education are those of footnote 15. In the case of per capita income, the upper and lower bounds, expressed in Geary-Khamis [G-K] 1990, are $42,916 (for Qatar in 1973), and $206 (D.R. Congo in 2001), and derive from Maddison (2010). A 'floor' of $300 has been accepted. See the discussion in Prados de la Escosura (2015).

distribution. Lastly, the entropy index G(0) corresponds to Henri Theil's population weighted index, also known as Mean Logarithmic Deviation (MLD), and G(1) to Theil's income weighted index, known for short, as Theil. In entropy indices GE(α), the more positive (negative) α, the more sensitive the index is to differences at the top (bottom) of the distribution. Hence, MLD is more sensitive to the bottom, and Theil to the top of the distribution.

Two types of inequality estimates are presented here, inequality between country averages in which all countries are given the same weight, regardless their size, that is, Milanović's Inequality 1; and inequality between country averages but weighted by countries size, so a large country counts more than a small one, namely, Milanović's Inequality 2.

The unweighted measure of inequality exhibits advantages that deserve being highlighted. It allows for the fact that policies are implemented at country level and have an impact on its citizens' well-being. Besides, weighted measures are very sensitive to the performance of highly populated countries. However, Inequality 2, although implicitly assumes perfectly equal within-country distribution, does get us closer to a measure of world distribution by assigning higher value to more populated countries (Milanović, 2005: 7-8). Unfortunately, no data on within-country distribution of social dimensions of well-being are available for such a large sample and time span.[18]

Different country samples have been used in the alternative inequality estimates, for which the longer the time span, the narrower the coverage. Thus, over the entire time span, 1870-2007, 96 countries are considered, its number rising up to 104, 137, and 157 countries for the samples starting in 1913, 1950, and 1990, respectively. The country samples represent over 90 per cent of the world population. Given the high degree of coincidence between alternative sample results, no splicing of the indices for different country samples has been introduced, giving preference to the measure corresponding to the largest country coverage for each year (Prados de la Escosura, 2015).

[18] Clio Infra efforts to provide inequality measures for education and income fall short of what is needed here.

Does population-weighted international inequality provide a good proxy for global inequality, that is, inequality among world inhabitants (Inequality 3)? This would be the case if between-country inequality, rather than within-country inequality, drives global inequality.[19] Evidence on global inequality estimates both for per capita income and education supports this hypothesis (Bourguignon and Morrisson, 2002: van Zanden et al., 2013; Morrisson and Murtin, 2013). It will be, then, assumed here that inter-country dispersion provides a lower bound measure of global inequality.[20] But do trends in between-country inequality also capture those in global inequality?

As international inequality has been usually assessed in terms of per capita GDP, I will start by looking at inequality in average incomes.[21] If we firstly delve into unweighted measures (Inequality 1), a sustained increase in income inequality emerges for those measures sensitive to changes at the bottom of the distribution; in the case of the MLD, up to 2000, and in the Atkinson coefficient, A(ε=2), all the way to 2007 (Figure 2a and Table 1). Meanwhile, for the Theil, that is, a measure sensitive to the top of the distribution, the rise in inequality stopped in 1950, opening the way to a steady decline down to 1990. The Gini, more sensitive to the middle of the distribution, also peaked in 1950 stabilising thereafter. It is worth stressing the sharp increase in inequality between 1938-1950 across all inequality measures.

When population-weighted inequality across countries (inequality 2), is examined, it appears a sustained rise up to the late 1970s, more intense until 1950, followed by a decline until 2007 (Figure 2b and Table 1). There is a difference, however, between the Gini and the Theil that were rather stable during the second half of the twentieth century and the MLD and Atkinson that experienced rise and fall phases, with 1980 as the turning point.

[19] This assertion only applies in the context of perfectly decomposable entropy indices, but for the Gini, the overlap component, which tends to evolve in opposite direction to between-country inequality, also matters (Milanović, 2005: 25).

[20] It could also be argued that the dispersion in social dimensions tends to be significant lower than in the case of income, namely, the longevity or education gap between the rich and the poor is less than proportional to their income gap.

[21] The data sources and procedures are exposed in the electronic appendix to Prados de la Escosura (2015). The estimates for the different dimensions of well-being examined here are accessible at http://espacioinvestiga.org/home-hihd/?lang=en.

How much do large countries condition Inequality 2? Excluding India and China allow us to find out how much of the described trends in international income inequality results from their evolution (Figure 3 and Table 2). It appears that the two large Asian countries contributed to a higher level of international inequality until 1990 and to its subsequent decline thereafter. Alternatively, excluding Sub-Saharan Africa allows us to observe that, since 1960, this region has increasingly contributed to raising international income inequality.

Population and GDP expanded at different pace across countries over the long run. Did inequality rise because per capita income GDP grew at different rates across countries, or just because population grew faster in countries with either low or high income? A way to provide an answer is to simulate the yearly rates at which, other things being equal, inequality would have evolved had all countries enjoyed identical per capita income (population) growth.[22] The results from the simulation indicate that differences in the pace of economic growth across countries explain the evolution of income inequality, while no significant impact derives from the dispersion in rates of population growth.

A further question is the extent to which inequality 2 is driven by the gap between advanced and developing countries and by the dispersion within each of these two groups. Here advanced countries comprise those belonging to the OECD prior to its enlargement in 1994 (*OECD*, for short, or the *West*, as this group of countries are indistinctively mentioned throughout the paper).[23] It can be noticed that the gap between the *West* and the *Rest* was the main contributor to the aggregate level of inequality until the 1950s on the basis of the MLD, and for the entire time span considered in terms of the Theil, but the dispersion within the two groups accounts for

[22] The practical way of carrying out the simulation here has been computing weighted inequality measures in which initial level of per capita income (population) has been kept constant over specific periods: 1870-1913, 1913-1950, 1950-1990, and 1990-2007.

[23] In this paper, *OECD*, or the *West*, coincides largely – but not completely – with the membership of the Organisation for Economic Co-operation and Development (OECD) up to 1994: Western Europe, its 'Western Offshoots', and Japan. Western Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. Three OECD members are excluded: Iceland and Luxemburg are left out for lack of human development estimates; Turkey is counted with Asia in order to reduce group heterogeneity in terms of development. 'Western Offshoots' consists of Australia, Canada, New Zealand and the United States.

most of the increase in total inequality during the late 1930s and 1940s and explains the sustained rise in international inequality until 1975 (Figures 4a and 4b and Table 3). Likewise, the reduction in the dispersion within the *West* and within the *Rest* drove the decline in international income inequality between 1980 and 2000; thereafter, between-group inequality took the lead. A closer look at the evolution of the *Rest* regions suggests that the growing disparities between them steered post-1950 international income inequality (Figure 5).

Are trends in income inequality replicated by those of non-income dimensions of well-being? Access to knowledge, proxied by education indicators, is a component of welfare to be considered. High levels of inequality I and II (well above those for per capita income and life expectancy at birth) are observed for all indices for education measures, literacy and gross enrolment, in the late nineteenth and early twentieth century, prior to the diffusion of mass primary education (Benavot and Riddle, 1988; Lindert, 2004).

In the case of literacy, both Inequality I and II started from high levels and experienced steady decline throughout most of the twentieth century (Figures 6a and 6b). When measured by the Atkinson index, inequality remained stable until mid-twentieth century, followed by steady decline until 2007 (Table 4). Inequality levels remained high in all indices until the last quarter of the twentieth century. In the cases of MLD and Theil, the inequality contraction was more intense between the 1930s and 1960s.

In terms of enrolment, inequality fell from 1880 to 1980, suffered a temporary reversal in the 1990s, and stabilised thereafter (Figures 9a and 9b). Only in the case of the Atkinson index, the decline of Inequality 1 was deferred until the second half of the twentieth century. As in the case of literacy, the contraction of MLD and Theil appeared more intense (Table 7).

In both the cases of literacy and enrolment, the dispersion of its improvement across countries, rather than the variance of population growth, explains the inequality contraction over the long run.

In order to ascertain the extent to which large countries conditioned population-weighted measures of inequality, I have simulated literacy and enrolment

inequality in the absence of China and India, firstly, and, then, in the absence of the Sub-Saharan African region (Figures 7 and 10). It appears that China and India contributed to higher levels of inequality prior to World War II and, then, to lower levels. Sub-Saharan Africa contributed to higher inequality throughout the entire period under consideration (Tables 5 and 8).

How do trends in education inequality compare to those obtained by Morrisson and Murtin (2013)? These authors have computed inter-country education inequality on the basis of the original values of average years of schooling and, therefore, their levels are systematically lower than those provided here, as bounded variables exhibit a spurious tendency towards convergence. However, inequality also fell in Morrisson and Murtin's estimates.

Breaking down aggregate inequality 2 into inequality between *OECD* countries and the rest of the world and inequality within each group reveals that, in the case of literacy, the gap between the *West* and the *Rest* made the main contribution to the level of international inequality only until the beginnings of the twentieth century (1900 according to the MLD, and early 1930s according to the Theil), but drove total inequality until mid-twentieth century (World War II, with the MLD; 1960, with the Theil). Henceforth, the dispersion in literacy standards within each group, the *West* and the *Rest*, but mostly between developing regions, was the main driver (Table 6 and Figures 8a and 8b).

In the case of enrolment, the gap between the *West* and the *Rest* represented the largest share of international inequality until the twentieth century (1900 for the MLD and later, 1930, for the Theil) and only drove inequality until the early 1930s, when within-group inequality -largely within the *Rest*- took the lead until 1990. Thus, although educational practices became increasingly globalised since the interwar years, were diffused unevenly in developing regions (Table 9 and Figures 11a and 11b).

Longevity is another dimension of well-being to be considered. Inequality trends in life expectancy, as measured by different unweighted indices, provide a common picture, although less intense when computed by the Gini coefficient (Table 10). Different phases can be identified for unweighted and population-weighted inequality. Inequality 1 rose up to 1900, declined to 1913, and, then, recovered to reach a peak in the mid-1920s. A sustained inequality decline took place thereafter,

particularly intense during the late thirties and forties. The declining trend reverted after 1990, returning to 1970 levels by 2007 (Figure 12a). In the case of Inequality 2, the increase was more intense up to the mid-1920s, followed by a stronger contraction to 1970, particularly in the late 1920s, and, then, stability until the turn of the century, when a reversal to the late 1960s levels took place (Figure 12b).

How do inequality trends in life expectancy compare to those obtained by previous studies? Bourguignon and Morrisson (2002) computed inequality 2 (Theil index) on the basis of the original values of life expectancy at birth and, since bounded variables tend to converge over time, the level of inequality is systematically lower than in my estimates; nonetheless, their estimates also exhibit a sustained decline.

It is also worth noting that the variance in life expectancy gains across countries, rather than the dispersion in population growth, is what explains the inequality decline over the long run.

Does the performance of large countries drive inequality 2? Inequality trends are flatter when China and India are excluded (Table 11). India and China contributed to a higher level of inequality up to the 1950s and to its reduction thereafter (Figure 13). The fact that the two Asian countries fell behind the *West* in terms of longevity largely explains the steady rise in inequality up to the early 1920s, while its catching up contributed to the inequality contraction between the late 1920s and 1950. Excluding Sub-Saharan Africa does not alter world inequality trends, but increase its level, especially since the 1970s.

In Table 12 trends in inequality 2 are decomposed into between-group inequality, that is, the gap between the *OECD* and the *Rest* of the world, and inequality within each of these two groups. It is only up to the late 1930s, that the gap between the *West* and the *Rest* made the largest contribution to international inequality; thereafter, within group inequality became its main contributor (Figures 14a and 14b). However, the reduction in the gap between the *West* and the *Rest* drove the decline in aggregate inequality until 1970. The post-1990 rise in inequality was driven by the dispersion within the *Rest*. The performance of the *Rest* regions relative to the *OECD* shows the reversion of their catching up to the West since 1970, and the distinctive behaviour of the former socialist bloc in central and eastern Europe -falling behind since the 1960s-, way ahead the rest of the developing regions (Figure 15).

How can the evolution of life expectancy inequality be explained? And why is so different from that of per capita income? Health improvements can be depicted in terms of a health function (Preston, 1975). Movements along the function represent gains that can be attributed to economic growth and result in nutrition improvements -that strengthen the immune system and reduce morbidity (Stolnitz, 1955; McKeown et al., 1962, 1975; Fogel, 2004)- and in the public provision of health (Loudon, 2000; Cutler and Miller, 2005). Outward shifts in the health function capture, in turn, medical technological change, which has been the main contributor to the long run increase in longevity since the late nineteenth century (McKinley and McKinley, 1977; Riley, 2005b; Cutler et al., 2006).

The epidemiological or health transition –that is, the phase in which persistent gains in lower mortality and higher survival are achieved as infectious disease gives way to chronic disease (Omran, 1971; Riley, 2001)- is associated to the diffusion of the germ theory of disease since the 1880s (Preston, 1975) that led to the introduction of new vaccines since the 1890s. In addition to vaccines, medical technological progress introduced new drugs to cure infectious diseases -sulpha drugs since the late 1930s (Easterlin 1999)- and antibiotics since the 1950s-, contributing to the spread of the health transition (Easterlin, 1999; Jayachandran et al., 2010; Lindgren, 2016).

However, the improvement in life expectancy across the world that lies beneath the decline in life expectancy inequality- at a time of economic distress- calls for additional explanations also associated to the diffusion of the germ theory of disease. Thus, improvements in public health –often at low cost- and the diffusion of preventive methods of disease transmission and knowledge dissemination through school education may have contributed significantly to the reduction of infant mortality and female post-delivery deaths (Riley, 2001), two major determinants of the increase in life expectancy at birth in developing societies.

During the epidemiological transition substantial gains in longevity were achieved. However, these achievements were unevenly distributed as lack of economic means and basic scientific knowledge prevented the wide diffusion of new medical technology and health practice across countries. The increase in life expectancy inequality in the late nineteenth and early twentieth century can be associated to the fact that the first health transition was restricted to advanced western countries.

The gradual international diffusion of the health transition between the 1920s and the 1970s helps explain the reduction in life expectancy inequality. The contraction was particularly intense during the 1930s and 1940s, when average incomes stagnated or declined across countries and international income inequality increased as a result of the Great Depression and World War II. Life expectancy increased in countries of low and stagnant (when no declining) real per capita income as a consequence of the first health transition (Mandle, 1970; Riley, 2005a).

The increase in life expectancy inequality after 1990 may be associated, not just to the impact of HIV-AIDS in Sub Saharan Africa or to the demise of socialism in large parts of the world, particularly in Central and Eastern Europe, but also to a second health transition that has been restricted to the *West* so far. In this new transition, mortality and morbidity fall among the elderly as a result of new medical knowledge that has permitted a better treatment of respiratory and cardiovascular disease and vision problems (particularly, cataract surgery) (Cutler et al., 2006; Chernew et al., 2016; Eggleston and Fuchs, 2012). The rise in longevity has also been helped by better nutrition in early years of life. The result is people living not just longer life but longer healthy life years (Mathers et al., 2001; Murray and Lopez, 1997; Salomon et al., 2012).

Thus, the episodes of rising international inequality in life expectancy in the late nineteenth and early twentieth century and, then, in the late twentieth and early twentieth-first century, coincide with the epidemiological transition and the second health transition, and are associated to the uneven diffusion of new medical technologies, knowledge, and health practices.

This finding suggests the existence of an inverted U shape curve relationship between inequality in longevity and the level of life expectancy at birth, in other words, a Health Kuznets Curve (Figure 16). The driving force of the Health Kuznets Curve would be the spread of the health transitions across countries. The uneven diffusion of the epidemiological or first transition would account for its rising side, while its increasing diffusion across the globe would account for its declining section. The closing of the health Kuznets curve seems to have given way to a new one. The medical technology associated to the second health transition, as is not evenly spread, creates differences in longevity opening a new phase of inequality in (healthy) life expectancy.

Since well-being is multidimensional and its different dimensions exhibit contradictory trends, looking now at the international distribution of a composite index such as the historical index of human development, that combines them, seems warranted. After increasing in the late nineteenth century, inequality in human development experienced a sustained decline throughout most of the twentieth century, starting from 1900 and reaching to 1990, when stabilised (except for the Atkinson index), for Inequality 1 (Figure 17a), and from World War I through 2007, for Inequality 2 (Figure 17b). The contraction in Inequality 1 was more intense between 1938 and 1970, and particularly severe during the 1940s. In the case of Inequality 2, although a sharp decline took place in the late 1920s, its reduction happened between 1950 and the mid-1970s (Table 13). The decline was deeper for MLD and Theil indices.

It is worth noting that is the variance in human development gains across countries, rather than the dispersion in population growth, what explained the long-run contraction in inequality.

The performance of large countries affected trends in Inequality 2. In particular, China and India contributed to raising its level until the 1950s and to reducing it thereafter (Figure 18). Sub Saharan Africa has made a sustained contribution to raising inequality over the long run, and especially since 1990 (Table 14).

When aggregate inequality 2 is decomposed into the gap between the *West* and the *Rest* and the dispersion within both groups, it emerges that the gap between *OECD* countries and the rest of the world made the largest contribution to the level of international inequality during the late nineteenth and early twentieth century -until 1930 and 1950 for the MLD and Theil indices, respectively-, while the dispersion within groups, especially in the *Rest*, took over from mid-twentieth century onwards (Figures 19a and 19b). However, inequality trends were driven by the gap between the *West* and the *Rest* up to the early 1960s (Table 15).

Concluding Remarks

This paper has provided a long-run view of inter-country inequality in well-being based on a new dataset. Well-being inequality has declined over time and the trends in social dimensions concur. Well-being dimensions alter the view on long run inequality derived from real per capita GDP: in particular, inequality in social

dimensions declined after World War I while income inequality increased until mid-twentieth century. The spread of mass primary education and the health transitions were the main drivers of such a equalising trend in well-being.

