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Abstract

How has wellbeing evolved over time and across regions? How does the West compare to the Rest? What explains their differences? These questions are addressed using an historical index of human development. A sustained improvement in wellbeing has taken place since 1870. The absolute gap between OECD and the Rest widened over time, but an incomplete catching up –largely explained by education- has occurred since 1913 but fading away after 1970, when the Rest fell behind the OECD in terms of longevity. As the health transition was achieved in the Rest, the contribution of life expectancy to human development improvement declined. Meanwhile, in the OECD, as longevity increased, healthy years expanded. A large variance in human development is noticeable in the Rest since 1970, with East Asia, Latin America and North Africa catching up to the OECD, while Central and Eastern Europe and Sub-Saharan Africa falling behind.

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How has world wellbeing evolved over the long run? How does the *West* compare to the *Rest*? Have their differences widened? How do regions in the *Rest* compare to each other? What explains their differences? Economists usually address these questions in terms of per capita income (See Oulton 2012 for its most recent defence). Human welfare is widely viewed, however, as a multidimensional phenomenon, in which income is only one facet. As a matter of fact, attempts at providing more comprehensive measures of living standards go back to the origins of modern national accounts (Engerman 1997). Non-income dimensions such as infant mortality, life expectancy at birth, height, literacy, and school enrolment have been used individually or combined into a composite index (physical quality of life, basic needs, and, more recently, human development indices) to provide measures of wellbeing beyond GDP. In this paper, these recurring questions will be addressed using a new index of human development that stresses the health and knowledge dimensions of wellbeing.[2]

Human development was originally defined as "a process of enlarging people's choices"(UNDP 1990: 10), namely, enjoying a healthy life, acquiring knowledge and achieving a decent standard of living. These achievements provide individuals with freedom to choose (Fleurbaey 2009) and the opportunity "to lead lives they have reasons to value" (Sen 1997). Human development can, thus, be depicted as positive freedom (Desai 1991: 356), by which individuals are granted access to goods and services, including property, that allow the development of their personal potential.

When a synthetic measure of Human development is attempted its different dimensions, expressed in reduced form, are combined into an index: life expectancy at birth as a proxy for a healthy life, education measures (schooling, literacy) for access to knowledge, and discounted *per capita* income (its log) as a surrogate for other wellbeing dimensions other than education and health (Anand and Sen 2000; UNDP 2001: 240). Since all dimensions are considered indispensable they are assigned equal weights. However, in this reduced human development index form agency and

[2] There is an alternative to the capabilities approach followed here that investigates the association between per capita GDP and life expectancy (or education). The results vary widely from Pritchett and Summers (1996), 'wealthier is healthier' view to Acemoglu and Johnson (2007) negative impact of increasing longevity on economic growth.

freedom are left aside. However, without agency and freedom the human development index becomes a 'basic needs' index (Ivanov and Peleah 2010).[3]

I will start the paper by discussing the HDI, as defined by the United Nations Development Programme (UNDP), and proposing an alternative historical index (*HIHD*).[4] Next, I will present the main results for the world and its main regions and their differences over time. Lastly, I will discuss the contribution of each dimension of human development to the index's aggregate performance over time and the extent to which they explain the observed differences in human development between the *West*, defined as the countries that composed the OECD prior to 1994, -*OECD*, hereafter-, and the *Rest*, namely, the developing regions.[5]

As regards the time span considered, the initial date, 1870, seems an appropriate starting point because, the dearth of data for earlier decades aside, it is when large scale improvements in health -to which the diffusion of the germ theory of disease since the 1880s contributed significantly- (Preston 1975; Easterlin 1999), and mass education (Benavot and Riddle 1988; Lindert 2004) began in Western Europe and the European Offshoots. It is also in the late nineteenth century when, along the advance in medical knowledge, social spending started expanding in Western Europe and its offshoots (Riley 2001; Lindert 2004). The final year, 2007, signals the end of an era of sustained progress in wellbeing across the board.

Some findings can be highlighted. Substantial gains in world human development are observed since 1870 –and especially over 1913-1970. A major

[3] By agent is meant, in the capabilities terminology, 'someone who acts and brings about change and whose achievements can be judged in terms of her own values and objectives' (Sen 1999: 19).

[4] I will not discuss here the human development index as a measure of wellbeing as it has recently been done (Klugman et al. 2011, Prados de la Escosura 2010).

[5] Before 1994 OECD members were: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland – only since 1990-, Ireland, Italy, Japan, Luxemburg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the UK and the US. Since no human development estimates have been obtained for Iceland and Luxemburg, these two countries are excluded from my own version of *OECD*. Turkey, although an OECD member, has been excluded from the *OECD* group and added to Asia in order to make the group more homogeneous in terms of development. New members joining since 1994 (and not included in my restricted definition of OECD) are: the Czech Republic, Estonia, Hungary, Israel, Poland, Slovakia, Slovenia, South Korea, and Mexico.

advance in human development took place between 1920 and 1950 just at the time of an economic globalization backlash, which resulted from substantial gains in longevity and education.

Although the gap between *OECD* and the *Rest* widened in absolute terms, an incomplete catching up took place across the board in developing regions between 1913 and 1970. Thereafter, the variance in the *Rest*'s performance has been large. Asia, driven by China and India, and, to less extent, Latin America and North Africa managed to catch up, while Central and Eastern Europe (including Russia) and Sub-Saharan Africa fell behind.

Education and, to less extent, life expectancy at birth appears to lie behind the Periphery's limited catching-up in terms of human development up to 1970. Afterwards, all world regions in the fell behind the *OECD* in terms of the longevity index, where -as a result of a *second* health transition- life expectancy at birth increased faster in the *West*. In the *Rest*, the health or epidemiological 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 (Riley 2005a)- is the only period in which substantial gains in longevity were achieved. This largely explains the *Rest*'s failure to catch up with the *West* despite the educational expansion and the recovery, at the turn of the twentieth century, of per capita income growth.

Major gains in human development were achieved in the *OECD* during the regulated phase of capitalism, when the public provision of health and education appears to have played a distinctive role in human development progress. In Europe, socialist societies' achievements in human development matched those of capitalist economies until the late 1960s, showing a case of socialism's success in raising health and education from initial low levels. Since the late 1960s, however, gains in life expectancy and income per head stopped in Europe's socialist countries and catching-up gave way to falling behind.

Measuring Human Development

How progress in human development dimensions is measured matters. Usually, the original values of social variables (life expectancy, infant mortality, heights, literacy, etc.) are used untransformed in studies on the progress of human welfare

(see, for example, Becker et al. 2005, Acemoglu and Johnson 2007, Hatton and Bray 2010, Lindert 2004). However, its bounded nature has raised concern about the use of original values to comparing their levels and rates of variation over space and time (Sen 1981, Kakwani 1993, Cornia and Menchini 2006, Canning 2010).

In fact, when the original values of a social variable, which has asymptotic limits, say, life expectancy, are employed, identical changes in absolute terms result in lower increases, as the starting level is higher. More specifically, the objection is based upon the fact that the mortality decline takes place at different age groups, depending on a country's level of development, rendering comparisons difficult. In poor countries, the main reduction of mortality takes place among children, as infectious disease declines, whereas, in rich countries, it is among the elderly where mortality falls as a result of a better treatment of cardiovascular disease and of better nutrition in their early years (Deaton 2006; Eggleston and Fuchs 2012). Thus, if original values of life expectancy are employed, absolute changes of the same magnitude receive larger weight when the starting level is lower, and, hence, give more weight to saving the life of younger over older people. This finding led Angus Deaton (2006) to conclude that 'the use of life expectancy at birth as an overall measure of [health] benefit is not easily justifiable because its relatively heavy weighting for mortality reductions early in life is arbitrary'.[6]

In an attempt to correct this bias –and following Amartya Sen (1981)-, a linear transformation was introduced for non-income dimensions in the human development index (UNDP 1990), which, by reducing the denominator, widens the index's range. Thus, in the UNDP HDI, the original values of each dimension (*I*) are transformed into index form according to the following formula,

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

Where *x* is the observed value of a given dimension of welfare, and *Mo* and *M* are the maximum and minimum values, or goalposts -which facilitate comparisons over time-. Each dimension ranges, thus, between 0 and 1.

[6] Furthermore, as a result, the use of original values of life expectancy at birth to measuring international inequality in health over-exaggerates its decline when, in fact, recent reductions in mortality in rich countries may have widened international health inequalities.

From 1995 to 2009 *Human Development Reports* kept the same goalposts for its different dimensions. For life expectancy at birth, the maximum and the minimum values were established at 85 and 25 years, respectively. For education, adult literacy and gross enrolment (primary, secondary, and tertiary) rates, with maximum and minimum values of 100 and 0, were combined using two-thirds and one-third weights, respectively. In the case of per capita GDP, the maximum and minimum values were 40,000 and 100 dollars, respectively, and, in 1999, a logarithmic transformation was introduced to allow for diminishing returns of income in terms of human development as this indicator is employed as a crude proxy for those dimensions of wellbeing other than education and health (Anand and Sen 2000).[7]

In 2010 the *Human Development Report* (UNDP 2010) introduced major changes in the indicators used to represent human development dimensions. Thus, for education, the expected years of schooling for a school-age child and the mean years of schooling for population aged 25 and above were combined using an unweighted geometric average.[8] In the case of income, PPP-adjusted per capita Gross National Income (GNI) replaced purchasing-power-adjusted GDP per head. The inclusion of GNI per capita represents an improvement as it captures the income accrued to residents of a country, not just the income produced in the country regardless the share retained at home.[9]

The new human development index also altered its goalposts for each dimension with upper and lower bounds corresponding to the maximum values observed during the period 1980-2010 and to discretionally fixed minimum values,

[7] Prior to 1999 per capita income was discounted above a certain threshold -the world average income- with Atkinson's formula for the utility of income. So, for example, the maximum level, $40,000 became just $5,448 in 1995 (UNDP 1995: 134). The logarithmic transformation implied, in turn, discounting all income, not just the income above a given level (UNDP 1999: 159).

[8] Previously, in the Human Development Report (UNDP 1994), mean years of schooling had been used. The education attainment index was the result of weighting the mean years of schooling index by one-third and the adult literacy rate index by two-thirds (UNDP 1994).

[9] Thus, GNI (or GNP) represents GDP plus net receipts of primary income from abroad and, thus, includes international flows such as remittances and aid, and excludes income generated in the country but repatriated abroad.

respectively. Upper and lower bounds for life expectancy were, then, fixed at 83.2 and 20 years, respectively. The expected years of schooling and the mean years of schooling were assigned maxima of 20.6 and 13.2 years, respectively, and minima of zero. In the case of per capita income, the 40,000 PPP US dollars maximum represented, at the time of its introduction in the early 1990s, an upper bound that no country had ever reached. As such an upper limit has been overcome in current price purchasing power parity (PPP) dollars, it was replaced by the maximum observed (108,211 PPP $ 2008). The minimum was set at 163 PPP $ US 2008.[10]

Up to 2010, the index of human development (HDI) was derived as the unweighted arithmetic average of the three dimensions' indices. Since 2010, in an attempt to mitigate the substitutability between its different dimensions, -that is, to avoid that a high achievement in one dimension linearly compensates for a low achievement in another-, the indices for each dimension are combined using a geometric average.[11]

The new index is very data demanding, and when long-run trends are needed, most of the information required (for example, GNI or expected years of schooling) is not available across countries and over time. 'Old' indicators (namely, literacy and school enrolment for education, and real GDP per head) have been, then, recovered in the so-called 'hybrid' human development index due to its wider availability. However, in the 'hybrid' HDI, indices for each dimension are derived with the new goalposts and combined with a geometric average (Gidwitz *et al*. 2010: 3).

Although the multiplicative formula may be considered a substantial improvement over the previous additive one, the linear transformation of the social,

[10] Since in the new UNDP HDI upper bounds represent the highest observed values in the time series since 1980, in the Human Development Report for 2011 the maxima for life expectancy and per capita GNI have been updated to 83.4 years and 107,721 PPP $ 2005, while the maxima for expected years of schooling and the mean years of schooling are 18.0 and 13.1, respectively. In the case of per capita GNI the minimum has been reduced to 100 PPP $ 2005 (UNDP 2011, p. 168).

[11] The geometric average had been previously proposed by Desai (1991) and Sagar and Najam (1998) and used in historical estimates by Prados de la Escosura (2010). There are serious discrepancies about the choice between arithmetic and geometric averages to combine the dimensions' indices. See, for example, the harsh critique of the new index in Ravallion (2012) and the response in Zambrano (2011).

non-income dimensions remains a serious obstacle for the comparison of human development levels across countries and over time. Thus, in the linear transformation, for a given absolute change in a social dimension, its corresponding increase would be larger the lower the initial level, favouring the country with the lower initial level of human development. Such a bias is only justifiable if, from a normative point of view, achieving a 'basic' or minimum level of human development becomes the main goal. However, the linear transformation narrows down the differences across countries introducing a spurious tendency towards human development convergence.

In an attempt to facilitating comparability of HDI levels across countries the Human Development Report 2010 introduced the alternative concept of 'deviation from fit', which provides a country's deviation from its expected performance, given its initial HDI (UNDP 2010: 217).[12] Unfortunately, the 'deviation from fit' method only facilitates comparisons between countries starting from similar levels.[13]

It appears, therefore, that a linear transformation of the original values of each dimension -currently used in the HDI- does not provide a solution to the comparability problem over space and time. In fact, it poses a further challenge. In Sen's words (1981: 292), "as, say, longevity becomes high, it becomes more of an achievement to raise it further".[14] Nanak Kakwani (1993: 312) concurs: "as the standard of living

[12] The Human Development Report 2010 defines the 'deviation from fit' as "a measure of progress that captures changes in a country's indicators relative to the average change for countries starting from the same point" (UNDP 2010: 26).

[13] Another option is provided by the 'shortfall' approach (Sen 1981: 292), which measures, for a given dimension, the relative fall in the distance between the country's initial level and some chosen upper bound. Thus, the shortfall is obtained as $Q(x_1, x_2) = (x_2 - x_1) / (M - x_1)$, where *x* is the observed value of a given dimension of welfare at time 1 and 2,and M, its maximum value. Unfortunately, the shortfall approach results are not additive (Kakwani 1993, p. 310). Contrary to the linear transformation, this method tends to favour the country with the higher initial level (Gidwitz et al. 2010: 19).

[14] Thus, the "intrinsic" value of a single "functioning", for example, the ability to live a healthy life, is not captured by its linear measure, since, as Srinivassan (1994: 240) argues, "a unit decrease in the deprivation in life expectancy at an initial life expectancy of, say, 40 years is not commensurate with the same unit decrease at 60 years".

reaches progressively higher limits, incremental improvement should require much greater resources than similar incremental improvements from a lower base".[15]

Perhaps, the problem derives from the fact that ethical and measurement aspects of wellbeing are at odds in the human development index. As Partha 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 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."[16]

The shortcomings of the linear transformation become clearer when quality is taken into account. Life expectancy at birth and literacy and schooling rates (or, for the same token, years of education) are just crude proxies for a 'long and healthy life' (Engineer et al. 2009) and for access to knowledge, respectively, the actual goals of human development.

Unfortunately, health-adjusted life expectancy and quality-adjusted education measures are only available for recent years. Research on the last two decades concludes that healthy life expectancy increases as total life expectancy at birth expands and that age-specific disability is lower when life expectancy is higher (Salomon et al. 2012). In other words, the quality of life rises for each age cohort as life expectancy at birth increases.[17]

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[15] Molina and Purser (2010: 11) also stress the additional effort to increase human development's social dimensions at high levels.