The diffusion of the health transition(s) drove life expectancy inequality and a Health Kuznets Curve could be suggested for life expectancy at birth. Inequality fell while life expectancy rose throughout the twentieth century as the epidemiological transition was spreading across the globe and, then, came to a halt as it was completed. A new phase of increasing inequality opened at the turn of the century, associated to a second health transition, linked to the successful fight against cardiovascular and respiratory disease that, so far, has only effected the developed countries, giving a boost to life expectancy of the elderly. In so far the new medical technology becomes widely accessible, another decline in life expectancy inequality could be foreseen during the twentieth-first century closing the second health Kuznets curve.

Why inequality declined in social dimensions and human development, but not in GDP per head? Was it due to public policy, or to the fact that medical technology is a public good? Why has not been a second health transition in the *Rest*? Has it been the outcome of inequalising new medical technologies, or the result of lack of public policies? Answering these questions present a challenging research programme.

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Table 1

International Inequality in Real Per Capita GDP, 1870-2007

	Unweighted				Population-weighted			
	MLD	**Theil**	**Gini**	**Atkinson (ε=2)**	**MLD**	**Theil**	**Gini**	**Atkinson (ε=2)**
1870	0.23	0.23	0.38	0.35	0.17	0.20	0.32	0.25
1880	0.26	0.26	0.40	0.38	0.22	0.25	0.36	0.30
1890	0.28	0.28	0.41	0.41	0.25	0.28	0.39	0.33
1900	0.29	0.29	0.42	0.42	0.29	0.31	0.42	0.38
1913	0.31	0.31	0.43	0.44	0.33	0.35	0.45	0.43
1925	0.32	0.31	0.44	0.46	0.37	0.39	0.47	0.46
1929	0.35	0.33	0.45	0.49	0.39	0.40	0.48	0.48
1933	0.32	0.31	0.43	0.46	0.31	0.32	0.43	0.42
1938	0.35	0.33	0.45	0.49	0.39	0.38	0.47	0.50
1950	0.54	0.62	0.55	0.60	0.59	0.56	0.56	0.64
1955	0.54	0.60	0.55	0.60	0.58	0.54	0.56	0.63
1960	0.52	0.56	0.54	0.60	0.58	0.53	0.55	0.63
1965	0.51	0.50	0.53	0.61	0.63	0.56	0.57	0.66
1970	0.54	0.51	0.54	0.63	0.66	0.58	0.58	0.68
1975	0.53	0.47	0.53	0.64	0.68	0.58	0.58	0.69
1980	0.54	0.45	0.52	0.66	0.67	0.59	0.58	0.69
1985	0.54	0.44	0.52	0.66	0.62	0.58	0.57	0.65
1990	0.53	0.43	0.51	0.67	0.61	0.58	0.57	0.65
1995	0.58	0.46	0.53	0.69	0.56	0.55	0.55	0.63
2000	0.61	0.48	0.54	0.72	0.56	0.56	0.55	0.63
2005	0.60	0.46	0.53	0.72	0.48	0.47	0.51	0.61
2007	0.60	0.45	0.52	0.73	0.45	0.43	0.49	0.60

Table 2

International Inequality in Real GDP per head, 1870-2007: The Contribution of China and India and Sub Saharan Africa (MLD)

	Actual	Excluding China and India	Excluding Sub Saharan Africa
1870	0.17	0.17	0.17
1880	0.22	0.20	0.22
1890	0.25	0.21	0.25
1900	0.29	0.22	0.29
1913	0.33	0.24	0.33
1925	0.37	0.28	0.37
1929	0.39	0.28	0.38
1933	0.31	0.22	0.30
1938	0.39	0.25	0.39
1950	0.59	0.40	0.59
1955	0.58	0.40	0.58
1960	0.58	0.41	0.58
1965	0.63	0.44	0.63
1970	0.66	0.46	0.66
1975	0.68	0.47	0.68
1980	0.67	0.49	0.66
1985	0.62	0.52	0.60
1990	0.61	0.55	0.57
1995	0.56	0.59	0.50
2000	0.56	0.62	0.49
2005	0.48	0.60	0.40
2007	0.45	0.58	0.36

Table 3

Decomposing International Inequality in Real Per Capita GDP (population-weighted): MLD and Theil

	MLD			Theil		
	Within-group	**Between-group**	**Total**	**Within-group**	**Between-group**	**Total**
1870	0.03	0.14	0.17	0.04	0.17	0.20
1880	0.04	0.18	0.22	0.04	0.21	0.25
1890	0.05	0.19	0.25	0.05	0.22	0.28
1900	0.07	0.22	0.29	0.06	0.25	0.31
1913	0.09	0.24	0.33	0.08	0.27	0.35
1925	0.10	0.27	0.37	0.08	0.30	0.39
1929	0.12	0.27	0.39	0.09	0.31	0.40
1933	0.10	0.21	0.31	0.08	0.24	0.32
1938	0.16	0.23	0.39	0.11	0.27	0.38
1950	0.28	0.31	0.59	0.20	0.36	0.56
1955	0.27	0.31	0.58	0.18	0.36	0.54
1960	0.29	0.29	0.58	0.18	0.34	0.53
1965	0.33	0.30	0.63	0.20	0.36	0.56
1970	0.38	0.28	0.66	0.24	0.34	0.58
1975	0.41	0.27	0.68	0.25	0.33	0.58
1980	0.41	0.27	0.67	0.25	0.33	0.59
1985	0.35	0.27	0.62	0.24	0.34	0.58
1990	0.35	0.26	0.61	0.24	0.34	0.58
1995	0.30	0.26	0.56	0.21	0.34	0.55
2000	0.28	0.28	0.56	0.19	0.36	0.56
2005	0.26	0.22	0.48	0.17	0.30	0.47
2007	0.25	0.20	0.45	0.17	0.26	0.43

Table 4

International Inequality in Literacy, 1870-2007
(Kakwani Indices)

	Unweighted				Population-weighted			
	MLD	**Theil**	**Gini**	**Atkinson (ε=2)**	**MLD**	**Theil**	**Gini**	**Atkinson (ε=2)**
1870	1.55	1.09	0.75	0.93	1.03	0.79	0.64	0.88
1880	1.56	1.04	0.74	0.94	0.93	0.77	0.64	0.84
1890	1.59	1.02	0.73	0.95	0.92	0.77	0.64	0.84
1900	1.54	0.96	0.72	0.95	0.95	0.74	0.64	0.85
1913	1.45	0.93	0.71	0.94	0.92	0.72	0.63	0.85
1925	1.33	0.83	0.67	0.94	0.90	0.70	0.62	0.83
1929	1.29	0.80	0.67	0.94	0.90	0.69	0.62	0.83
1933	1.23	0.77	0.66	0.93	0.86	0.65	0.60	0.82
1938	1.20	0.74	0.65	0.93	0.77	0.58	0.58	0.80
1950	1.02	0.68	0.62	0.89	0.67	0.50	0.54	0.80
1955	0.86	0.61	0.60	0.85	0.59	0.45	0.51	0.75
1960	0.78	0.57	0.58	0.82	0.55	0.43	0.50	0.72
1965	0.67	0.50	0.55	0.77	0.49	0.39	0.48	0.68
1970	0.57	0.44	0.52	0.71	0.45	0.38	0.47	0.63
1975	0.51	0.40	0.49	0.67	0.42	0.36	0.46	0.60
1980	0.46	0.37	0.47	0.63	0.38	0.34	0.45	0.56
1985	0.41	0.33	0.45	0.61	0.37	0.34	0.45	0.54
1990	0.35	0.27	0.41	0.57	0.29	0.26	0.39	0.46
1995	0.33	0.25	0.39	0.56	0.28	0.25	0.39	0.46
2000	0.27	0.21	0.35	0.49	0.21	0.18	0.33	0.38
2005	0.22	0.18	0.32	0.41	0.19	0.16	0.31	0.33
2007	0.21	0.17	0.32	0.40	0.18	0.16	0.31	0.32

Table 5

International Inequality in Literacy, 1870-2007: The Contribution of China and India and Sub Saharan Africa (MLD) (Kakwani Indices)

	Actual	Excluding China and India	Excluding Sub Saharan Africa
1870	1.03	0.94	1.00
1880	0.93	0.92	0.89
1890	0.92	0.93	0.86
1900	0.95	0.90	0.88
1913	0.92	0.82	0.84
1925	0.90	0.71	0.83
1929	0.90	0.69	0.82
1933	0.86	0.65	0.78
1938	0.77	0.64	0.68
1950	0.67	0.70	0.57
1955	0.59	0.62	0.51
1960	0.55	0.59	0.47
1965	0.49	0.52	0.42
1970	0.45	0.47	0.40
1975	0.42	0.44	0.37
1980	0.38	0.40	0.35
1985	0.37	0.38	0.34
1990	0.29	0.32	0.27
1995	0.28	0.31	0.26
2000	0.21	0.25	0.18
2005	0.19	0.22	0.16
2007	0.18	0.21	0.15

Table 6

Decomposing International Inequality in Literacy (population-weighted): MLD and Theil (Kakwani Indices)

	MLD			Theil		
	Within-group	**Between-group**	**Total**	**Within-group**	**Between-group**	**Total**
1870	0.52	0.51	1.03	0.23	0.56	0.79
1880	0.43	0.50	0.93	0.23	0.54	0.77
1890	0.41	0.51	0.92	0.22	0.55	0.77
1900	0.49	0.45	0.95	0.25	0.49	0.74
1913	0.46	0.46	0.92	0.23	0.50	0.72
1925	0.49	0.41	0.90	0.25	0.45	0.70
1929	0.53	0.37	0.90	0.28	0.41	0.69
1933	0.54	0.32	0.86	0.29	0.36	0.65
1938	0.54	0.23	0.77	0.32	0.27	0.58
1950	0.49	0.18	0.67	0.29	0.21	0.50
1955	0.45	0.15	0.59	0.28	0.17	0.45
1960	0.43	0.12	0.55	0.29	0.14	0.43
1965	0.37	0.12	0.49	0.24	0.15	0.39
1970	0.34	0.12	0.45	0.23	0.14	0.38
1975	0.31	0.11	0.42	0.23	0.13	0.36
1980	0.28	0.10	0.38	0.22	0.12	0.34
1985	0.28	0.10	0.37	0.22	0.12	0.34
1990	0.22	0.07	0.29	0.17	0.09	0.26
1995	0.22	0.07	0.28	0.17	0.08	0.25
2000	0.17	0.04	0.21	0.13	0.05	0.18
2005	0.15	0.04	0.19	0.12	0.04	0.16
2007	0.15	0.03	0.18	0.12	0.04	0.16

Table 7

International Inequality in Gross Enrolment, 1870-2007
(Kakwani Indices)

	Unweighted				Population-weighted			
	MLD	**Theil**	**Gini**	**Atkinson (ε=2)**	**MLD**	**Theil**	**Gini**	**Atkinson (ε=2)**
1870	1.09	0.85	0.68	0.84	1.25	1.01	0.72	0.86
1880	1.09	0.82	0.67	0.86	1.26	0.95	0.71	0.87
1890	1.05	0.75	0.65	0.86	0.83	0.72	0.62	0.76
1900	1.04	0.71	0.64	0.86	0.92	0.72	0.63	0.80
1913	0.92	0.62	0.60	0.86	0.81	0.63	0.60	0.78
1925	0.78	0.52	0.55	0.83	0.54	0.47	0.52	0.66
1929	0.72	0.48	0.54	0.82	0.48	0.42	0.50	0.63
1933	0.69	0.47	0.53	0.81	0.49	0.41	0.49	0.64
1938	0.66	0.44	0.51	0.81	0.55	0.45	0.51	0.68
1950	0.52	0.35	0.46	0.76	0.33	0.27	0.40	0.60
1955	0.44	0.31	0.43	0.72	0.24	0.20	0.35	0.53
1960	0.35	0.26	0.40	0.60	0.19	0.15	0.30	0.43
1965	0.28	0.22	0.37	0.49	0.17	0.14	0.29	0.35
1970	0.25	0.20	0.35	0.46	0.16	0.14	0.29	0.31
1975	0.22	0.17	0.32	0.43	0.13	0.11	0.26	0.28
1980	0.16	0.12	0.27	0.33	0.11	0.10	0.24	0.22
1985	0.15	0.12	0.27	0.32	0.11	0.11	0.25	0.22
1990	0.17	0.14	0.28	0.33	0.13	0.13	0.27	0.24
1995	0.21	0.20	0.34	0.36	0.15	0.16	0.29	0.26
2000	0.20	0.19	0.34	0.36	0.14	0.14	0.29	0.26
2005	0.18	0.18	0.33	0.31	0.12	0.13	0.27	0.21
2007	0.18	0.18	0.33	0.30	0.12	0.13	0.27	0.20

Table 8

International Inequality in Gross Enrolment, 1870-2007: The Contribution of China and India and Sub Saharan Africa (MLD) (Kakwani Indices)

	Actual	Excluding China and India	Excluding Sub Saharan Africa
1870	1.25	0.86	1.25
1880	1.26	0.80	1.26
1890	0.83	0.73	0.80
1900	0.92	0.64	0.89
1913	0.81	0.55	0.76
1925	0.54	0.39	0.50
1929	0.48	0.36	0.44
1933	0.49	0.35	0.45
1938	0.55	0.39	0.50
1950	0.33	0.38	0.27
1955	0.24	0.31	0.18
1960	0.19	0.26	0.14
1965	0.17	0.24	0.12
1970	0.16	0.22	0.12
1975	0.13	0.18	0.10
1980	0.11	0.13	0.09
1985	0.11	0.14	0.10
1990	0.13	0.16	0.11
1995	0.15	0.21	0.13
2000	0.14	0.18	0.11
2005	0.12	0.16	0.10
2007	0.12	0.15	0.11

Table 9

Decomposing International Inequality in Gross Enrolment (population-weighted): MLD and Theil (Kakwani Indices)

	MLD			Theil		
	Within-group	**Between-group**	**Total**	**Within-group**	**Between-group**	**Total**
1870	0.42	0.83	1.25	0.18	0.83	1.01
1880	0.57	0.69	1.26	0.24	0.71	0.95
1890	0.33	0.50	0.83	0.18	0.54	0.72
1900	0.47	0.45	0.92	0.23	0.49	0.72
1913	0.45	0.36	0.81	0.23	0.40	0.63
1925	0.32	0.23	0.54	0.21	0.26	0.47
1929	0.28	0.20	0.48	0.18	0.23	0.42
1933	0.33	0.17	0.49	0.22	0.19	0.41
1938	0.46	0.08	0.55	0.36	0.09	0.45
1950	0.22	0.10	0.33	0.15	0.12	0.27
1955	0.17	0.07	0.24	0.12	0.08	0.20
1960	0.15	0.04	0.19	0.10	0.05	0.15
1965	0.14	0.03	0.17	0.11	0.04	0.14
1970	0.13	0.03	0.16	0.11	0.03	0.14
1975	0.11	0.02	0.13	0.09	0.02	0.11
1980	0.09	0.02	0.11	0.07	0.02	0.10
1985	0.09	0.03	0.11	0.08	0.03	0.11
1990	0.09	0.04	0.13	0.08	0.05	0.13
1995	0.07	0.08	0.15	0.06	0.10	0.16
2000	0.10	0.05	0.14	0.08	0.06	0.14
2005	0.07	0.05	0.12	0.07	0.06	0.13
2007	0.08	0.04	0.12	0.07	0.05	0.13

Table 10

International Inequality in Life Expectancy, 1870-2007
(Kakwani Indices)

	Unweighted				Population-weighted			
	MLD	**Theil**	**Gini**	**Atkinson (ε=2)**	**MLD**	**Theil**	**Gini**	**Atkinson (ε=2)**
1870	0.27	0.29	0.39	0.35	0.22	0.24	0.36	0.31
1880	0.30	0.32	0.42	0.40	0.24	0.25	0.37	0.33
1890	0.36	0.35	0.45	0.48	0.31	0.31	0.42	0.41
1900	0.37	0.36	0.46	0.49	0.35	0.35	0.44	0.46
1913	0.34	0.34	0.45	0.46	0.39	0.37	0.46	0.50
1925	0.38	0.36	0.47	0.49	0.42	0.37	0.47	0.53
1929	0.34	0.32	0.44	0.46	0.25	0.25	0.38	0.36
1933	0.32	0.31	0.43	0.45	0.23	0.23	0.37	0.35
1938	0.27	0.26	0.40	0.39	0.21	0.21	0.35	0.31
1950	0.19	0.18	0.34	0.31	0.17	0.17	0.32	0.28
1955	0.18	0.17	0.33	0.30	0.16	0.16	0.31	0.26
1960	0.17	0.16	0.32	0.29	0.12	0.12	0.27	0.22
1965	0.16	0.14	0.30	0.27	0.11	0.10	0.25	0.20
1970	0.14	0.13	0.28	0.25	0.08	0.08	0.22	0.16
1975	0.13	0.12	0.27	0.25	0.08	0.07	0.21	0.15
1980	0.11	0.10	0.26	0.22	0.07	0.07	0.21	0.14
1985	0.11	0.10	0.25	0.21	0.07	0.07	0.20	0.13
1990	0.11	0.09	0.24	0.21	0.07	0.06	0.20	0.14
1995	0.11	0.10	0.25	0.24	0.07	0.07	0.20	0.15
2000	0.13	0.11	0.26	0.24	0.08	0.08	0.22	0.16
2005	0.14	0.12	0.28	0.26	0.09	0.09	0.23	0.18
2007	0.14	0.13	0.28	0.26	0.10	0.09	0.23	0.18

Table 11

International Inequality in Life Expectancy, 1870-2007: The Contribution of China and India and Sub Saharan Africa (MLD) (Kakwani Indices)