[16] An example of giving priority to the ethical aspect over the measurement of wellbeing is provided by Noorbakhsh (1998, p. 519) who modified the human development index by extending the principle of diminishing returns to education (but not to longevity for which the linear transformation was kept) on the basis that that 'under similar conditions the early "units" of educational attainments to a country should be of much higher value than the last ones'.

[17] 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

A similar association can be proposed between the increase in the number of years of schooling and the quality improvement of the education received. The comparison between cognitive skills (Hanushek and Kimko 2000, Hanushek and Woessmann 2012) and gross rates of schooling suggests that quality improvements are correlated with increases in the quantity of education (Figure 1).[18]

The bottom line is that more years of life and education imply better health and education for a country's population.

Since social indicators (life expectancy, literacy infant mortality, etc.) have, unlike GDP per head, asymptotic limits -which reflect physical and biological maxima-, Kakwani (1993) explored the non-linearity of the relationship between the value of each social indicator and its achievement. Using an axiomatic approach, 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[19],

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

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

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concentrate at the end of life (Salomon et al. 2012). Such a result supports the expansion of morbidity – that is, that years lived in disability increase with life expectancy-, rather than a compression of morbidity, a conclusion supported by previous research which found a more than proportional increase in healthy life expectancy as life expectancy at birth rose (Murray and Lopez 1997, Mathers 2001, 2004). The compression of morbidity hypothesis put forward by Fries (1980) posits that with improvements in survival, the prevalence of disability decreases and, therefore, the proportion of life lived with disability also declines. Nonetheless, whether an association between death and ill health occurred since 1870 remains under discussion and deserves further research (Riley 1990, Howse 2006, Bleakley 2007, 2010, Cutler at al. 2010).

[18] In order to carry out the comparison, Hanushek and Kimko (2000) cognitive skills measures for 1960-1990 were preferred to Hanushek and Woessmann's (2012) as the time span they covered was wider, although the alternative results are similar. These quality measures were normalized between 0 and 1 to facilitate the comparison with gross enrolment rates.

[19] For example, in the case of longevity, "a further increase must be regarded as a greater achievement than an equal increase at lower levels of longevity, …the achievement must increase at a faster rate than the longevity" (Kakwani 1993: 313).

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: 314) 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 UNDP HDI represents a particular case, for $\varepsilon = 0$, which yields expression [1] for each dimension of the index.

Following Kakwani's proposal, the original values of the social, non-income dimensions of the index have been transformed using a convex achievement function (expression 3).

Thus, in the alternative historical index of human development, *HIHD*, as a social indicator reaches higher levels, its increases represent higher achievements than had the same increase taken place at a lower level, while, in both the UNDP 'old' and 'hybrid' *HDI*, they reflect the same change regardless of its starting level.[20] The new historical index has been derived, then, as a multiplicative combination of the transformed values of each dimension.

If we denote the non-linearly transformed values of life expectancy and education as *LEB* and *E*DU, and the adjusted *per capita* income as, the historical index of human development can be expressed as,

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

Sources and Procedures

A brief presentation of the sources and procedures used to construct indices for each dimension of human development is provided in this section. Specific details are offered in the Appendix.

[20] If the same absolute changes of the example in footnote 3 are considered with the convex transformation (expression 3) and the new goalposts once again, 10 extra years of life expectancy would represent a 121 percent increase when the initial value of life expectancy is 30 years, a 69 percent increase if it is 40 years, and a 90 percent increase if it is 70 years.

Life expectancy is defined as 'the average number of years of life which would remain for males and females reaching the ages specified if they continued to be subjected to the same mortality experienced in the year(s) to which these life expectancies refer' (United Nations 2000).[21] Data for most countries during the period 1980-2007 come from the 2010 Human Development Report (UNDP 2010) while the United Nations' Demographic Yearbook Historical Supplement (United Nations 2000) provides the rest of the data from 1950 onwards.[22] Pre-1950 estimates come mostly from Riley 2005b), Flora (1983), the OxLAD database for Latin America (Astorga *et al*. 2003), which were completed with national sources. Dearth of data forced me occasionally to introduce some assumptions for the period before the epidemiological or health transition[23] that, in developing regions, particularly those of South Asia and Sub-Saharan Africa, often started during the Interwar years (Riley 2005b, 2005c).[24] Thus, in those (mostly pre-1913) cases, for which data on life expectancy or, in its absence, on infant mortality and heights do not exist, a 'floor' of 25 years has been

[21] In fact, most estimates come from Life Tables constructed on the assumption that the theoretical cohort is subject, throughout its existence, to the age-specific death rates observed in a sample population at a particular time. Since the mortality levels prevailing at the time the life table is built are assumed to remain unchanged until all members of the cohort have died, if mortality falls over time, the life expectancy of people born in more recent times will be underestimated.

[22] In fact, most estimates come from Life Tables constructed on the assumption that the theoretical cohort is subject, throughout its existence, to the age-specific death rates observed in a sample population at a particular time. Since the mortality levels prevailing at the time the life table is built are assumed to remain unchanged until all members of the cohort have died, if mortality falls over time, the life expectancy of people born in more recent times will be underestimated.

[23] Omran (1971: 736) defines the epidemiological transition as a long-term shift in mortality "whereby pandemics of infection are gradually displaced by degenerative and man-made diseases as the chief form of morbidity and primary cause of death".

[24] In the case of Africa, dearth of data made indirect estimates of life expectancy at birth necessary for the pre-1950 era. More specifically, on the basis of information for African countries since 1950, a statistical association between life expectancy and other health dimensions (infant mortality and, in its absence, height) for which pre-1950 data are available was established (Prados de la Escosura, forthcoming). In addition, I have followed James Riley's (2005a: 539) recommendation: "for the pretransition period the assumption is … that the average of all life expectancy estimates of acceptable quality for countries in a region provides the best available gauge of the pretransition average for the entire region".

accepted as the minimum historical value for life expectancy at birth. Furthermore, given a minimum goalpost (M_o) of 20 years – that appears to be the *Homo sapiens* lowest life expectancy prior to the late 19th century (Fogel 2009: 13; Steckel 2009: 34)-, the 25 years 'floor' precludes a zero value for the transformed life expectancy index and, consequently, for the *HIHD*.[25]

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. Empirically, however, adult literacy is a far from uniform concept. Reading and writing do not necessarily go together in developing countries (Markussen 1990, Nilsson 1999) and, thus, the estimated literacy rate varies depending on whether a wide or a narrow definition (just reading or reading and writing skills) is used.

The 2009 Human Development Report (UNDP 2009) provides most of the data on literacy for 1980-2007. From 1950 onwards data come from UNESCO (1970, 2002) and the World Bank (2010), completed with data from Banks (2010), Hayami and Ruttan (1985), and Easterly (1999).[26] UNESCO (1953, 1957), Flora (1973), OxLAD database for Latin America, plus national sources, provide data for the pre-1950 era.

Enrolment rates basically capture the expansion of formal education and do not inform about the length of the academic year, the quality of education, or student completion (Benavot and Riddle 1988). Historical evidence only allows one to estimate the unadjusted rate of total enrolment, that is to say, the percentage of population aged 5-24 enrolled in primary, secondary, and tertiary education. Only for the recent past, international organisations (UNESCO, OECD, World Bank) provide gross enrolment rates, in which the denominator is adjusted to the age bracket for each type of schooling (primary, secondary, etc.). Unadjusted rates will usually under-estimate gross enrolment rates, as, in the past, hardly any country's education extended to

[25] Truncating the lower part of the distribution by assuming a life expectancy 'floor' of 25 years has the advantage of allowing the inclusion of countries for which no data are available. Using a lower 'floor' (say, 22 years) does not alter the results significantly.

[26] Given the wide discrepancies between the UNESCO and UNDP figures over the years 1980-95, in order to keep consistency with those from the Human Development Reports, I have chosen the UNDP figures with a few exceptions (Algeria, 1990-1995, and Botswana, 1980-1985). See Appendix A.

those aged 24 years. Thus, for the historical (pre-1980) estimates using the ratio between gross enrolment rates (GER) and unadjusted rates (UER) for each country ($_i$) in 1980, and assuming the relationship between GER and UER was stable over time, I corrected the downward bias in previous benchmark years ($_j$). That is,

$$GER_{ij} = (GER_{i1980} / UER_{i1980}) * UER_{ij} \qquad [5]$$

The 2009 Human Development Report (UNDP 2009) provides most of the data enrolment for 1980-2007, completed with UNESCO (2010). For the pre-1970 period, enrolment figures come mostly from UNESCO (2010), Banks (2010), Mitchell (2003a, 2003b, 2003c), Flora (1983), and OxLAD database for Latin America, supplemented with national sources. With regard to the relevant population, see the Appendix.

In the case of education indicators (literacy and enrolment rates), UNDP goalposts [M=100, Mo=0] have been kept, but the highest and lowest historical values were set at 99 and 1 per cent, respectively.[27]

The UNHDI assumption that the marginal utility of *per capita* income declines as it reaches higher levels has been accepted. The fact that this transformed measure was chosen by the UNDP to proxy any dimension of wellbeing (excluding health and education) explains why such an astringent assumption has been kept. Were such an assumption relaxed, the range within which human development levels vary would increase substantially.[28] Thus, in order to get the income index I have used the log of GDP per head in expression [1].

[27] The assumption of 1 per cent as the lowest historical value for literacy and enrolment seems historically more reasonable than accepting zero, as the 'old' and hybrid *HDI* do, while a historical maximum of 99 per cent is also accepted for adult literacy in the *HDI*, but not in the hybrid HDI, in which the maximum observed level for the gross enrolment rate is 115.8 per cent (Gidwitz et al. 2010). A consequence of assuming a historical lower bound of 1 per cent is preventing zero values for the transformed variables.

[28] If the assumption of diminishing returns to income were relaxed, per capita GDP would drive the human development index, as it does not have an asymptotic upper bound, rendering, therefore, the HDI redundant. Zambrano (2011) provides a theoretical justification for the introduction of diminishing returns to income per head within the conceptual framework of the human development index.

In historical terms, there is practically no discrepancy in the available per capita GDP figures (expressed in Geary-Khamis [G-K] 1990 $) between the old UNDP 'cap' (G-K 1990 $ 40,000) and the new 'observed maximum' (G-K 1990 $ 42,916 for Qatar in 1973), although a significant difference appears between the previous lower bound of $100 and the observed minimum ($ 206 corresponding to D.R. Congo in 2001) (Maddison 2010).[29] Similarly to the cases of social indicators, I have assumed a lower bound for *per capita* GDP that has been set at G-K 1990 $ 300, which represents a basic level of physiological subsistence (Sagar and Najam 1998: 254, Milanovic *et al*. 2011), below the World Bank's extreme poverty threshold of G-K 1990 $ 1 a day per person and Maddison's (2006) G-K 1990 $ 400 per head.[30] GDP per head (G-K 1990 $) data come from Maddison (2006, 2010) supplemented with historical national accounts (see Appendix).

Later, the indices for each dimension of human development were combined with a geometric average (see expression [4]) in order to derive the historical index (*HIHD*). World human development has been computed on the basis of four different country samples for which time and spatial coverage are inversely related. Thus, over the entire time span, 1870-2007, 96 countries are considered, and its number rises up to 104, 137, and 157 countries for the samples starting in 1913, 1950, and 1990, respectively. These samples represent above 90 per cent of the world population (and practically 100 per cent after 1950).[31]

[29] In the 2010 Human Development Report (UNDP 2010), expressed in 2008 international dollars, the lowest level observed since 1980 has been established in $163, which is equivalent to $108 in 1990 Geary-Khamis dollars. The highest per capita income level reached over the same time span, $ 108,211 international dollars of 2008, corresponds to $ 72,020 Geary-Khamis dollars of 1990. Such a figure has never been achieved in Geary-Khamis 1990 dollars (Maddison 2010) estimates, so I have chosen the observed maximum and minimum values over 1870-2007 in Maddison (2010) estimates.

[30] This lower bound for per capita income, which, no doubt, truncates the data set at the bottom, allows me to consider countries in earlier periods for which no data exist and that, otherwise, would reduce the country sample considered here.

[31] Since regional aggregates are highly coincidental for each of these samples, I decided there was no need for splicing them. The estimates for each of the four samples are at the reader's disposal.

Trends in Human Development

A long-run upward trend in world human development is observed for both the UNDP indices ('hybrid' and 'old' HDI) –whose level in 2007 was a fourfold of that in 1870- and for the new historical index, *HIHD* –which rose six fold within the same period-. The *HIHD* exhibits a systematically lower level than both the 'hybrid' and 'old' UNDP indices. A widening absolute gap opens up between them over time, but not in relative terms, as the *HIHD* grows at a faster pace: 1.3 per cent annually against 0.9 and 1.0 per cent for 'old' and the 'hybrid' HDI, respectively.

There is significant room for improvement in world human development and, using the Human Development Report conventional distinction between 'low' (< 0.5), 'medium' (0.5-0.8), and 'high' (> 0.8) levels, the world, according to the *HIHD*, would be still below the 'medium' level in 2007. In contrast, the *UNDP* indices place the world in the 'medium' level since the 1960s and approaching nowadays the 'high' level.

Three main phases can be distinguished: a first one, up to 1913, of steady and moderate progress; a second one of acceleration, (but for World War II), during the period 1913-1970, and a third one, since 1970, in which a sustained deceleration gave way to an expansion from 1990 onwards (Figure 2 and Table 1).

Since the income index is the same for all indices (the *HIHD* and both UNDP indices), their differences derive from the way in which the original values of the social variables (life expectancy at birth and education) are transformed and the kind of average (arithmetic or geometric) used in its aggregation. The alternative indices for life expectancy and education (Figures 3 and 4) confirm the lower level but faster growth of the alternative Kakwani indices, and consequently, the widening gap between them and the UNDP linearly transformed indices.

When the alternative UNDP indices are contrasted, it appears that the 'hybrid' index remains systematically below the 'old' HDI. Moreover, if the 'UNDP old' and the 'hybrid' indices for each social variable are compared, it appears that, in the case of life expectancy, the 'hybrid' index is above the 'old' one, while the opposite happens in the case of education. Thus, if index of human development excluding the income dimension is built, the 'old' and the 'hybrid' indices become practically identical (Figure 5). Since the income index is the same in either case, this result implies that the

difference between the 'old' and the 'hybrid' HDI stems almost exclusively from the arithmetic and geometric average used to combine the HDI dimensions.[32] Furthermore, by excluding income from the human development index, the absolute gap between the *HIHD** and the UNDP 'old' and 'hybrid' HDI* indices broadens.

Trends in world human development are affected by its regional evolution, particularly, by that of large regions exhibiting idiosyncratic behaviour such as, for example, China and India or Africa. It can be noticed that their exclusion from the aggregate world index raises the level of human development throughout 1870-2007 (Figure 6 and Table 2). Including Africa worsens the world level since 1950 and, especially, after 1990. The world without Africa shifts upwards and diverges from the world as a whole in terms of human development. In the case of China and India, their inclusion has a less negative impact on the world level from 1980 onwards as they experienced substantial gains in human development. Thus, there is a mild tendency to converge between the world without China and India and the world as a whole.

Trends in human development do not match closely those observed in real GDP per head (Figure 7). More specifically, phases of economic globalization have a dramatic impact on per capita income growth (Lindert and Williamson 2003) but not on the progress of human development.