	Actual	Excluding China and India	Excluding Sub Saharan Africa
1870	0.22	0.18	0.22
1880	0.24	0.19	0.24
1890	0.31	0.23	0.30
1900	0.35	0.24	0.35
1913	0.39	0.23	0.39
1925	0.42	0.23	0.41
1929	0.25	0.21	0.24
1933	0.23	0.20	0.22
1938	0.21	0.18	0.20
1950	0.17	0.17	0.16
1955	0.16	0.15	0.15
1960	0.12	0.13	0.11
1965	0.11	0.12	0.09
1970	0.08	0.11	0.07
1975	0.08	0.09	0.06
1980	0.07	0.10	0.06
1985	0.07	0.09	0.05
1990	0.07	0.09	0.05
1995	0.07	0.10	0.05
2000	0.08	0.11	0.05
2005	0.09	0.13	0.06
2007	0.10	0.13	0.07

Table 12

Decomposing International Inequality in Life Expectancy (population-weighted): MLD and Theil (Kakwani Indices)

	MLD			Theil		
	Within-group	**Between-group**	**Total**	**Within-group**	**Between-group**	**Total**
1870	0.07	0.15	0.22	0.07	0.17	0.24
1880	0.08	0.16	0.24	0.08	0.18	0.25
1890	0.10	0.20	0.31	0.08	0.23	0.31
1900	0.14	0.22	0.35	0.10	0.25	0.35
1913	0.16	0.23	0.39	0.11	0.26	0.37
1925	0.20	0.22	0.42	0.13	0.25	0.37
1929	0.09	0.15	0.25	0.07	0.18	0.25
1933	0.09	0.14	0.23	0.07	0.16	0.23
1938	0.08	0.13	0.21	0.06	0.15	0.21
1950	0.10	0.07	0.17	0.09	0.08	0.17
1955	0.10	0.06	0.16	0.08	0.07	0.16
1960	0.08	0.05	0.12	0.07	0.05	0.12
1965	0.08	0.03	0.11	0.06	0.04	0.10
1970	0.06	0.02	0.08	0.05	0.03	0.08
1975	0.06	0.02	0.08	0.05	0.02	0.07
1980	0.05	0.02	0.07	0.04	0.02	0.07
1985	0.05	0.02	0.07	0.04	0.02	0.07
1990	0.05	0.02	0.07	0.04	0.02	0.06
1995	0.05	0.02	0.07	0.04	0.02	0.07
2000	0.06	0.02	0.08	0.05	0.03	0.08
2005	0.07	0.02	0.09	0.06	0.03	0.09
2007	0.07	0.03	0.10	0.07	0.03	0.09

Table 13

International Inequality in Human Development (HIHD), 1870-2007

	Unweighted				Population-weighted			
	MLD	Theil	Gini	Atkinson (ε=2)	MLD	Theil	Gini	Atkinson (ε=2)
1870	0.43	0.42	0.50	0.52	0.34	0.36	0.45	0.43
1880	0.45	0.43	0.51	0.55	0.35	0.36	0.45	0.44
1890	0.48	0.44	0.51	0.58	0.34	0.34	0.44	0.45
1900	0.48	0.43	0.51	0.59	0.38	0.37	0.46	0.49
1913	0.44	0.40	0.49	0.56	0.38	0.36	0.46	0.49
1925	0.42	0.37	0.48	0.56	0.35	0.33	0.44	0.47
1929	0.40	0.35	0.46	0.55	0.29	0.28	0.41	0.42
1933	0.39	0.34	0.46	0.53	0.28	0.27	0.40	0.41
1938	0.36	0.31	0.44	0.51	0.27	0.25	0.39	0.40
1950	0.28	0.24	0.39	0.45	0.25	0.24	0.37	0.38
1955	0.25	0.22	0.37	0.41	0.21	0.20	0.35	0.34
1960	0.22	0.19	0.35	0.37	0.17	0.16	0.32	0.29
1965	0.19	0.17	0.33	0.33	0.15	0.15	0.30	0.27
1970	0.17	0.15	0.31	0.30	0.14	0.13	0.29	0.24
1975	0.16	0.14	0.30	0.29	0.12	0.12	0.27	0.22
1980	0.14	0.12	0.28	0.26	0.11	0.11	0.26	0.20
1985	0.13	0.12	0.27	0.25	0.11	0.10	0.26	0.19
1990	0.13	0.11	0.26	0.25	0.10	0.09	0.24	0.18
1995	0.13	0.12	0.27	0.26	0.10	0.09	0.24	0.19
2000	0.13	0.11	0.27	0.25	0.09	0.09	0.23	0.18
2005	0.12	0.11	0.26	0.24	0.09	0.08	0.22	0.17
2007	0.12	0.11	0.26	0.23	0.08	0.08	0.22	0.16

Table 14

International Inequality in Human Development (HIHD), 1870-2007: The Contribution of China and India and Sub Saharan Africa (MLD)

	Actual	Excluding China and India	Excluding Sub Saharan Africa
1870	0.34	0.29	0.34
1880	0.35	0.29	0.34
1890	0.34	0.31	0.33
1900	0.38	0.30	0.36
1913	0.38	0.28	0.36
1925	0.35	0.24	0.33
1929	0.29	0.23	0.27
1933	0.28	0.22	0.26
1938	0.27	0.20	0.25
1950	0.25	0.23	0.23
1955	0.21	0.20	0.19
1960	0.17	0.18	0.15
1965	0.15	0.17	0.13
1970	0.14	0.15	0.12
1975	0.12	0.14	0.11
1980	0.11	0.13	0.10
1985	0.11	0.12	0.09
1990	0.10	0.12	0.08
1995	0.10	0.13	0.08
2000	0.09	0.12	0.07
2005	0.09	0.12	0.06
2007	0.08	0.11	0.06

Table 15

Decomposing International Inequality in Human Development (HIHD) (population-weighted): MLD and Theil

	MLD			Theil		
	Within-group	**Between-group**	**Total**	**Within-group**	**Between-group**	**Total**
1870	0.09	0.25	0.34	0.07	0.29	0.36
1880	0.10	0.24	0.35	0.08	0.28	0.36
1890	0.11	0.23	0.34	0.08	0.26	0.34
1900	0.15	0.23	0.38	0.10	0.26	0.37
1913	0.16	0.22	0.38	0.11	0.25	0.36
1925	0.16	0.19	0.35	0.11	0.22	0.33
1929	0.13	0.16	0.29	0.10	0.19	0.28
1933	0.13	0.14	0.28	0.10	0.17	0.27
1938	0.15	0.12	0.27	0.11	0.14	0.25
1950	0.15	0.10	0.25	0.12	0.12	0.24
1955	0.13	0.08	0.21	0.10	0.10	0.20
1960	0.11	0.07	0.17	0.09	0.08	0.16
1965	0.10	0.05	0.15	0.08	0.06	0.15
1970	0.09	0.05	0.14	0.07	0.06	0.13
1975	0.08	0.04	0.12	0.07	0.05	0.12
1980	0.07	0.04	0.11	0.06	0.05	0.11
1985	0.07	0.04	0.11	0.06	0.04	0.10
1990	0.06	0.03	0.10	0.06	0.04	0.09
1995	0.06	0.04	0.10	0.05	0.04	0.09
2000	0.06	0.03	0.09	0.05	0.04	0.09
2005	0.06	0.03	0.09	0.05	0.03	0.08
2007	0.06	0.03	0.08	0.05	0.03	0.08

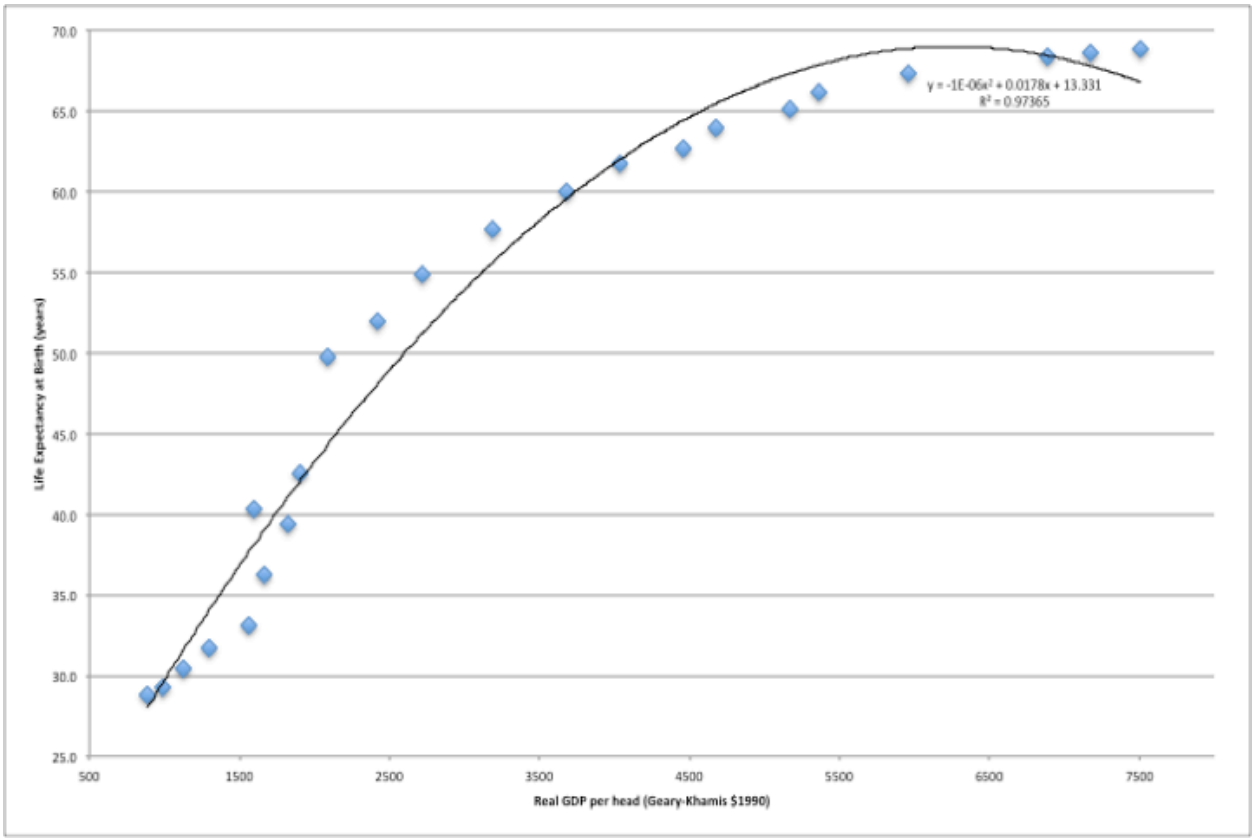


Figure 1a. Preston Curve: The World 1870-2007.

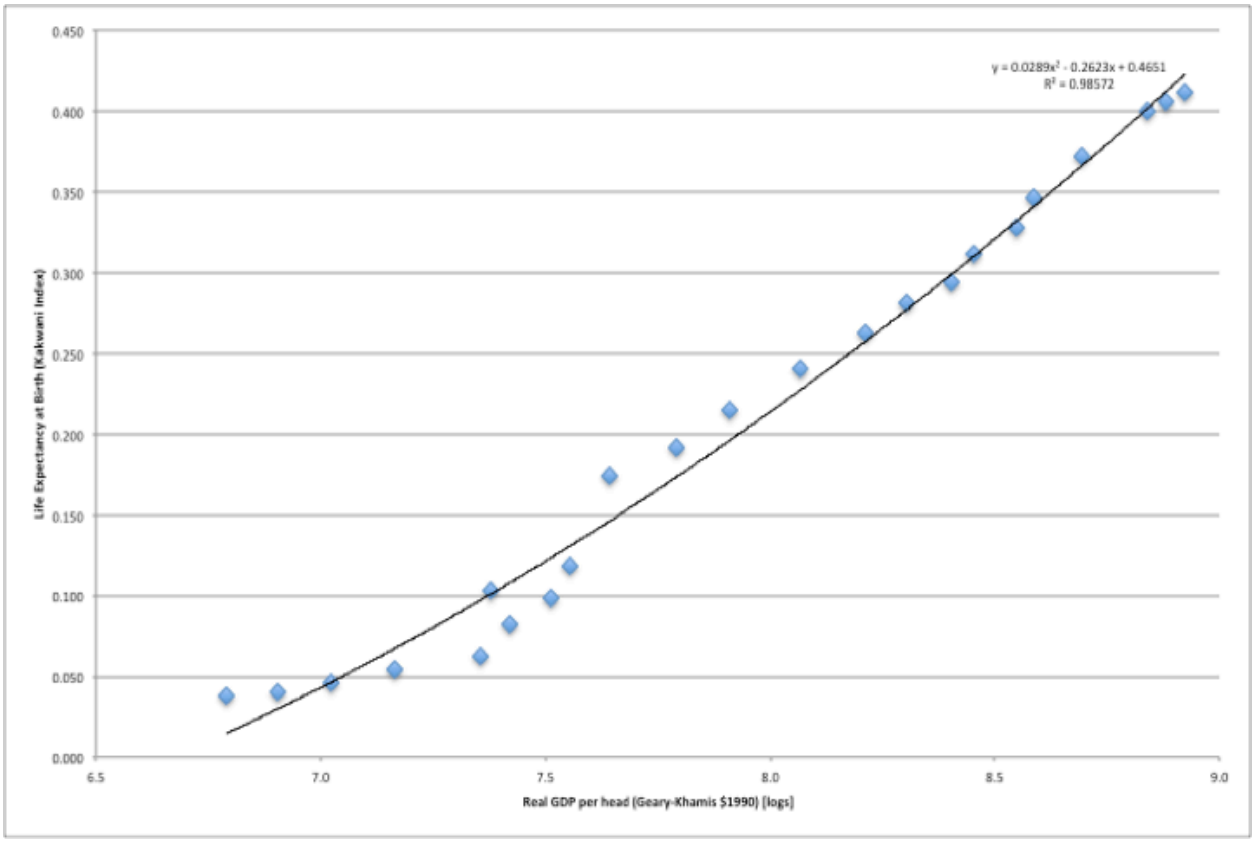


Figure 1b. Revised Preston Curve: The World 1870-2007.

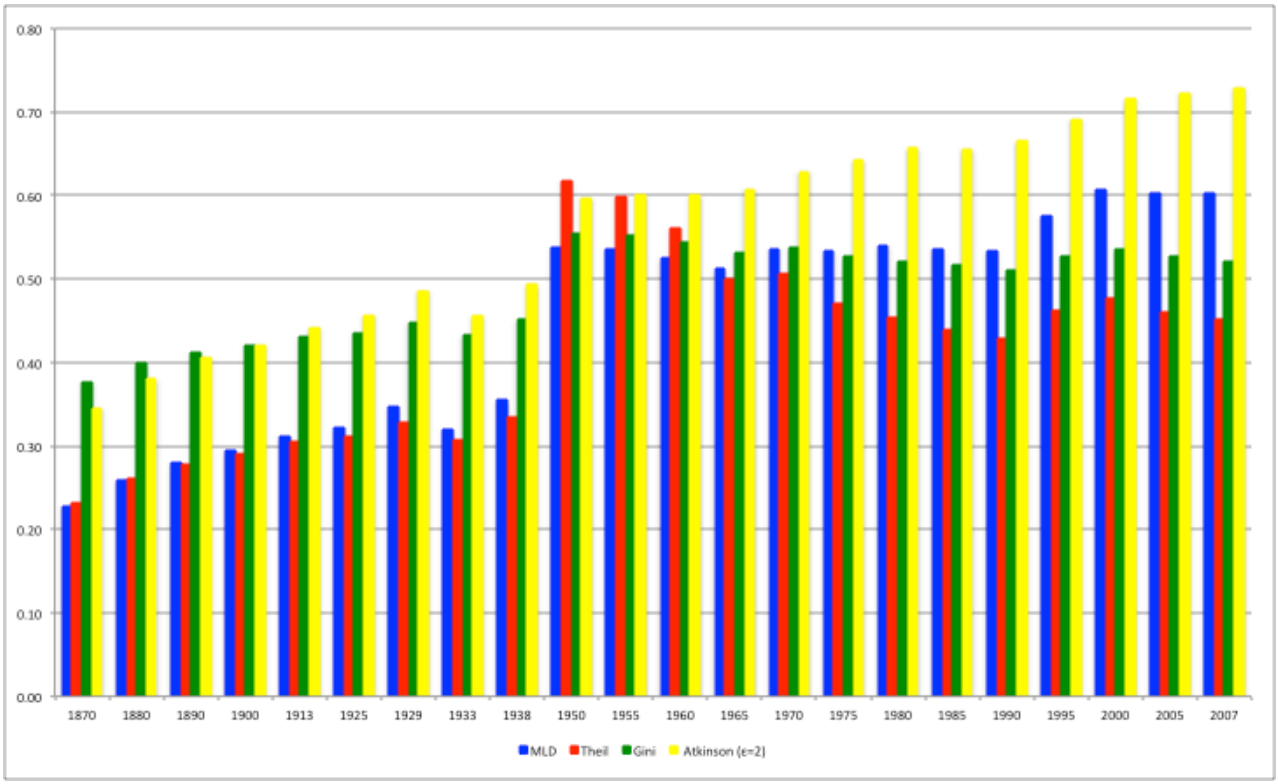


Figure 2a. International Inequality in Real Per Capita GDP, 1870-2007 (unweighted).