A counterintuitive lack of association is observed between human development and per capita income prior to World War I. Although the initial large-scale progress in health can be traced back to the late nineteenth century, with the diffusion of the germ theory of disease (Riley 2001), and the significant advance of primary education (Benavot and Riddle 1988), in the era of laissez faire capitalism the progress in human development dimensions fell short of the economic advancement resulting from globalization and industrialization. The negative impact of urbanization on life expectancy and the lack of public policies on education and health may account for human development's slower progress in the late nineteenth century (Easterlin 1999; Lindert 2004).

[32] Another differential element, but of much less weight, derives from their different goalposts. The coincidence between the 'old' and the 'hybrid' indices should attenuate Ravallion (2012) reservations about the impact of the new way (2010) of aggregating human development dimensions on the HDI.

It is during the globalization backlash of the period 1914-1950, though, when clear discrepancies emerged. More significantly, while real GDP per head stagnated or declined as world commodity and factor markets disintegrated, health and education practices became increasingly globalized and human development progressed steadily. Since 1950, advancement in human development has been hand-in-hand with economic growth, although at a lower pace in the Golden Age (1950-73) and, again, since 2000.

Were the fruits of human development progress evenly distributed or did regional differences widen? And did the gap between *OECD* and the *Rest* deepen over time? The answer is negative in both cases. The dispersion of human development fell between 1913 and 1990, if all countries are considered as equals (the unweighted Gini fell from 0.52 to 0.26) while the contraction continued until 2007 if countries are weighted by their population (the Gini fell from 0.46 to 0.22) (Figure 8).

Relative to the *OECD*, the *Rest* showed stability up to 1913 and catching up thereafter, stronger up to 1970 –with the exception of the World War II years-, and weaker afterwards (Table 3). Measured by the *HIHD*, the *Rest* presents comparatively lower levels than in terms of the UNDP indices with catching-up to *OECD* slowing down dramatically after 1970 (Figure 9). Thus, while, according to the *HIHD*, the *Rest* represented only 50 percent of the *OECD* level in 2007, it reached 71 and 75 percent in the 'hybrid' and 'old' HDI. Consequently, the *UNDP* indices offer a more benign view of the Periphery than the historical index of human development.

A deeper perception of world human development derives from comparing the performance of different regions in both absolute terms and relative to *OECD* (Figures 10 and 11). The comparison of levels and yearly rates of variation across regions shows a wide variance (Table 4).

Latin America caught up to the *OECD* until 1980, although more intensively during the first half of the twentieth century. In Africa a sustained improvement and catching-up took place between the 1920s and the 1970s, which, since 1980, slowed down in North Africa and ceased altogether in Sub-Saharan Africa. In Asia, starting from low levels -similar to those of Africa up to the early 1920s-, human development improved significantly until 1970 and, again, at the turn of the century, driven by

China's and India's progress. Since the 1970s, due to Central and Eastern Europe's falling behind *OECD* and Asia's (especially China's) and North Africa's catching up, a process of convergence between these regions and Latin America has taken place, while Sub-Saharan Africa fell behind.

By 2007, levels of human development in Central and Eastern Europe (including Russia), and Latin America matched those of the *OECD* in the late 1960s; while China and India had achieved the *OECD* level of 1960 and 1929, respectively, and, in the rest of Asia (excluding Japan), that of 1950. In Africa, the Arab north had reached the *OCDE* level of 1938 but in the Sub-Saharan region only represented that of 1890. On average, the *Rest* 's human development in 2007 had reached the level of *OECD* in 1950.

Relative to *the Core*, the *Periphery* performed better in human development (Figure 9) than in income per head terms (Figure 12), although not to the extent suggested by the conventional 'old' *UNDP HDI* (Crafts 2002). Thus, in 2007, real per capita GDP for the *Rest* was similar to that of *OECD* by 1938. Furthermore, in 2007, real per capita GDP levels in Central and Eastern Europe (including Russia), Latin America, and China were those of the OECD in the early 1960s, the late 1950s and 1950, respectively. In turn, the income levels of North Africa, India, and the rest of Asia (excluding Japan) were similar to those of OECD in 1913, the 1890s, and 1938. As for Sub-Saharan Africa they corresponded to those of mid-nineteenth century OECD.

What does explain the superior performance in terms of human development of the rich capitalist societies? It has been pointed out that it was largely due to public intervention, as markets would not have contributed to control disease transmission, encourage immunization, nor stimulate medical research (Easterlin 1999).

The relative size of social spending is associated to globalization, economic growth, democratization, and longevity (Lindert 2004: 20-21, 188, Huberman 2012). Globalization increases external risks and, hence, triggers the demand of government-led social protection (Rodrik 1997). This was the case during the first globalization (1870-1913), when increasing exposition to international trade created uncertainty among European workers, leading to demands of social protection and governments' 'labour compacts' (Huberman and Lewchuk 2003).

Have Government intervention and the expansion of social spending, in particular, the introduction of the welfare state, played a distinctive role in *OECD* wellbeing achievements? Figure 13 plots levels of human development against social transfers (that is, all social spending but that in education) expressed in proportion of GDP for a group of *OECD* countries.[33] A positive non-linear association seems to exist between the expansion of social protection and the improvement in human development that stabilizes above a low threshold of social transfers (as a share of GDP). Small changes in social transfers are associated with large increases in human development (left of the figure). Then, as one moves to the right, it can be observed that increases in social transfers are associated with smaller, but still positive, increases in human development. As social transfer reach 25 percent of GDP the curve tends to flatten, suggesting a reversal for levels above 30 percent. It seems, therefore, that increasing social spending accounts only up to a point the advancement in *OECD*'s human development.

At the time the welfare state expanded in advanced capitalist countries socialism emerged as alternative economic and social system.[34] It has been suggested that it is at low levels of economic development when socialist societies have an advantage over capitalist ones in lifting human wellbeing. Does the evidence on human development support this view?

A glance at the former Soviet Union shows that substantial gains in human development were obtained between the 1920s and the 1960s, which resulted in an impressive catching-up to the OECD (Table 4 and Figures 10-11). The significant achievements in health and education that lie behind human development advance and catching-up in the Soviet Union up to the mid-1960s can be also observed in

[33] The data on social transfers as a share of GDP for OECD countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, UK, and USA) at decadal intervals from 1880 to 2000 (except from 1960 when data are for 5-year intervals) comes from Lindert (1994) and the Allard-Lindert OECD 1950-2001 Dataset in Peter Lindert's website, http://lindert.econ.ucdavis.edu (accessed on August 18, 2012).

[34] I have chosen to use the term 'socialist' rather than 'communist' as in the Marxist thought the latter was the goal to be reached and socialism was the means to reach it. See a discussion in Ivanov and Peleah (2010).

socialist Central and Eastern Europe since 1950 (Figures 14-17). However, from the late 1960s onwards, human development progress gave way to stagnation and, relative to *OECD*, to a dramatic decline that lasted up to 2000.

The success of the Soviet Union in raising longevity and education during the central decades of the twentieth century provided an appealing model for newly independent nations in Asia and Africa after World War II as they were facing the challenge of meeting basic needs (Collier and O'Connell 2008; Ivanov and Peleah 2010). In China, human development that had improved significantly during the first half of the twentieth century, accelerated under socialism up to the 1960s, but only again in the 1990s, after pro-market economic reforms were introduced. Notwithstanding, in Asia, social engineering experiences during China's Cultural Revolution and Cambodia's Khmer Rouge rule proved disastrous in terms of human development. In Indochina, human development improvements had to wait until the late twentieth century, once economic liberalization was introduced, and Vietnam, Lao, and Cambodia only caught up to East Asian average after 1990. Socialist experiences in Sub-Saharan Africa did not succeed in terms of human development as the cases of Benin, Ethiopia, Congo, Angola, and Mozambique evidence. Political-economic distortions, particularly those associated to moving away from market resource allocation, appear inversely related to human development progress in Sub-Saharan Africa (Prados de la Escosura, forthcoming). Cuba, the only socialist experience in the Americas, achieved remarkable success since the 1959 Revolution, driven exclusively by its non-income dimensions, and represents the long-term exception. A preliminary evaluation suggests, therefore, that, but for Russia during the central decades of the twentieth century and Cuba, socialism has not delivered higher human development for developing countries than capitalism.

The short-cut approach to 'measure' human development used here so far leaves aside agency and freedom. Without agency –that is, the ability to pursue and realize goals a person has reasons to value- and freedom, the human development index becomes simply a 'basic needs' index (Ivanov and Peleah 2010). Thus, in order to achieve a comprehensive depiction of human development the opportunities individuals have of exercising their political capabilities and influencing public decisions

need to be taken into account (Dasgupta and Weale 1992; Cheibub 2010). This caveat is particularly relevant for the contrast between capitalism and socialism. Since restrictions of individual choice in socialist countries -as collectivization, forced industrialization, and political repression exemplify-, affected negatively agency and freedom, their achievements in health and education could be, strictly speaking, depicted as 'basic needs' rather than as human development (Ivanov and Peleah 2010).[35] The same caveat applies to fascism and other totalitarian regimes under capitalism. It is reassuring, nonetheless, that human development and democratization are correlated since 1950 and the correlation grows stronger as their levels get higher (see the positive sign of the quadratic term in the regression) (Figure 18).[36]

Decomposing Human Development Growth

Long run gains in human development are driven by the progress of its social dimensions, longevity and education (Table 5). A sustained progress in Kakwani indices of life expectancy at birth and education is observed in different world regions. Exceptions are the practical stagnation of life expectancy indices in Central and Eastern Europe from the 1960s onwards and in Sub-Saharan Africa since the 1980s. Nonetheless, the improvement falls short from that of OECD and catching up in the Rest either stop, as in it did the case of life expectancy after 1970, or falls short to be complete, as it happened in the case of education.

The growth of human development (*HIHD*) can be decomposed into the contribution of its different dimensions -life expectancy at birth (*LEB*), education (*EDU*) and truncated income (*UNY*)- on the basis of expression [4]. Using low case to denote rates of variation,

[35] From this perspective, the demise of socialism after 1989 would have represented an advance in terms of human development. However, as regards agency, advances in civil and political liberties the outcome has been quite uneven with political voice and participation restricted in the countries of the former Soviet Union (Central Asia, in particular) and indisputable progress in Central Europe and the Baltic republics (Brainerd 2010a).

[36] The index of democratization comes from Vanhanen (2011), normalized by dividing its value by its potential maximum so it ranges between 0 and 1, and becomes comparable to the HIHD.

$$hihd = 1/3\ leb + 1/3\ edu + 1/3\ uny \qquad [6]$$

It appears that social dimensions drove world human development gains over time, with life expectancy as the driving force during the 1920s and 1940s and education taking the lead during the 1930s, 1950s, and 1990s (Figure 19).

Health improvements can be depicted as movements along a health production function and shifts outwards in the health function (Preston 1975, Easterlin 1999). Movements along the curve would represent gains derived from economic growth, which result in nutrition improvements -that strengthen the immune system and reduce morbidity (Stolnitz 1955, McKeown *et al*. 1962, 1975, McKeown 1976, Fogel 2004)- and in the public provision of health (Loudon 2000; Cutler and Miller 2005). Outward shifts in the health function capture, in turn, technological change and would have been responsible for the sustained increase in longevity since the late nineteenth century (McKinley and McKinley 1977, Riley 2005a, Cutler et al 2006). Furthermore, health improvements derived from the diffusion of new technologies resulted not only in a longer life but also in longer healthy life years (Mathers et al. 2001, Murray and Lopez 1997, Salomon et al. 2012). Technological advance had an impact on health through the diffusion of the germ theory of disease since the 1880s (Preston 1975), the introduction of new vaccines (since the 1890s) and drugs to cure infectious diseases (sulpha drugs since the late 1930s and antibiotics since the 1950s) (Easterlin 1999, Jayachandran *et al*. 2010), and the new medical knowledge to treat respiratory and cardiovascular illnesses in the late 20th century (Cutler et al 2006).

Why does the longevity's drive in human development fade away by mid-twentieth century? The contrast between the experiences of the *OECD* and the *Rest* is illuminating. In the case of developed countries, improvements in life expectancy have driven human development advance ever since (Table 6 and Figure 20). In the late 20th century a 'second' health transition has taken place in the *OECD* with mortality falling among the elderly as a result of a better treatment of respiratory and cardiovascular disease and of better health and nutrition in their early years (Eggleston and Fuchs 2012). This sustained progress in life expectancy during the late twentieth and early twenty-first century is associated to gains in healthy life years (Salomon et al. 2012).

In the *Rest*, the role of life expectancy in human development advance is, despite its very impressive gains during 1913-1970, less decisive, since the late twentieth century as longevity gains appear to slow down once the health transition takes place and education becomes the main force underlying long-run progress in human development (Table 7 and Figure 21).

Catching up in the *Rest* to *OECD* -measured as the difference in the human development growth rate between the *Rest* and *OECD*-, concentrates between 1913 and 1970, and more intensely in the Interwar and, then, in the 1950s, years, a period in which, interestingly, a large proportion of the *Rest* was still under colonial rule (Table 8 and Figure 22). In the sluggish catching-up of the *Rest* since 1970, life expectancy plays a negative role, providing support to the view that health inequalities across countries increase as new health technology and knowledge occurs, since it is introduced earlier and at a faster pace in developed countries (Cutler *et al*. 2006: 117). Only after 2000, income per head constitutes the main element behind the *Rest*'s catching up.

The contrast between the West and the Rest is better understood when the role of human development dimensions is considered at regional level. In Eastern and Central Europe (Russia included) most improvement in human development took place up to 1970, -and more intensely in the 1890s and between the 1920s and 1950s, when catching up to the *OECD* took place- (Figures 23-24 and Tables A.1-A.2 in the Appendix). Education was the driving force (with remarkable intensity during the 1930s), but for the 1920s and the 1940s, when life expectancy took the lead. Since 2000 income has become the main dimension of human development advancement. A glance at Russia's performance –the dominating country in the region- confirms and accentuates this depiction, although most of its catching-up was restricted to the 1890s and to the period 1913-1950 (Tables A.3-A.4).

In the Soviet Union, the expansion of health care to the whole population was particularly successful in fighting infectious disease and child mortality. Infant mortality fell rapidly between 1940 and 1965 (Brainerd and Cutler 2005; Brainerd 2010b). By the mid-1960s life expectancy at birth had practically converged to Western Europe, after a dramatic improvement over the previous four decades, especially

during the 1950s (Mazur 1969). However, life expectancy fell since 1965 as a result of the decline in adult (male) longevity, which Dutton (1979) attributes to diseases of the circulatory system, increasing death rates by accident, suicide, and poisoning, and alcoholism. Increasing infant mortality since 1970 reinforced this declining trend.[37] In the rest of socialist Europe life expectancy also stagnated since the mid-1960s.

The demise of socialism in Central and Eastern Europe and the disintegration of the Soviet Union brought with it a decline in life expectancy (Brainerd and Cutler 2005, Brainerd 2010a). However, life expectancy recovered quickly and expanded after the mid-1990s in Central Europe, especially in Czechoslovakia, Poland and Hungary (Stillman 2006; Brainerd 2010a). Alcohol consumption and stress from the transition to market (unemployment uncertainty for mid-age workers, rising inequality), along with worsening of diets and health and material deprivation, appear to be largely responsible for the increase in mortality and help to explain the severity and persistence of the life expectancy decline in the former Soviet Union (Shkolnikov et al. 2001; Cutler and Brainerd 2005; Brainerd 2010a).