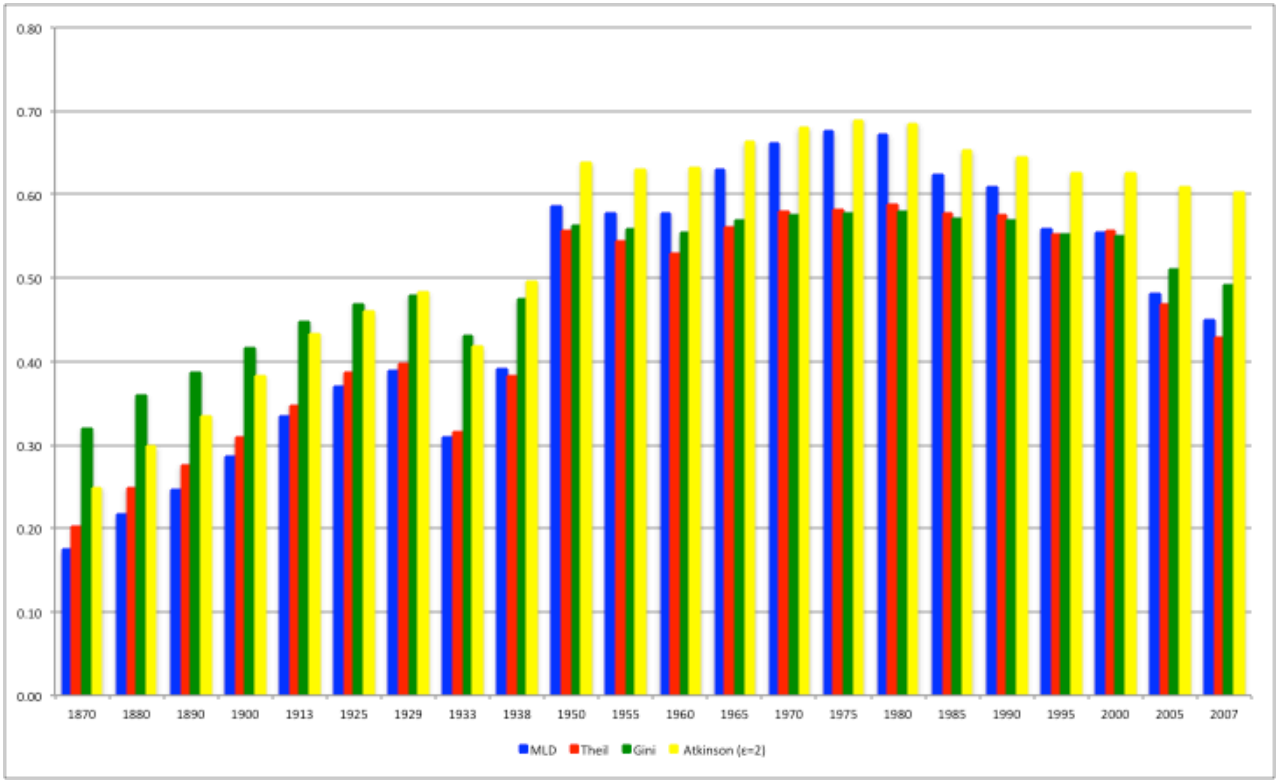


Figure 2b. International Inequality in Real Per Capita GDP, 1870-2007 (population weighted).

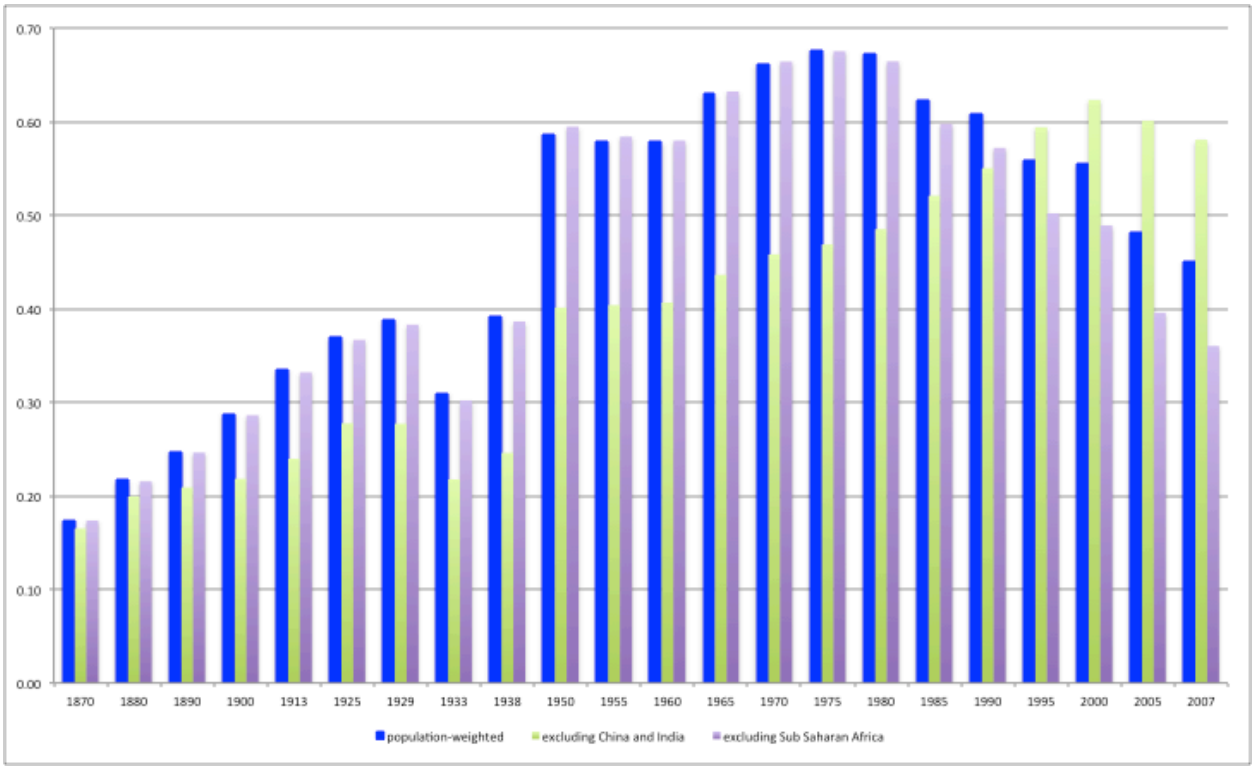


Figure 3. International Inequality in Real GDP per Head: The Contribution of China and India and Sub Saharan Africa, 1870-2007 (MLD)

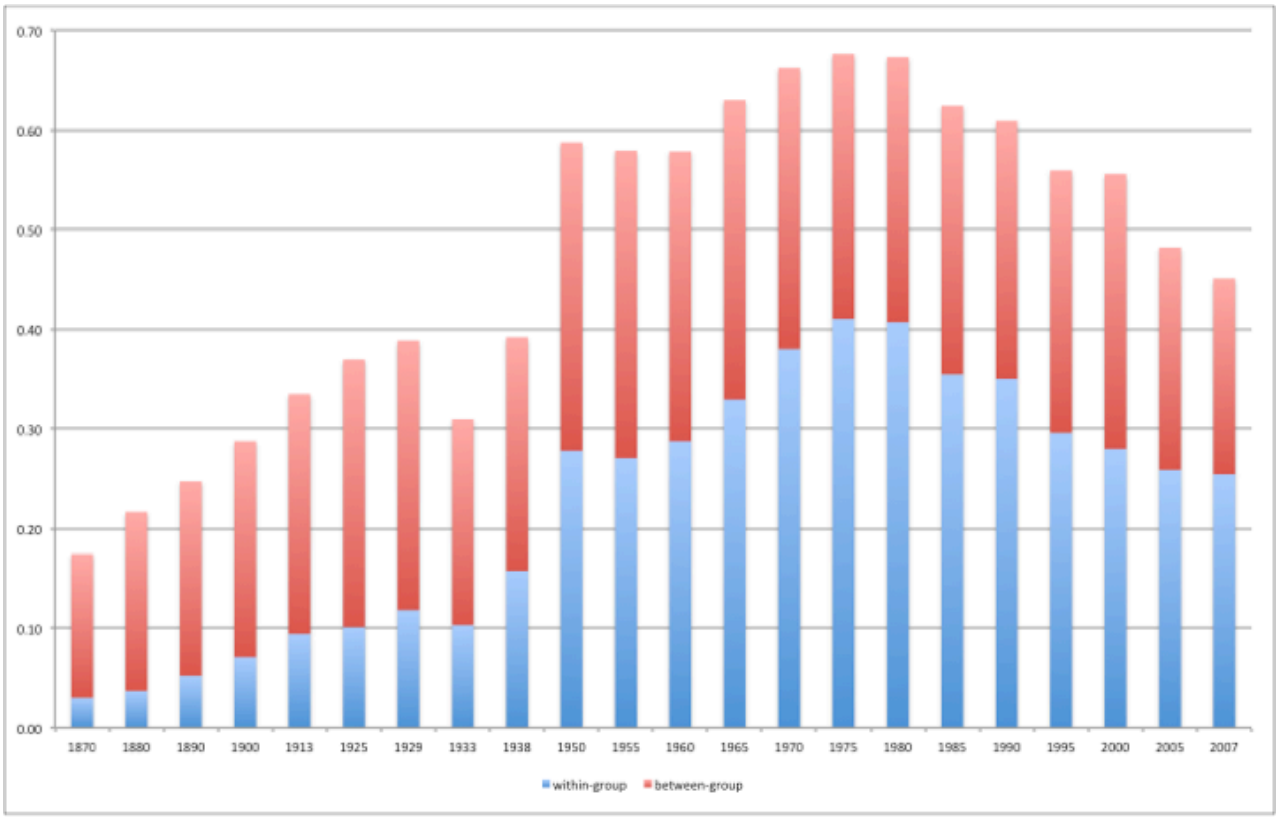


Figure 4a. Decomposing International Inequality in Real Per Capita GDP, 1870-2007 (population weighted) (MLD).

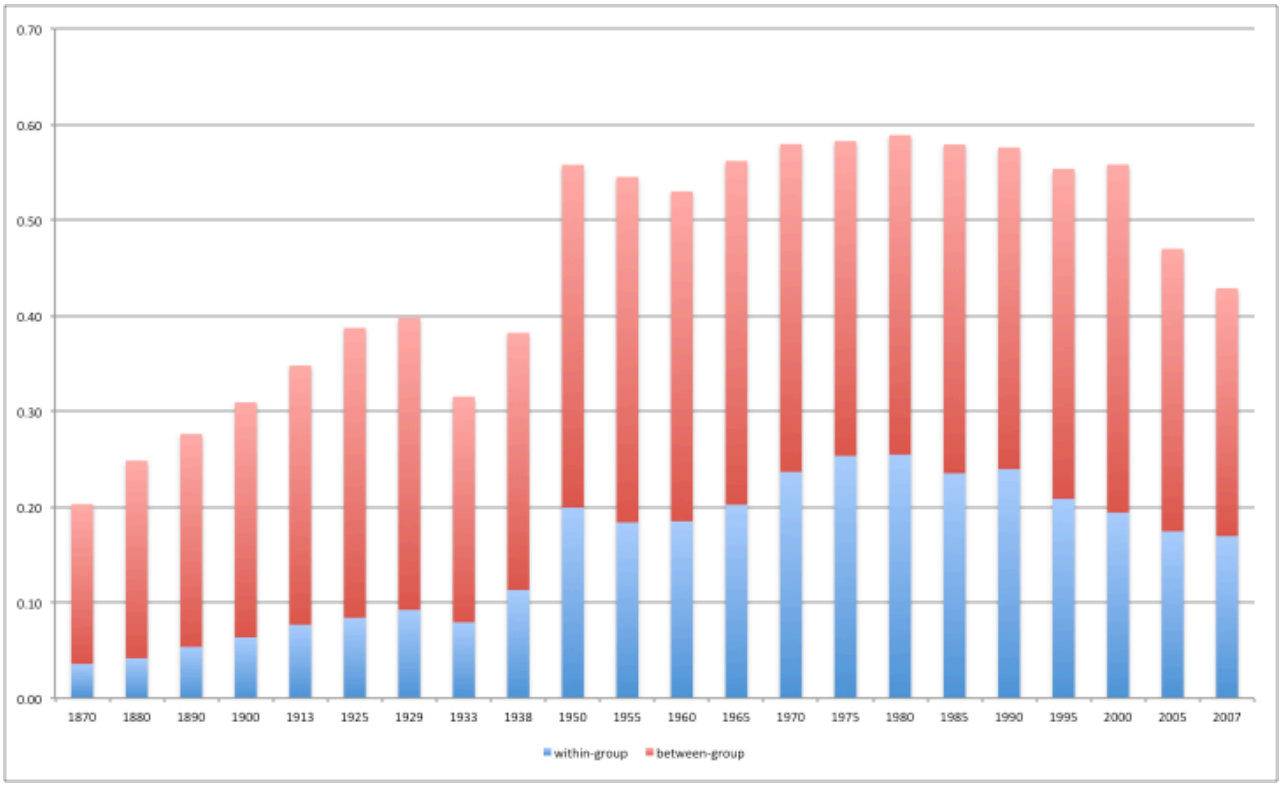


Figure 4b. Decomposing International Inequality in Real Per Capita GDP, 1870-2007 (population weighted) (Theil).

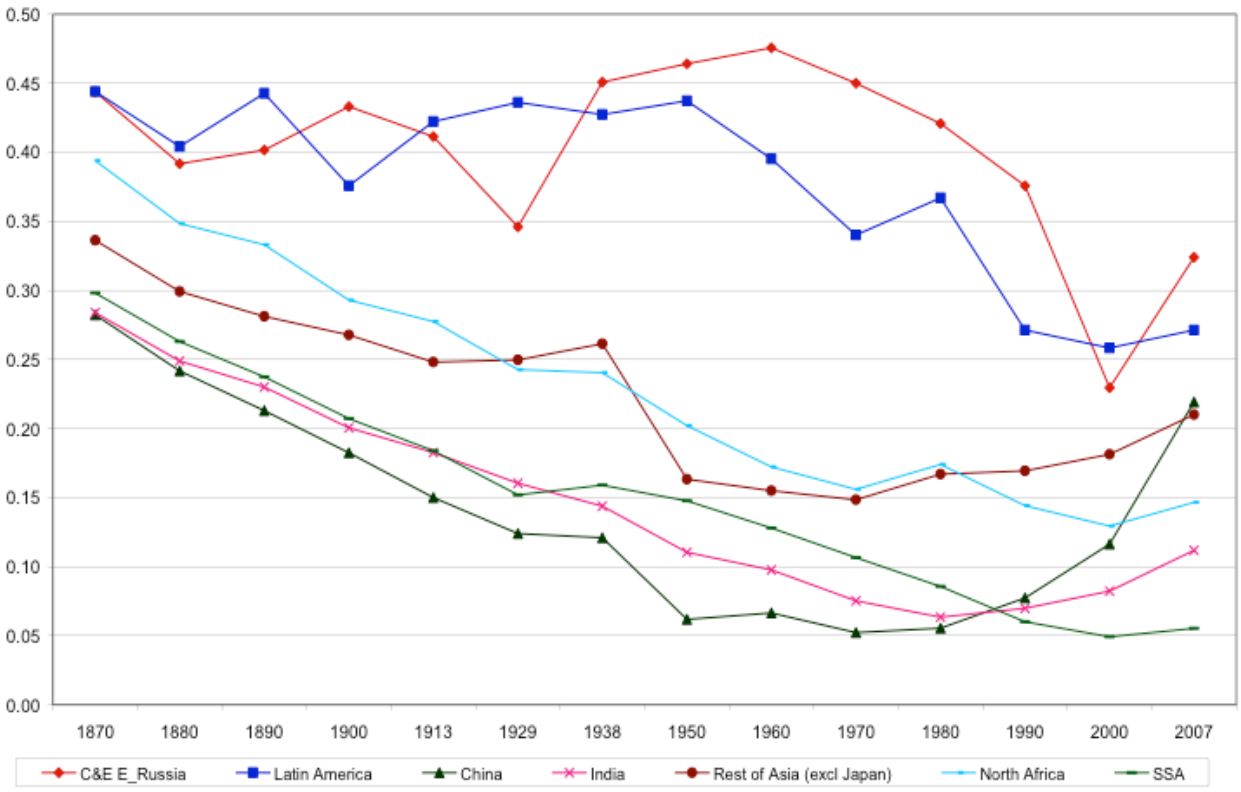


Figure 5. Relative Per Capita GDP in Developing Regions, 1870-2007 (OECD = 1)

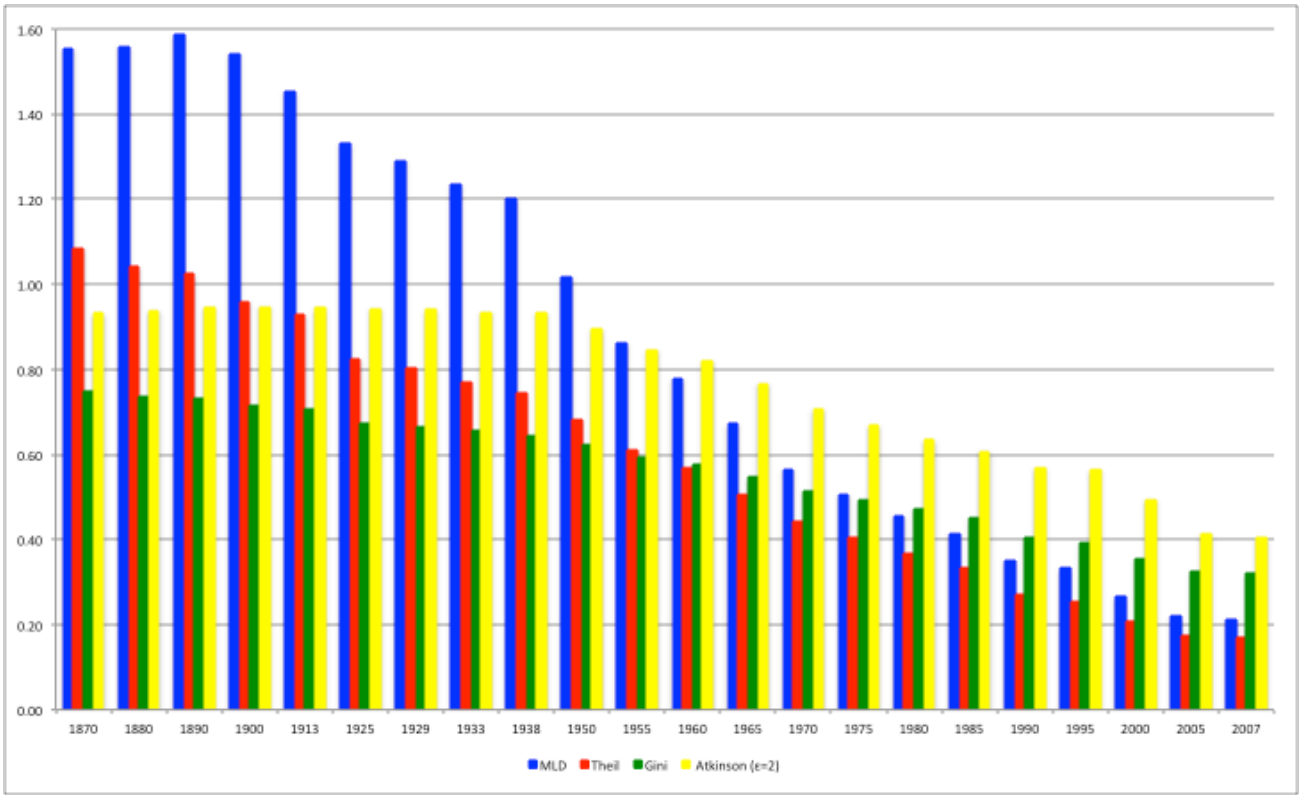


Figure 6a. International Inequality in Literacy, 1870-2007 (Kakwani Index) (unweighted).

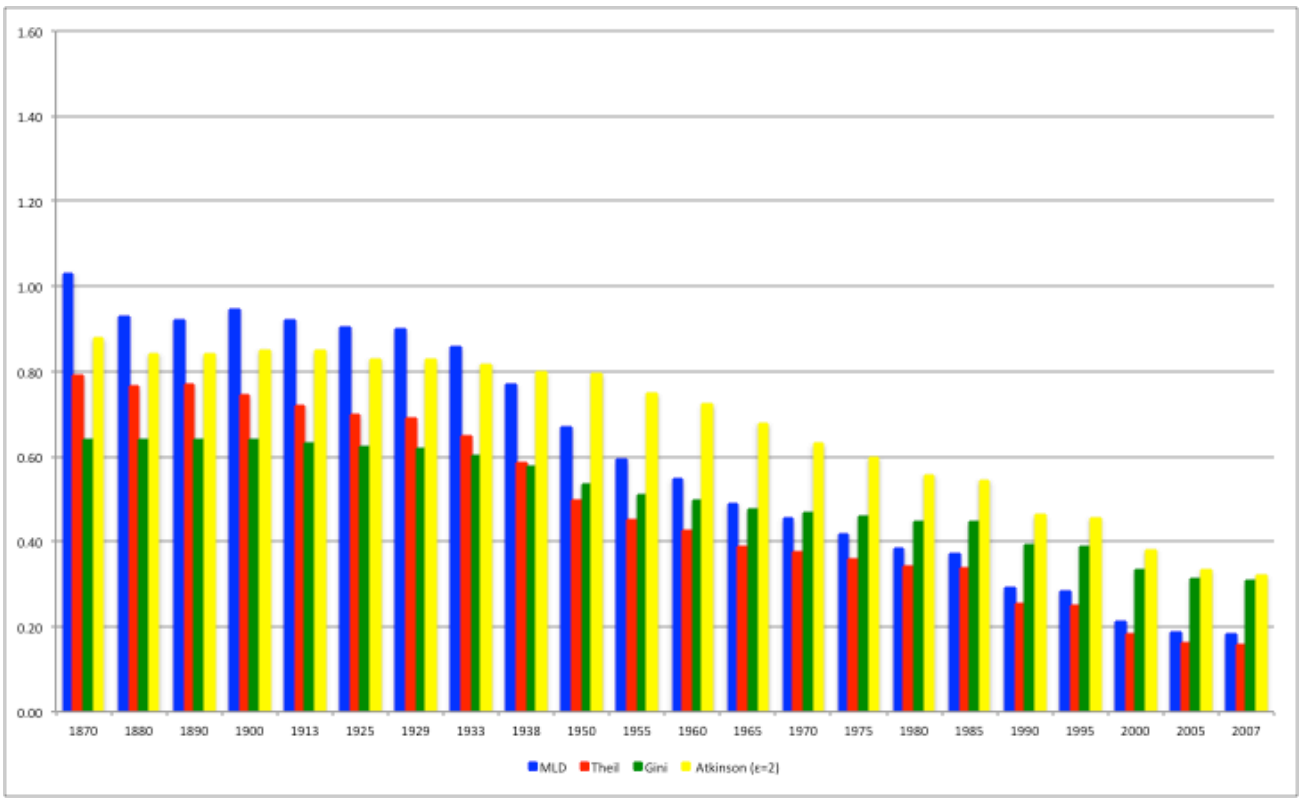


Figure 6b. International Inequality in Literacy, 1870-2007 (Kakwani Index) (population weighted).

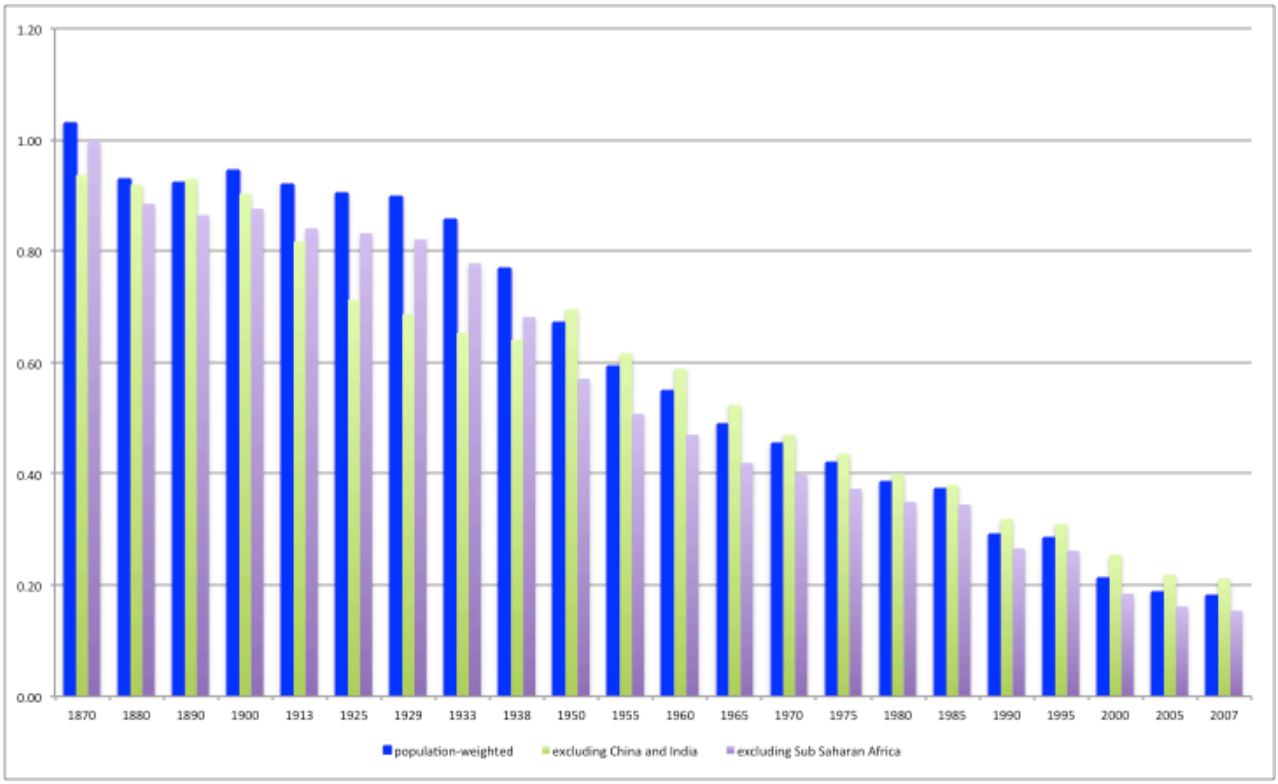


Figure 7. International Inequality in Literacy: The Contribution of China and India and Sub Saharan Africa, 1870-2007 (Kakwani Index) (MLD)

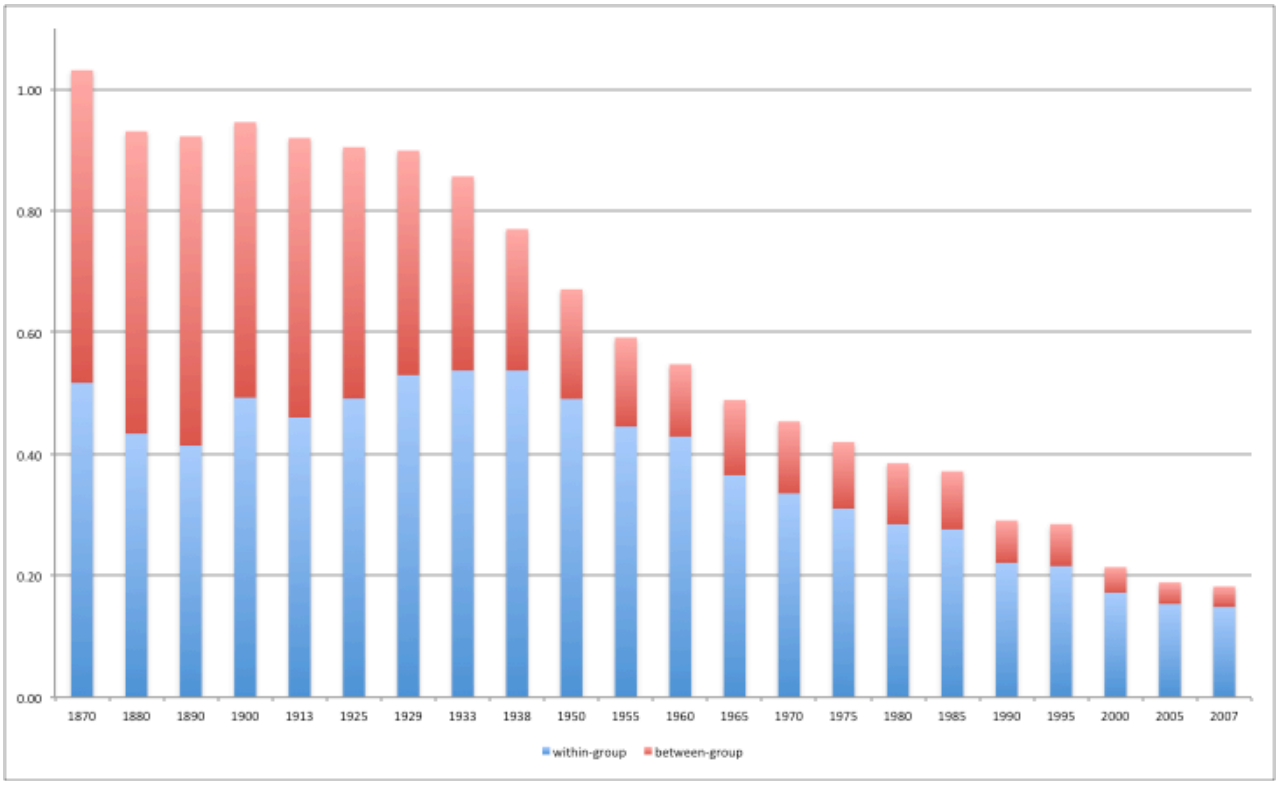


Figure 8a. Decomposing International Inequality in Literacy, 1870-2007 (population weighted) (Kakwani Index) (MLD)

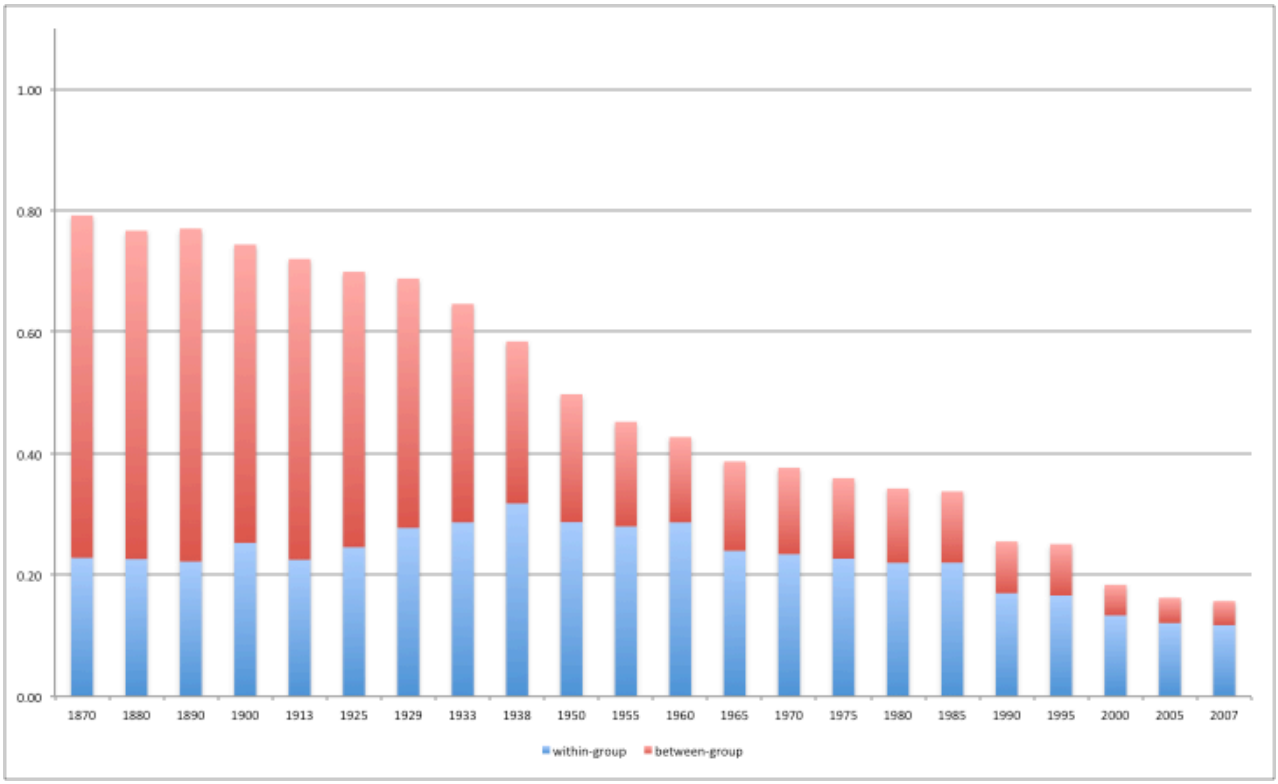


Figure 8b. Decomposing International Inequality in Literacy, 1870-2007 (population weighted) (Kakwani Index) (Theil)

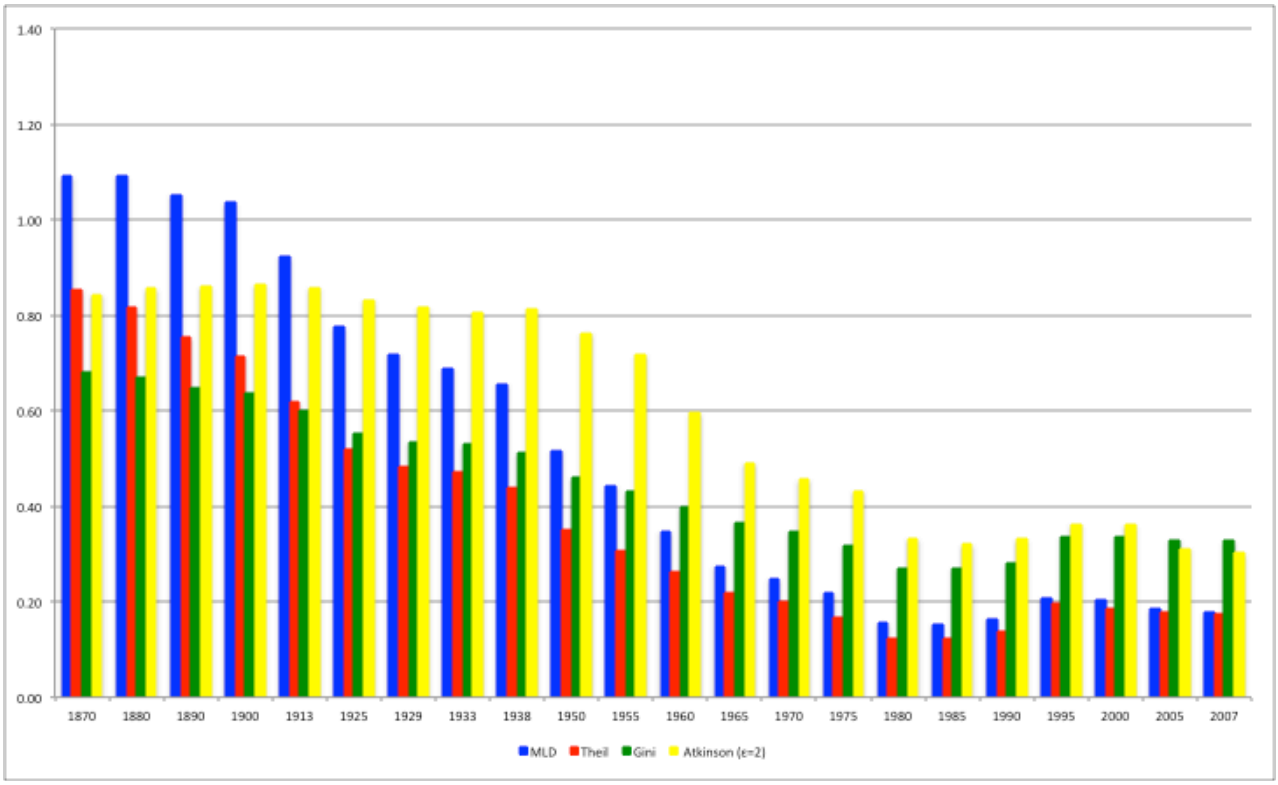


Figure 9a. International Inequality in Enrolment, 1870-2007 (Kakwani Index) (unweighted).