In Latin America, human development experienced moderate and steady progress and catching-up between 1880 and 1980 (Figure 25-26 and Tables A.5-A.6). In this region too education has been the leading dimension, especially, during the second half of the twentieth century (but for the 1980s). Life expectancy had a distinguished role during the early twentieth century, in particular during the 1940s, when the strongest catching-up to OECD of the entire period considered took place. Interestingly, such an advance often did not result of widespread treatment of infectious diseases with sulpha drugs and antibiotics and vaccination against tuberculosis, largely inaccessible to its low-income population, but of low-cost public health measures and the diffusion of hygienic practices and, often, during periods of economic stagnation (Riley 2001).[38] Latin America's weak convergence to developed

[37] Stature, a measure of health infrastructure and nutrition improvements, also experienced an increase in the 1930s accelerating from the late 1940s to 1970, when it stagnated (Brainerd 2010b).

[38] In Jamaica, for example, mortality declined sharply during 1920-1965, but more intensively during the late 1920s and 1930s while real per capita GDP was relatively stagnant. Low-cost public health measures and diffusion of health knowledge played a major role in eradicating communicable diseases (diarrheal

countries in the second half of the twentieth century deserves investigation. In particular, restricted access to health and education as result of income inequality may have been a serious obstacle for human development catching up.

Cuba provides an interesting counterpoint to the rest of Latin America and to other socialist experiences. A sustained improvement in life expectancy took place during the first half of the twentieth century, so by eve of the 1959 Revolution, Cuba was above the average Latin American and Southern European countries (McGuire and Frankel 2005, Devereux 2010; Ward and Devereux 2010, 2012). After the 1959 Revolution, a further and impressive improvement in life expectancy has taken place, as a result of the success in fighting and eradicating infant mortality. The mortality decline, initiated after the U.S. occupation, was associated to sanitary and public health innovation, and largely independent from Cuba's level of economic development (Díaz-Briquets 1981). Interestingly, there is some continuity in the post-1959 era, as human development success has occurred in striking contrast with its poor economic performance, an achievement that has been attributed to the coercive power of the socialist state (Devereux 2010, Mesa-Lago 2005). The case of Cuba provides a case of extreme contrast between the success in achieving 'basic needs' and the failure to enlarging people's choices –the core of human development- as agency and freedom are curtailed by the political regime.

Significant progress of human development has taken place in Asia during the last century although the regional variance was large. China experienced an impressive advancement and catching up in human development during the last hundred years, with special intensity in the Interwar and the Golden Age, led by education, between 1929 and 1960, and by life expectancy, from 1913 to 1929 and in the 1960s (Figure 27-28 and Tables A.7-A.8). Since the 1970s the income dimension has dominated progress in human development –largely a consequence of the pro-market reforms while its social components –life expectancy, in particular- played a minor role. The slowdown in health improvements has been regarded as a direct consequence of the new economic policies (Dréze and Sen 2002; Cutler et al. 2006).

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diseases, malaria, and tuberculosis), prior to the introduction of antibiotics (Riley 2005a). A similar experience is found in British Guiana (Mandle 1970).

India experienced a steady advance in human development since the late nineteenth century, catching up to *OECD* over the last century, especially in the 1920s and, again, during the 1940s and 1950s (Figure 29-30 and Tables A.9-A.10). Education appears as the main contributor to human development advancement in the long run, although life expectancy at birth drove it in the first half of the twentieth century. Improvements in sanitation, medical care, and famine prevention successfully contributed to reducing the impact of infectious disease (malaria, smallpox, cholera) (McAlpin 1983; Roy 2006: 311-312). These achievements are especially remarkable because they took place during a period of stagnation in real incomes per head (Roy 2006: 78, Maddison 2010) and under colonial rule, despite claims of colonial under-investment and poor health infrastructure (Amrith 2009). In the last three decades, the income dimension has played a major role, along education, in human development progress. This feature has been associated, as in the case of China, to the impact of pro-market reforms, which contributed to reduce the absolute extreme poverty rate by half since the early 1970s (Kotwal et al. 2011). A simultaneous slowdown in infant mortality reduction occurred as the new economic policies were implemented (Dréze and Sen 2002) helping to explain why longevity's contribution to human development progress has been so weak in recent times.[39]

In the rest of Asia (excluding Japan), sustained progress in human development has taken place since 1870 and catching up to OECD can be observed since 1913, especially up to 1938 and during the Golden Age (Figure 31-32 and Tables A.11-A.12). Education and health improvements jointly contributed in the advancement of human development. As in the case of India, substantial health improvements were achieved before independence. Thus, mortality from smallpox, cholera and plague was reduced through specific public health measures in Indonesia, the Philippines, and Taiwan during the 1920s (Preston 1975).

In Africa, a very distinctive performance is observed between its north and sub-Saharan regions. In North Africa, a steady long-run improvement has taken place in

[39] Despite the fact that those living below 1.08 1993 dollars per day has been cut down by half since the mid-1970s, the share of those below double the poverty line remains unaltered at about 80 per cent (Kotwal et al. 2011: 1185)

human development, on the basis of both longevity, which experienced a major improvement in the 1940s, and education gains, that allowed the region's catching-up to *OECD* during the twentieth century, especially in its central decades and in the 1970s (Figure 33-34 and Tables A.13-A.14). South of the Sahara the period 1913-1980 is also the one of human development advancement and catching-up. However, the leading role played by life expectancy is restricted to the 1930s and 1940s, and education provided the main source of progress, in particular, after economic growth per head collapsed during the last quarter of the twentieth century (Figure 35-36 and Tables A.15-A.16). The stagnation of life expectancy, due to the spread of HIV/AIDS and the resilience of malaria, together with arrested growth and the deceleration in the education expansion, largely resulting from political turmoil, civil wars and unsound economic policies –often inspired in the Soviet paradigm- (Collier 2000, Collier and O'Connell 2008)-, explain the weak advance in human development and the region's falling behind.[40] The surge in human development during the 2000s has been helped by the recovery in economic activity and, to less extent, in life expectancy, but education has remained the main force behind its advance.

Concluding Remarks

A substantial but incomplete improvement in world human development has taken place during the last one and a half centuries, although it was the period between World War I and the oil shocks of the 1970s the one in which wellbeing expanded intensively and across the board.

Substantial gains in longevity and education and, hence, in human development took place across the board between 1920 and 1950, just at the time of economic globalization backlash. This counterintuitive result calls for further investigation. Why are trends in GDP per head and human development not correlated

[40] In post-colonial Sub-Saharan Africa, the success of the Soviet Union during the central decades of the twentieth century was a paradigm for freedom fighters in the 1950s and influenced post-independence statist policies. Socialist experiments were unsuccessfully attempted in Benin, Congo, Ethiopia, Angola, and Mozambique, while socialist policies were introduced in Zambia and Tanzania (Collier and O'Connell 2008, Ivanov and Peleah 2010).

over time when increases in per capita income would surely contribute to better nutrition, health and education? Is their different behaviour related to public policy (e.g. public schooling, public health, the rise of the welfare state), or to the fact that medical technology is a public good?

The last four decades have witnessed a deceleration in human development advancement and a widening in the absolute gap between the *OECD* and the *Rest*. Nonetheless, a large variance in regional behaviour is concealed behind the *Rest*. Progress and catching up in large areas of Asia, North Africa and, to less extent, in Latin America, coexisted with the collapse and falling behind of former socialist Europe and Sub-Saharan Africa.

The choice of economic and social system had a far from negligible influence in human development progress across countries. Socialist and capitalist models implied different health and education policies, as well as different economic policies. The results presented here suggest that, despite its initial success as providers of 'basic needs', socialist experiences failed to sustain the momentum and, but for Cuba, stagnated and fell behind before the demise of socialism. Moreover, as in other totalitarian experiences, its suppression of agency and freedom prevented real achievements in human development.