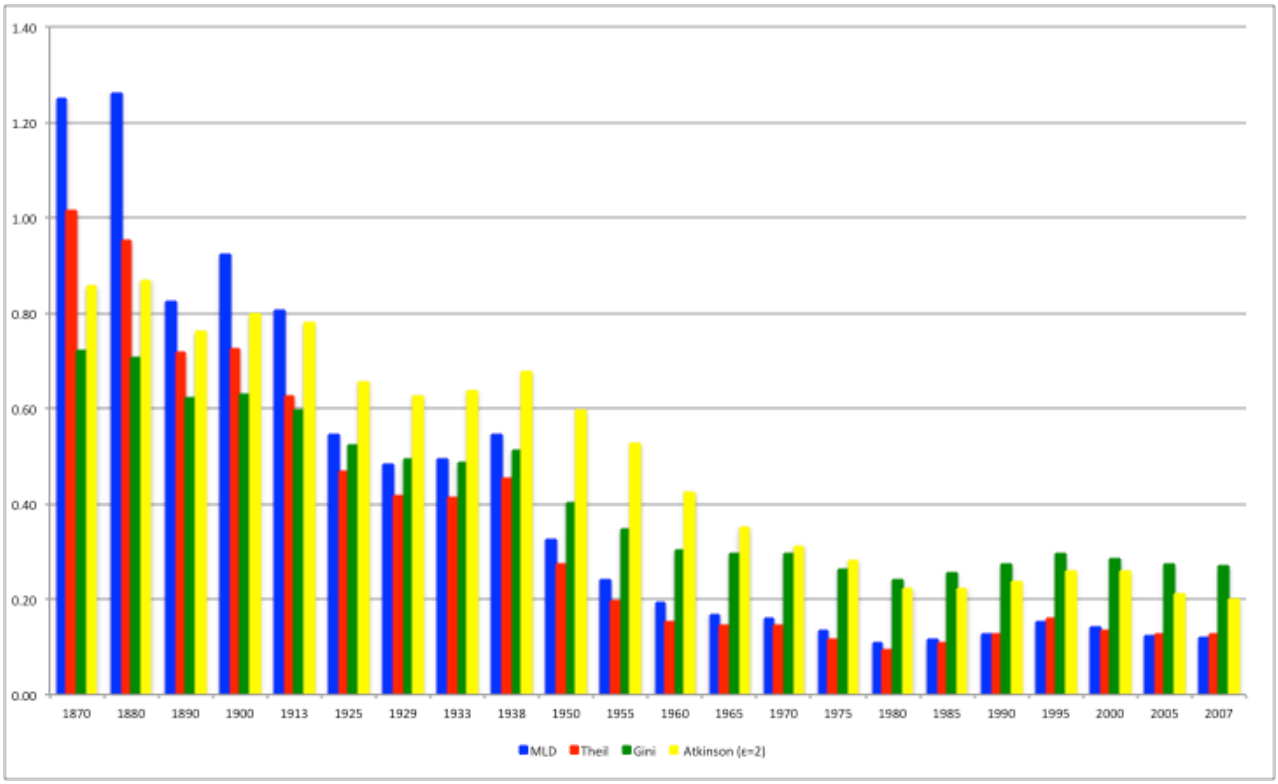


Figure 9b. International Inequality in Enrolment, 1870-2007 (Kakwani Index) (population weighted).

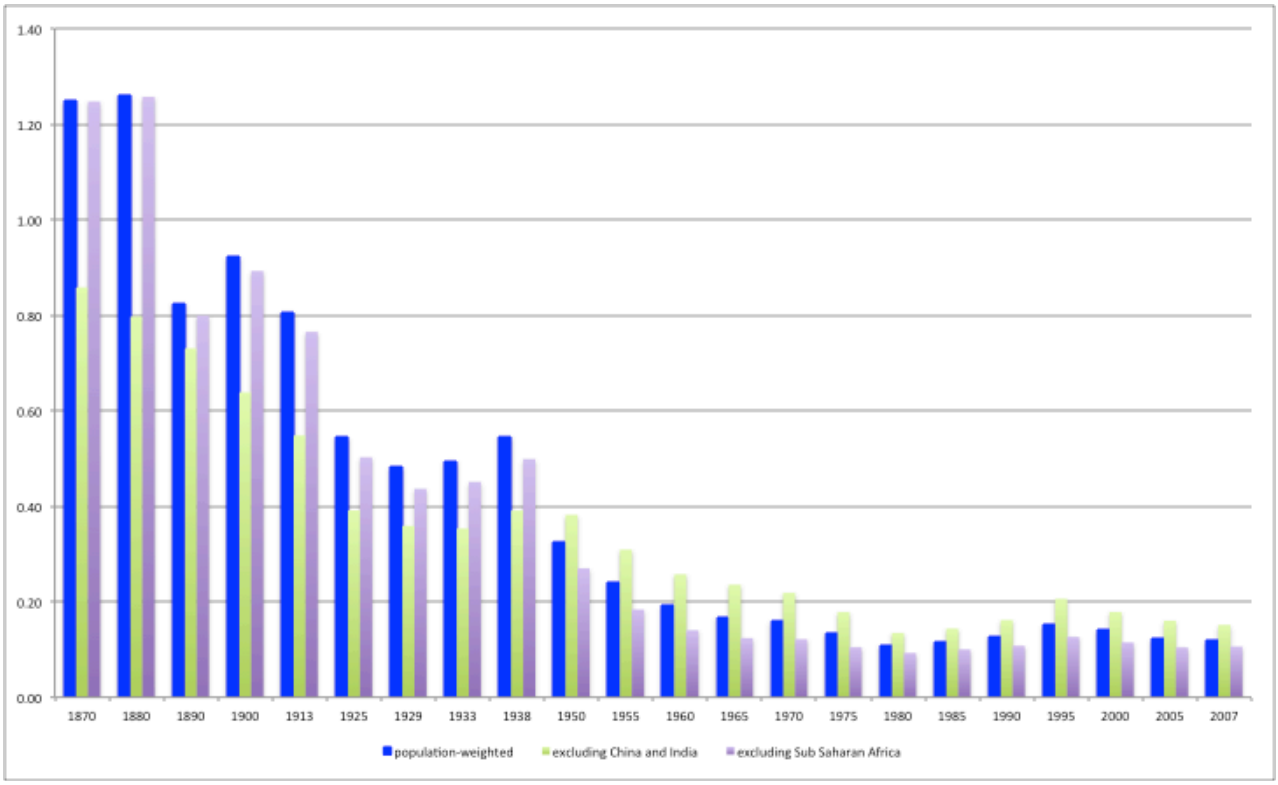


Figure 10. International Inequality in Enrolment: The Contribution of China and India and Sub Saharan Africa, 1870-2007 (Kakwani Index) (MLD)

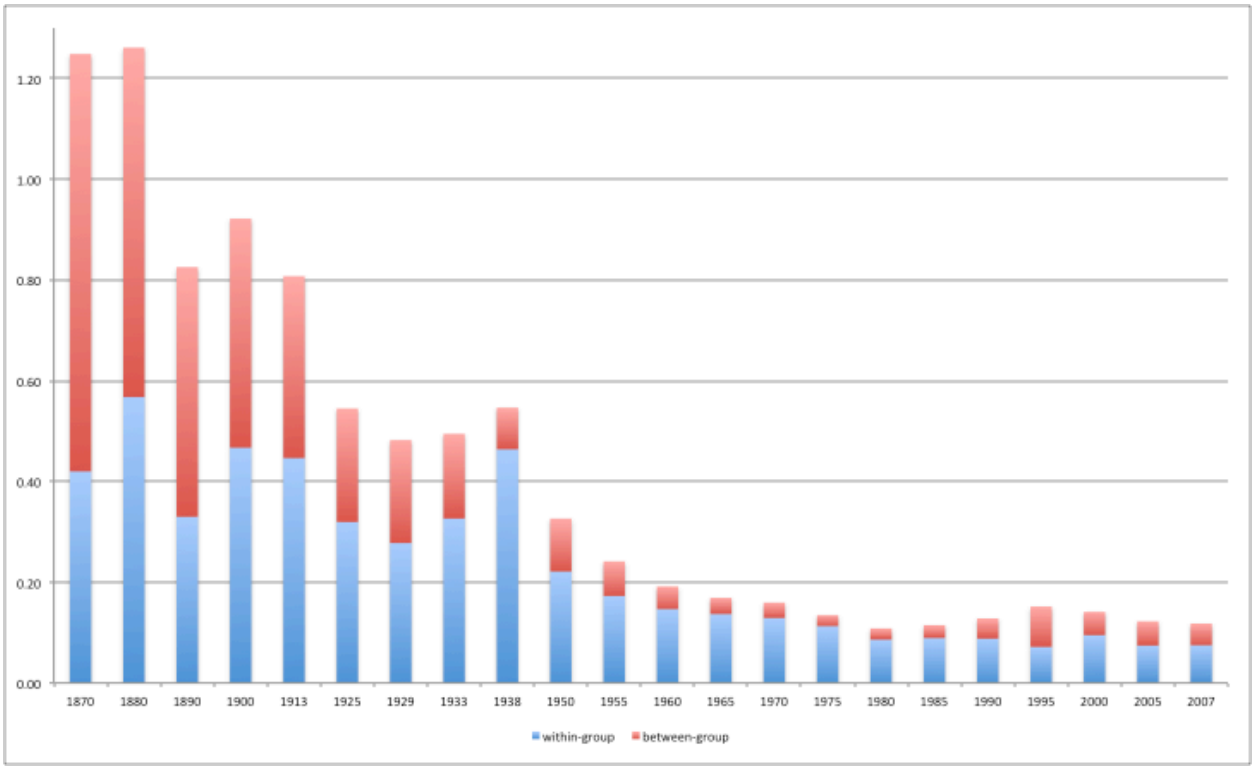


Figure 11a. Decomposing International Inequality in Enrolment, 1870-2007 (population weighted) (Kakwani Index) (MLD)

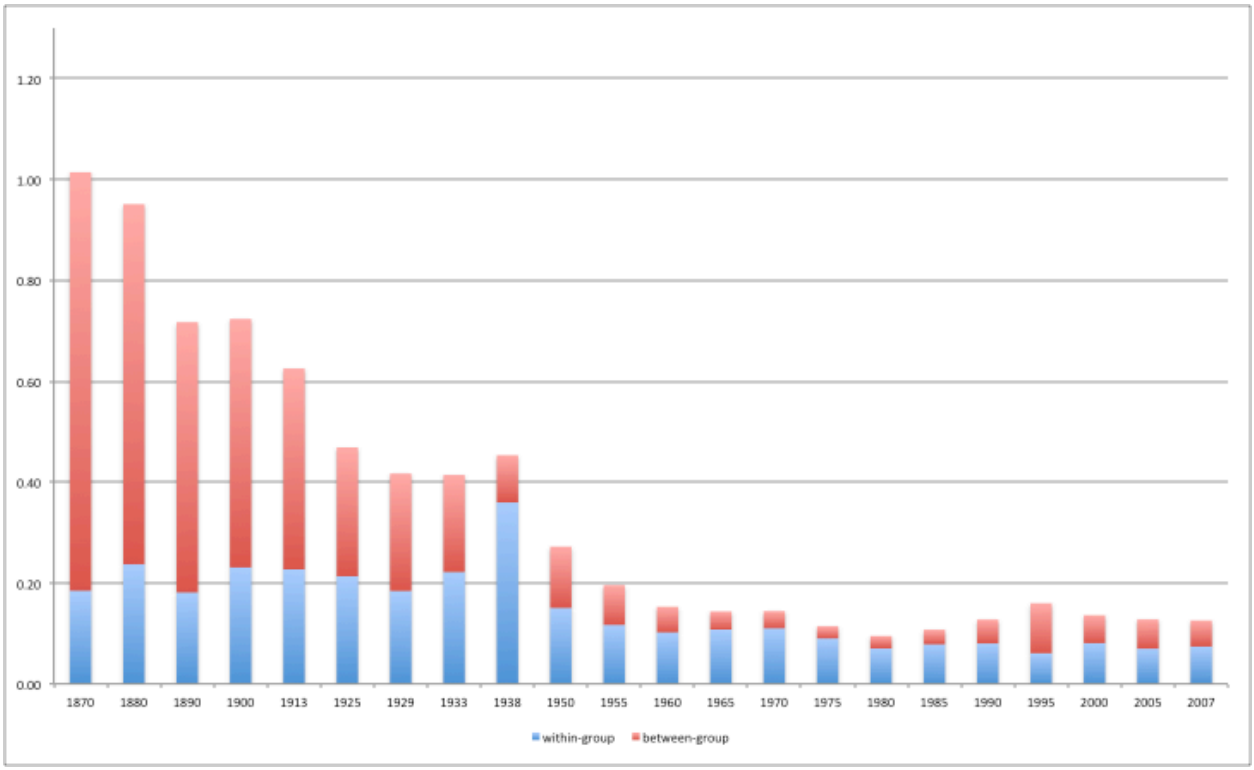


Figure 11b. Decomposing International Inequality in Enrolment, 1870-2007 (population weighted) (Kakwani Index) (Theil)

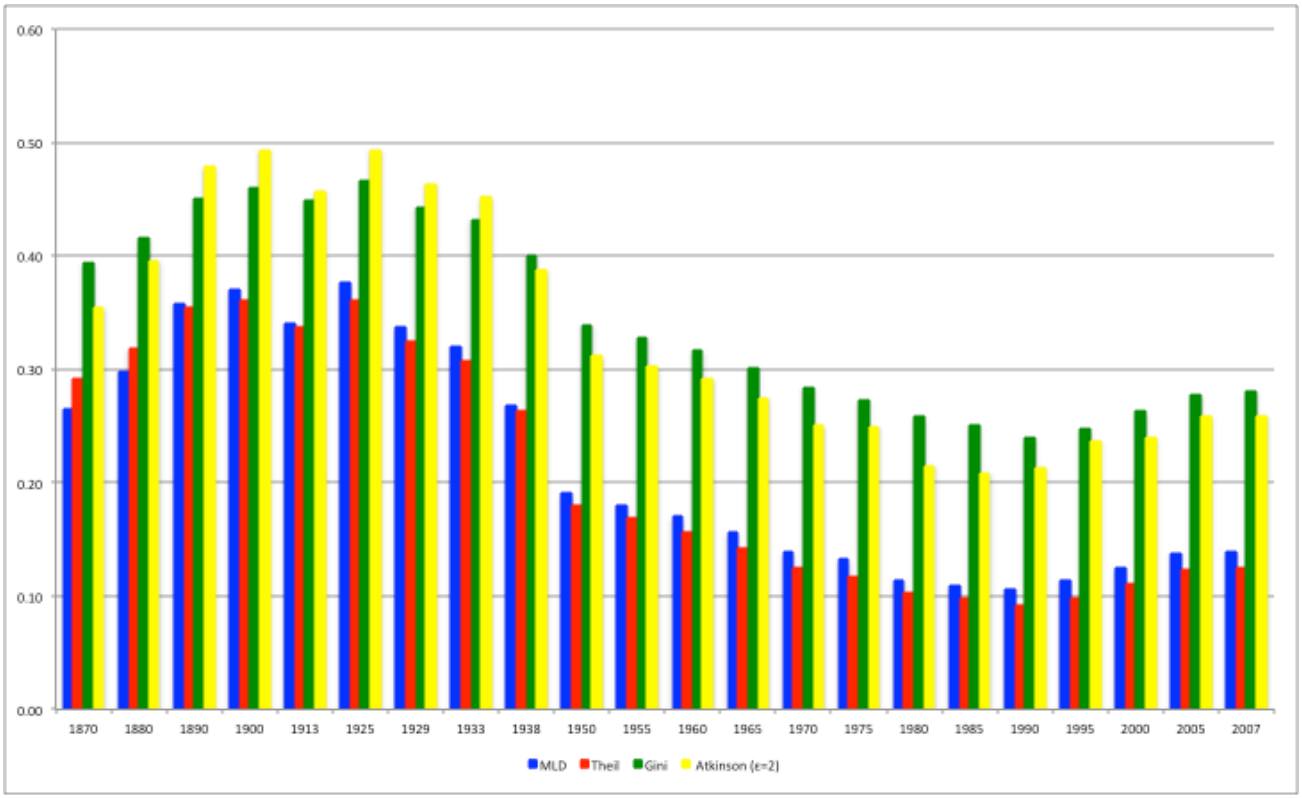


Figure 12a. International Inequality in Life Expectancy, 1870-2007 (Kakwani Index) (unweighted).

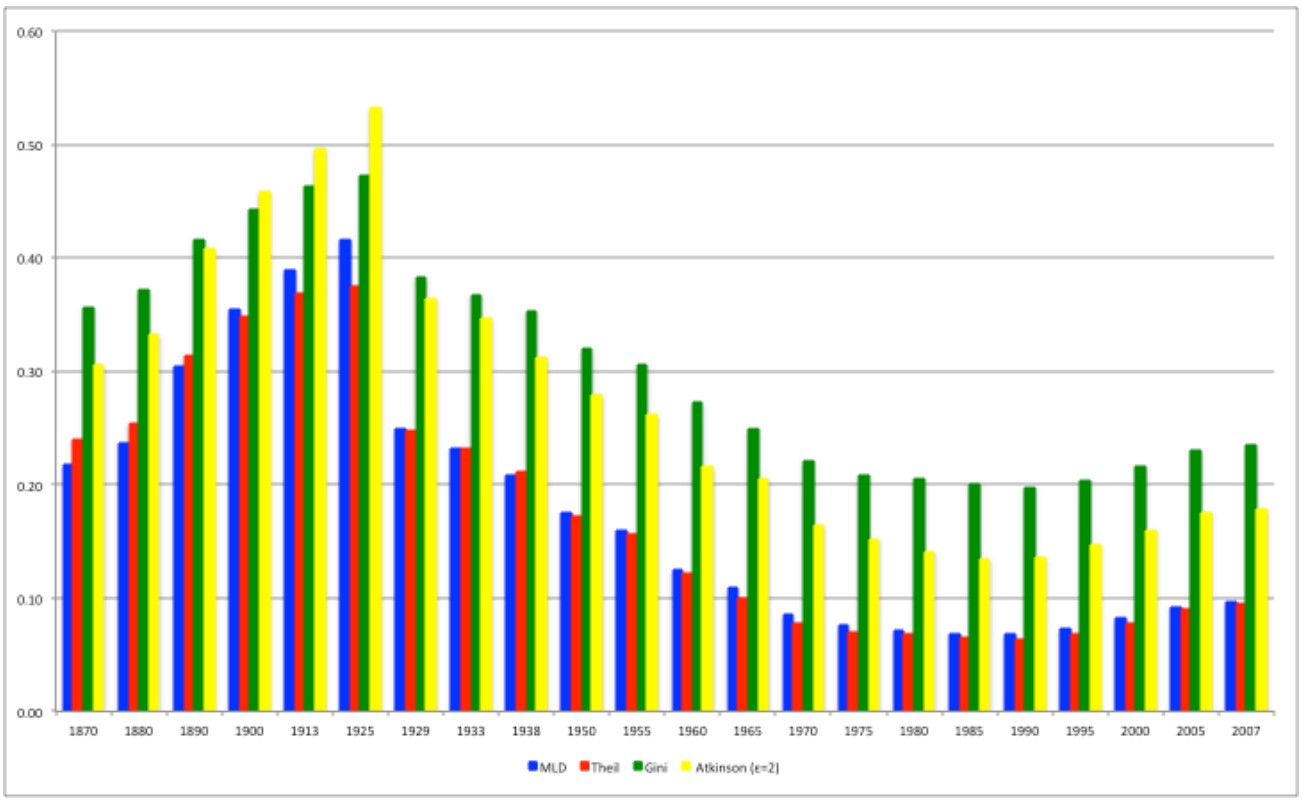


Figure 12b. International Inequality in Life Expectancy, 1870-2007 (Kakwani Index) (population weighted).

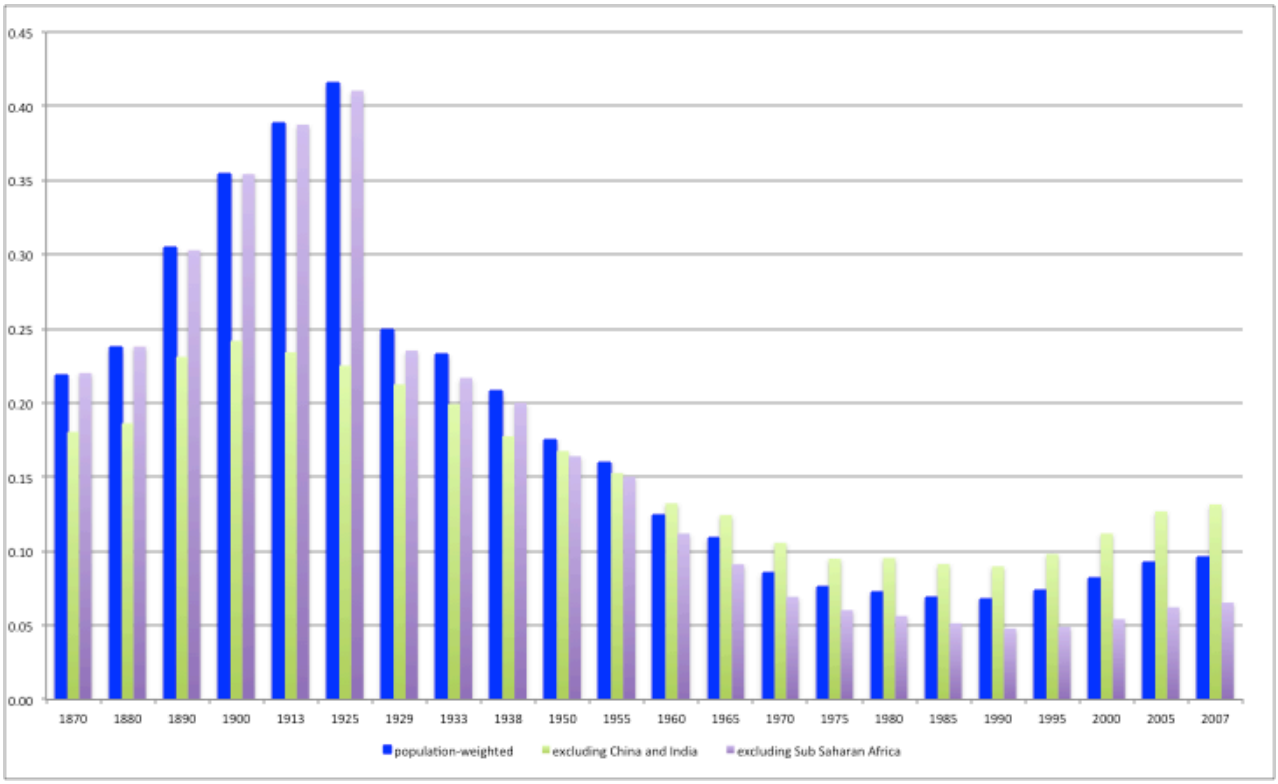


Figure 13. International Inequality in Life Expectancy: The Contribution of China and India and Sub Saharan Africa, 1870-2007 (Kakwani Index) (MLD)

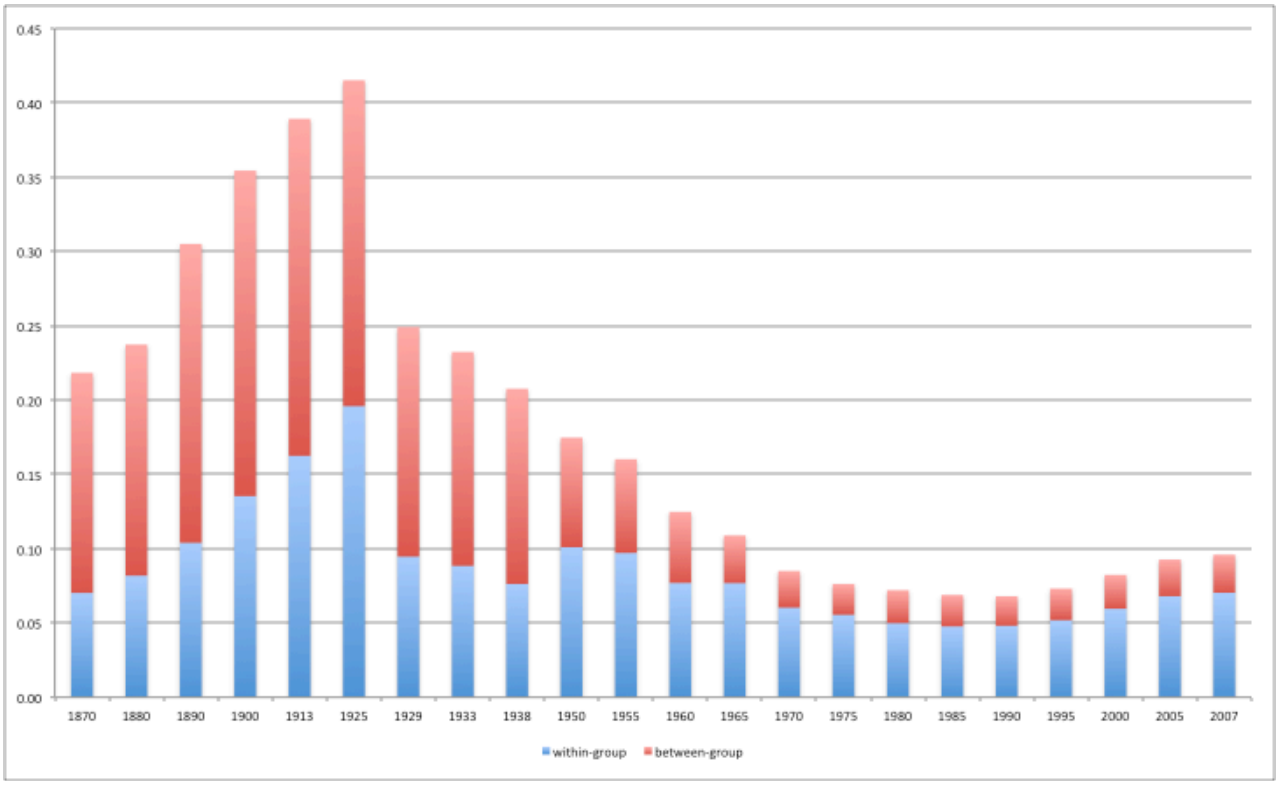


Figure 14a. Decomposing International Inequality in Life Expectancy, 1870-2007 (population weighted) (Kakwani Index) (MLD)

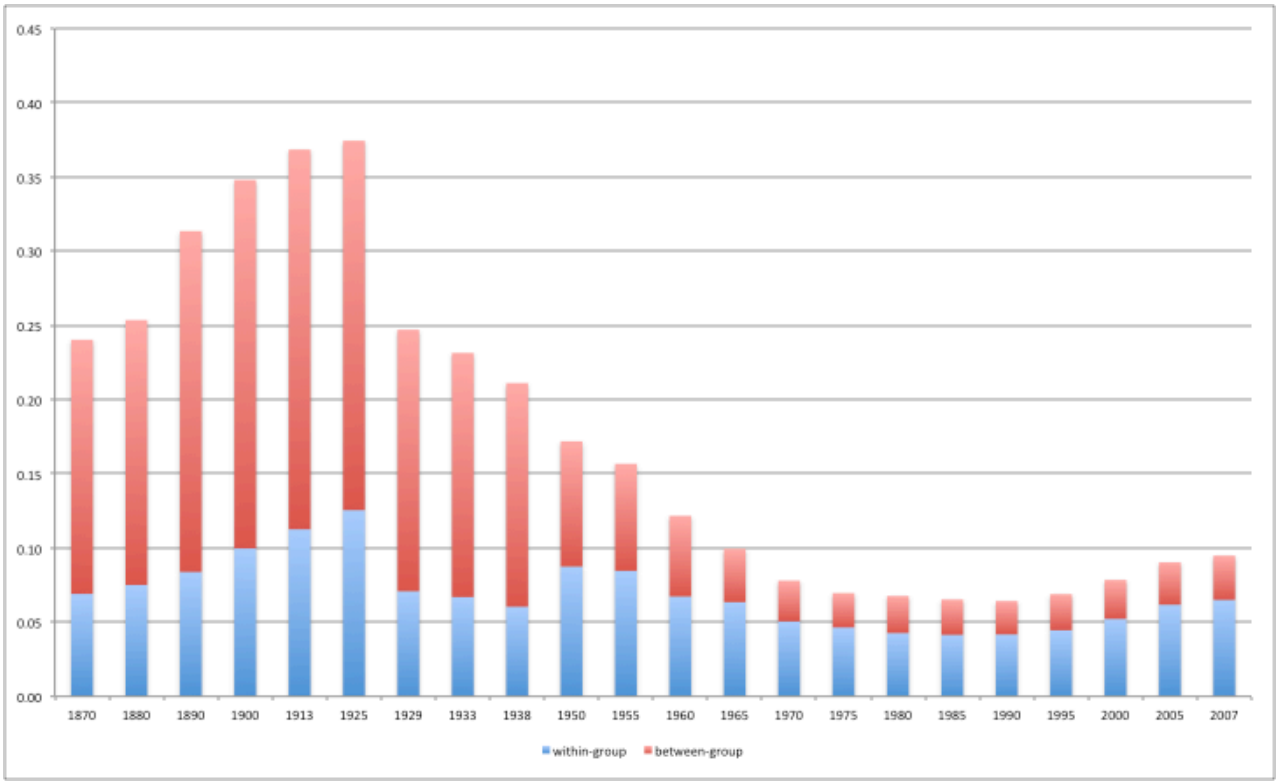


Figure 14b. Decomposing International Inequality in Life Expectancy, 1870-2007 (population weighted) (Kakwani Index) (Theil)

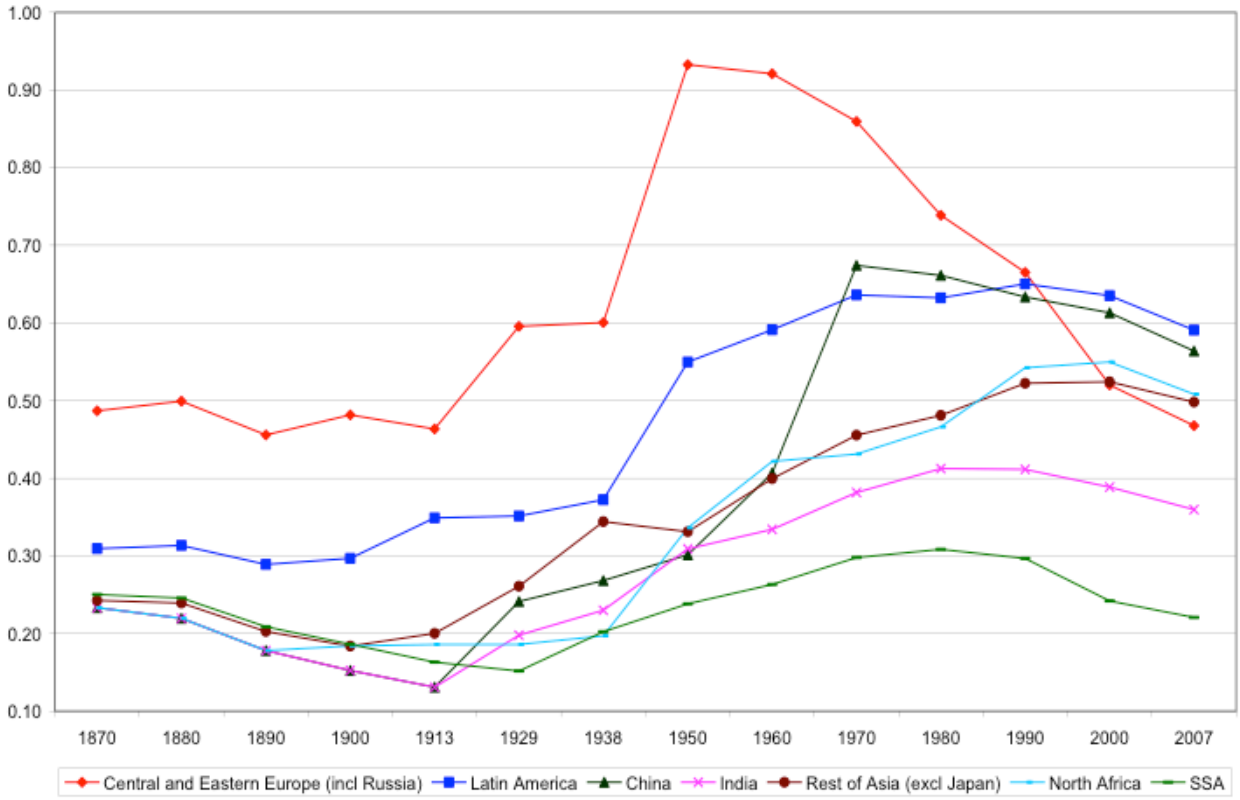


Figure 15. Relative Life Expectancy in Developing Regions, 1870-2007 (OECD = 1) (Kakwani Index)

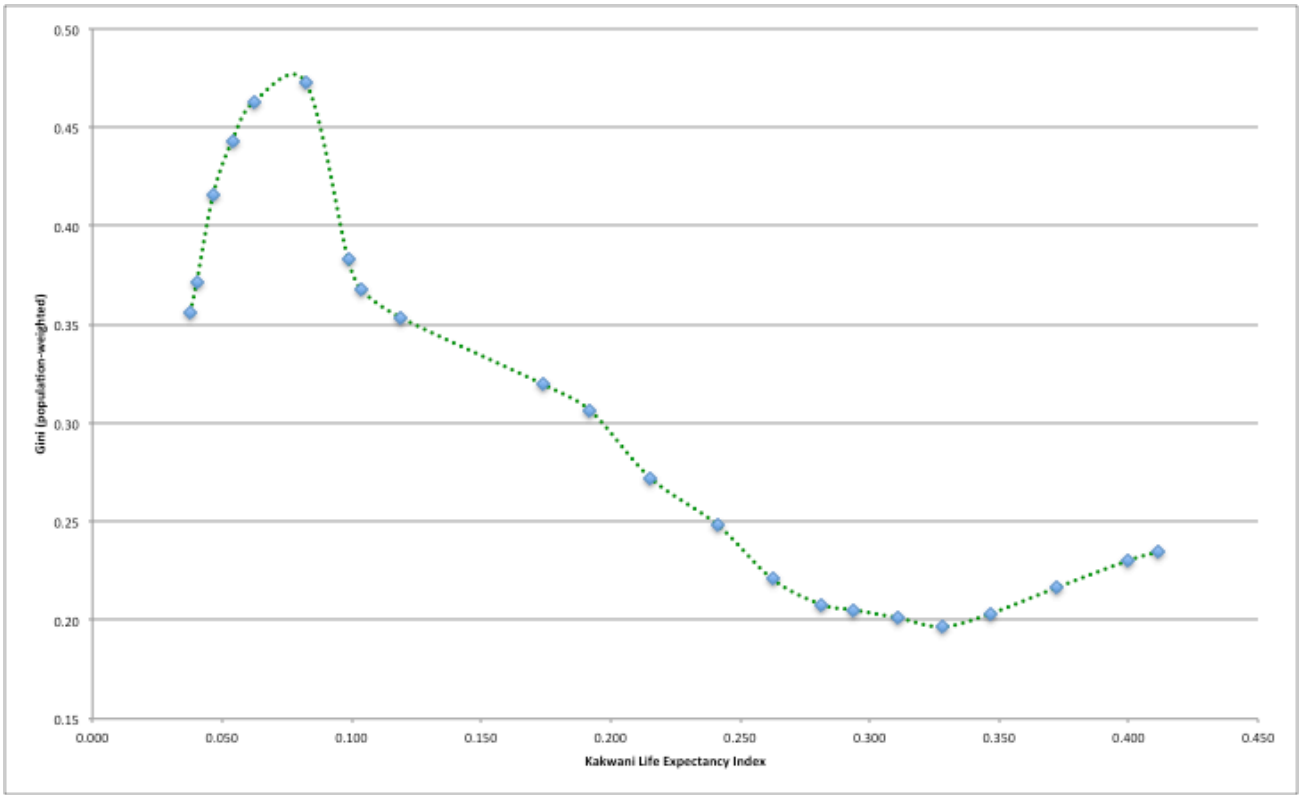


Figure 16. A Health Kuznets Curve? Life Expectancy Inequality (Gini) versus Levels (Kakwani indices) (population-weighted)

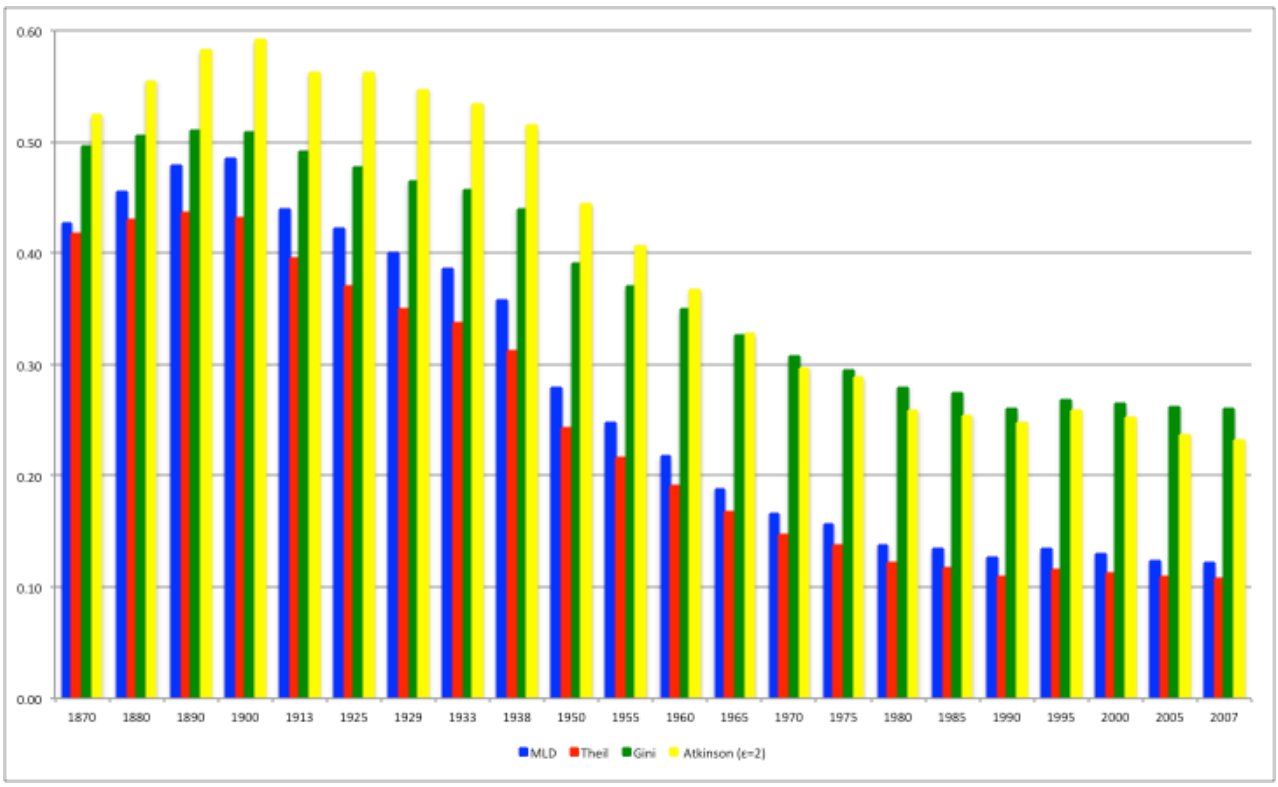


Figure 17a. International Inequality in Human Development 1870-2007 (HIHD) (unweighted).

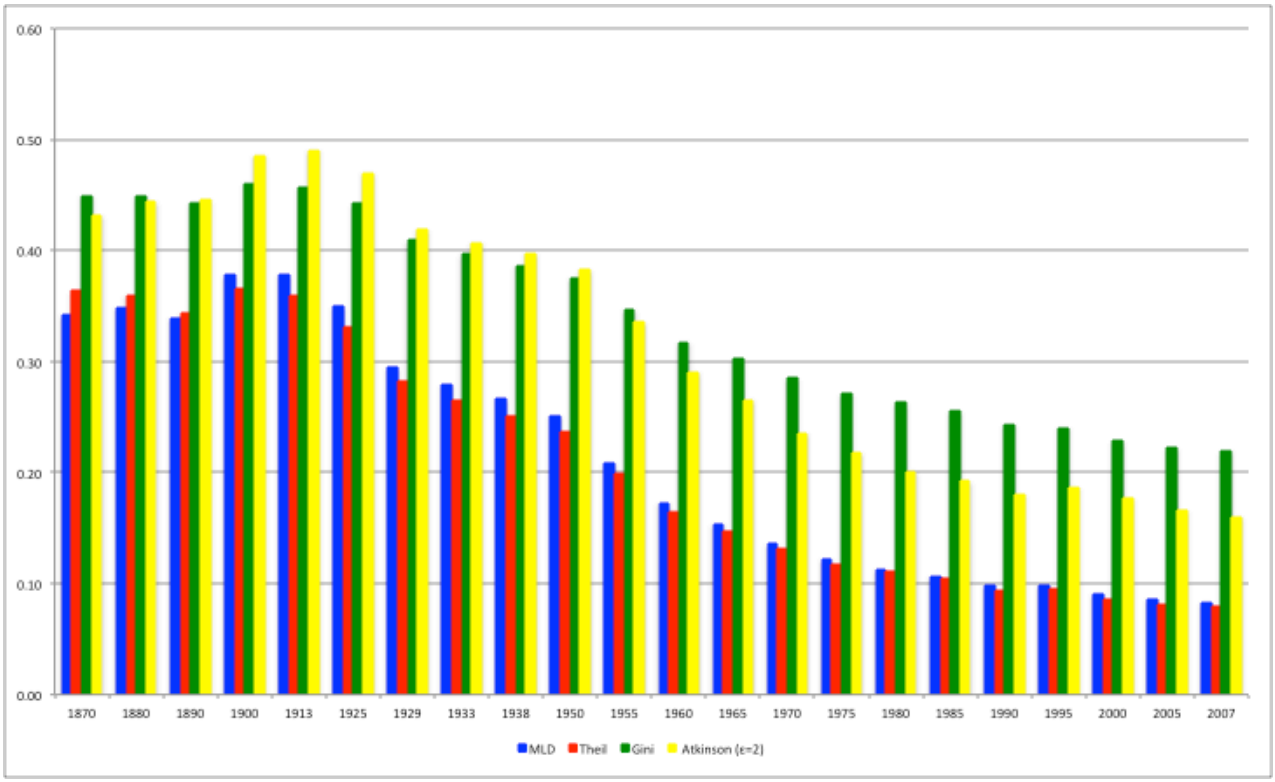


Figure 17b. International Inequality in Human Development, 1870-2007 (HIHD) (population weighted).

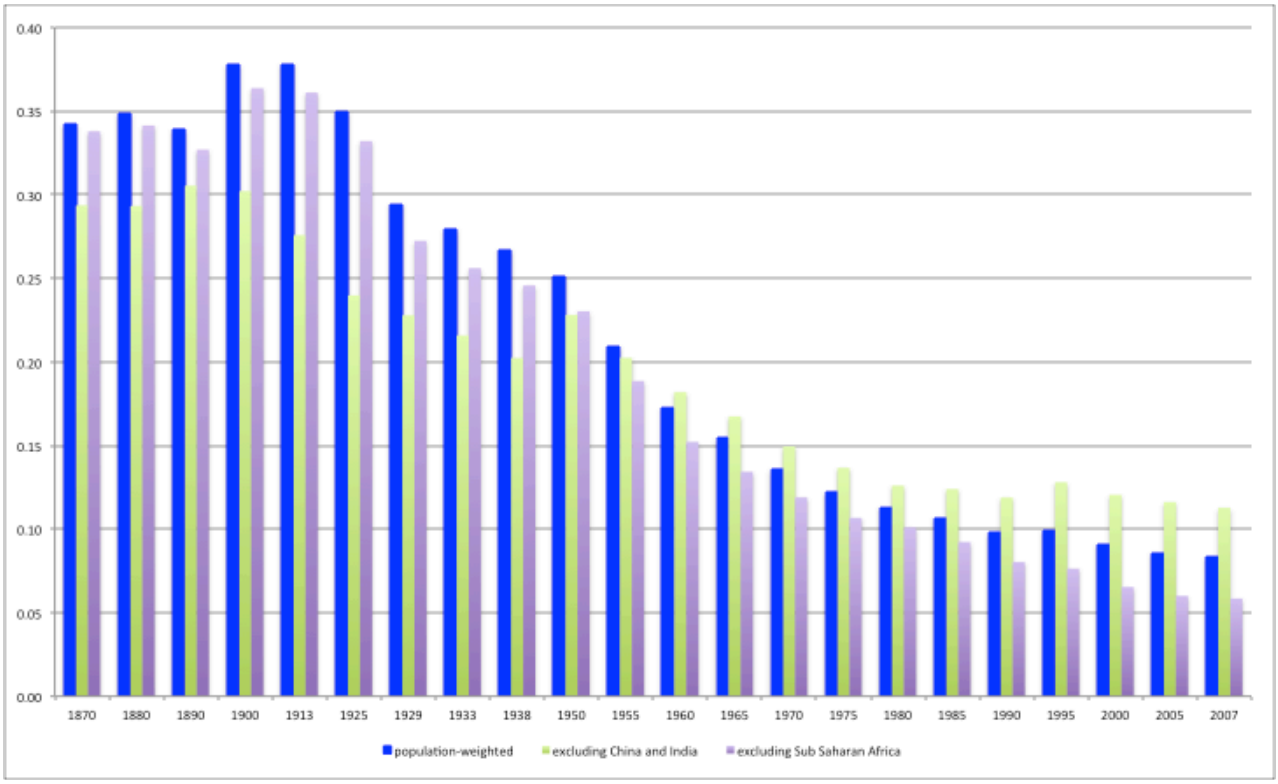


Figure 18. International Inequality in Human Development: The Contribution of China and India and Sub Saharan Africa, 1870-2007 (HIHD) (MLD)

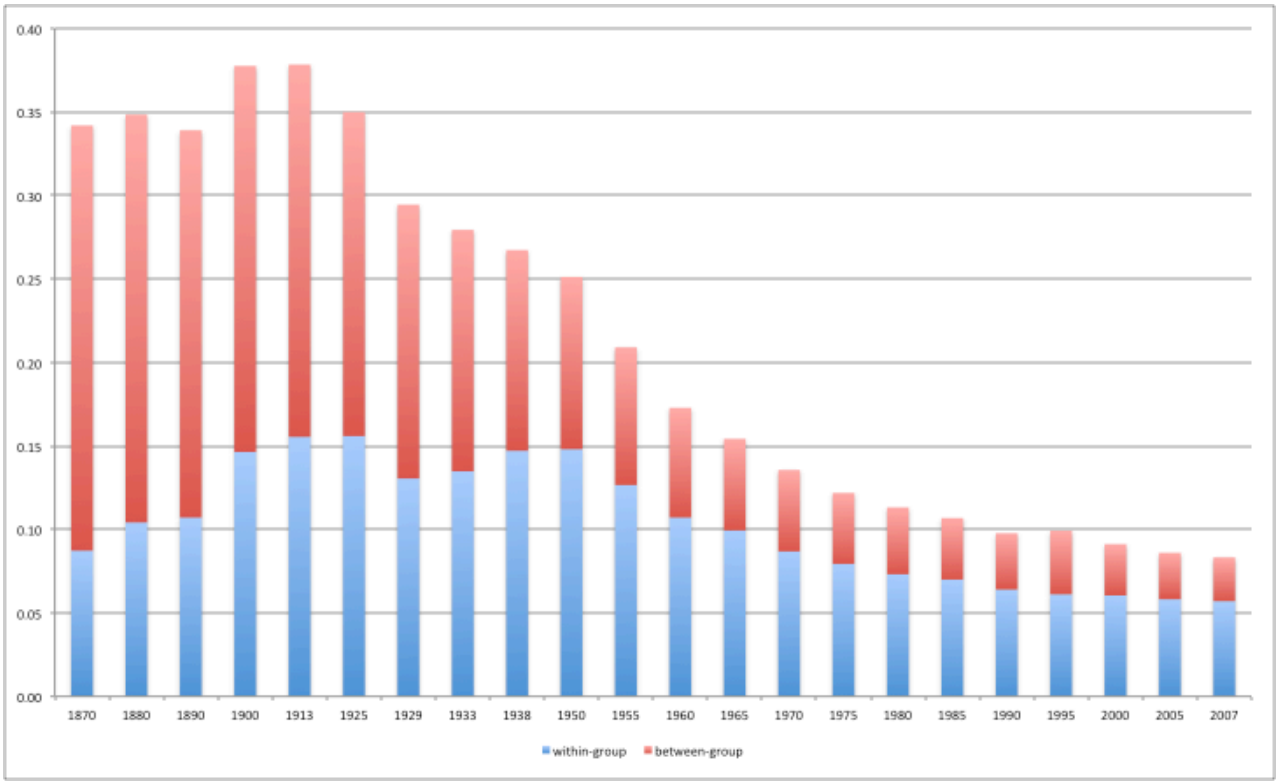


Figure 19a. Decomposing International Inequality in Human Development, 1870-2007 (population weighted) (HIHD) (MLD)

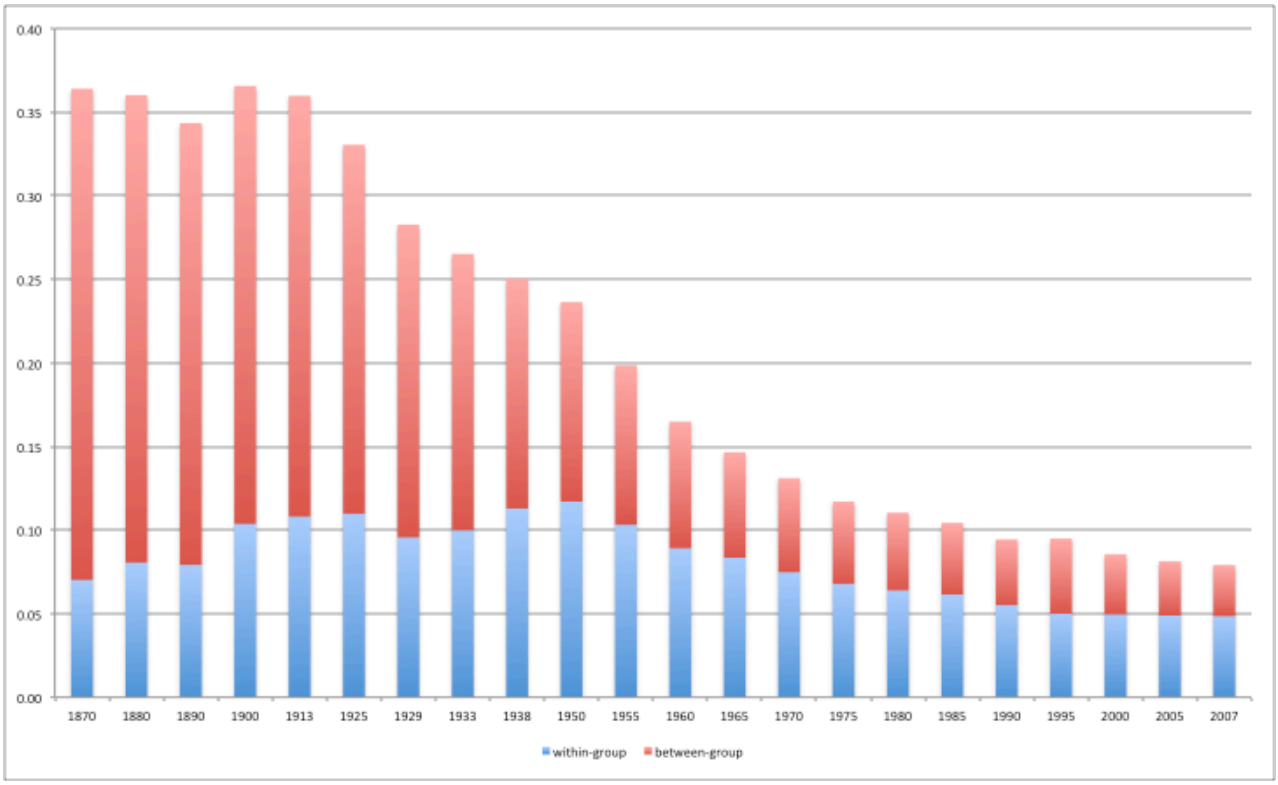


Figure 19b. Decomposing International Inequality in Human Development, 1870-2007 (population weighted) (HIHD) (Theil)