Differences in the behaviour of human development dimensions help to explain the gap between *OECD* and the *Rest* (and the variance within the *Rest*). Longevity is the key element in *OECD* forging ahead, not only because of the longer life span enjoyed by its population, but because of the higher quality of life associated to it. Conversely, in the *Rest*, life expectancy only played a major role in human development advancement and catching up until the central decades of the twentieth century and, as the demographic and epidemiological transition took place, its dynamic role faded away. A second wave of longevity expansion comparable to that of the *OECD* has not taken place in the *Rest* yet. Thus, education carried most of the weight in human development progress during the last four decades, with the income dimension playing a decisive role in catching up to *OECD*: positive in China and India, and negative in Sub-Saharan Africa and Russia and former socialist countries in Europe.

Why did life expectancy stop being the driving force of world human development as the health transition was completed? Why a 'second' transition, like the one underway in the *OECD*, has not been triggered off in the *Rest*? Is it due to a lack of public policies, or to the inequalising impact of the new medical technologies? Is it because health and education are high income-elastic goods? Or are political and institutional factors its main determinants? All these questions deserve further investigation.

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Table 1 ***Human Development in the World, 1870-2007: Alternative Indices***

Panel A:
Levels

	HIHD	Hybrid HDI	'Old' HDI
1870	0.076	0.173	0.212
1880	0.083	0.187	0.229
1890	0.095	0.210	0.252
1900	0.107	0.231	0.277
1913	0.122	0.257	0.306
1929	0.157	0.316	0.365
1938	0.185	0.359	0.407
1950	0.210	0.397	0.466
1960	0.263	0.476	0.540
1970	0.307	0.535	0.603
1980	0.334	0.573	0.639
1990	0.367	0.613	0.676
2000	0.416	0.659	0.719
2007	0.460	0.702	0.751

Panel B: Average Growth Rates (%)

1870-1880	1.0	0.8	0.8
1880-1890	1.4	1.1	0.9
1890-1900	1.2	1.0	0.9
1900-1913	1.0	0.8	0.8
1913-1929	1.6	1.3	1.1
1929-1938	1.8	1.4	1.2
1938-1950	1.1	0.8	1.1
1950-1960	2.2	1.8	1.5
1960-1970	1.5	1.2	1.1
1970-1980	0.9	0.7	0.6
1980-1990	0.9	0.7	0.6
1990-2000	1.3	0.7	0.6
2000-2007	1.4	0.9	0.6
1870-1913	1.1	0.9	0.9
1913-1950	1.5	1.2	1.1
1950-1970	1.9	1.5	1.3
1970-1990	0.9	0.7	0.6
1990-2007	1.3	0.8	0.6
1870-1913	1.1	0.9	0.9
1913-1970	1.6	1.3	1.2
1970-2007	1.1	0.7	0.6
1870-2007	1.3	1.0	0.9

Table 2 ***Human Development in the World and excluding China and India and Africa, 1870-2007***

Panel A: HIHD Levels

	World	World excluding China and India	World excluding Africa	World excluding Sub-Saharan Africa
1870	0.076	0.115	0.077	0.077
1880	0.083	0.125	0.085	0.085
1890	0.095	0.142	0.098	0.098
1900	0.107	0.160	0.111	0.110
1913	0.122	0.179	0.127	0.126
1929	0.157	0.220	0.164	0.163
1938	0.185	0.257	0.194	0.192
1950	0.210	0.272	0.221	0.219
1960	0.263	0.321	0.276	0.274
1970	0.307	0.363	0.322	0.320
1980	0.334	0.391	0.350	0.348
1990	0.367	0.419	0.388	0.386
2000	0.416	0.456	0.445	0.443
2007	0.460	0.495	0.494	0.491
Panel B: Average Growth Rates (%)				
1870-1880	1.0	0.9	1.0	1.0
1880-1890	1.4	1.3	1.4	1.4
1890-1900	1.2	1.2	1.2	1.2
1900-1913	1.0	0.9	1.0	1.0
1913-1929	1.6	1.3	1.6	1.6
1929-1938	1.8	1.7	1.8	1.8
1938-1950	1.1	0.5	1.1	1.1
1950-1960	2.2	1.6	2.2	2.2
1960-1970	1.5	1.2	1.6	1.6
1970-1980	0.9	0.7	0.8	0.9
1980-1990	0.9	0.7	1.0	1.0
1990-2000	1.3	0.8	1.4	1.4
2000-2007	1.4	1.2	1.5	1.5
1870-1913	1.1	1.0	1.2	1.2
1913-1950	1.5	1.1	1.5	1.5
1950-1970	1.9	1.4	1.9	1.9
1970-1990	0.9	0.7	0.9	0.9
1990-2007	1.3	1.0	1.4	1.4
1870-1913	1.1	1.0	1.2	1.2
1913-1970	1.6	1.2	1.6	1.6
1970-2007	1.1	0.8	1.2	1.2
1870-2007	1.3	1.1	1.4	1.4

Table 3 *Human Development in OECD and the Rest, 1870-2007*

Panel A: HIHD Levels

	OECD	The *Rest*	*Rest* excluding China and India	*Rest* excluding Africa	*Rest* excluding Sub-Saharan Africa
1870	0.175	0.040	0.054	0.041	0.041
1880	0.192	0.044	0.060	0.044	0.044
1890	0.220	0.051	0.070	0.052	0.052
1900	0.246	0.057	0.082	0.058	0.058
1913	0.277	0.065	0.096	0.067	0.067
1929	0.334	0.094	0.131	0.098	0.098
1938	0.366	0.124	0.176	0.130	0.129
1950	0.417	0.148	0.190	0.155	0.154
1960	0.482	0.203	0.240	0.213	0.212
1970	0.541	0.249	0.283	0.261	0.259
1980	0.593	0.278	0.313	0.291	0.290
1990	0.658	0.315	0.343	0.331	0.331
2000	0.745	0.363	0.373	0.387	0.386
2007	0.809	0.405	0.408	0.434	0.433
Panel B: Average Growth Rates (%)					
1870-1880	0.9	0.8	1.1	0.9	0.9
1880-1890	1.4	1.5	1.5	1.6	1.6
1890-1900	1.1	1.0	1.6	1.1	1.1
1900-1913	0.9	1.1	1.2	1.1	1.1
1913-1929	1.2	2.3	2.0	2.4	2.4
1929-1938	1.0	3.1	3.3	3.1	3.1
1938-1950	1.1	1.5	0.6	1.5	1.5
1950-1960	1.4	3.2	2.3	3.2	3.2
1960-1970	1.2	2.0	1.7	2.0	2.0
1970-1980	0.9	1.1	1.0	1.1	1.1
1980-1990	1.0	1.2	0.9	1.3	1.3
1990-2000	1.2	1.4	0.8	1.5	1.6
2000-2007	1.2	1.6	1.3	1.7	1.6
1870-1913	1.1	1.1	1.3	1.2	1.2
1913-1950	1.1	2.2	1.9	2.3	2.3
1950-1970	1.3	2.6	2.0	2.6	2.6
1970-1990	1.0	1.2	1.0	1.2	1.2
1990-2007	1.2	1.5	1.0	1.6	1.6
1870-1913	1.1	1.1	1.3	1.2	1.2
1913-1970	1.2	2.3	1.9	2.4	2.4
1970-2007	1.1	1.3	1.0	1.4	1.4
1870-2007	1.1	1.7	1.5	1.7	1.7

Table 4 *Human Development across World Regions, 1870-2007*

Panel A: HIHD Levels

	OECD	Central & Eastern Europe (Incl. Russia)	Latin America	China	India	Rest of Asia (Excl. Japan)	North Africa	Sub-Saharan Africa
1870	0.175	0.073	0.055	0.032	0.025	0.028	0.036	0.027
1880	0.192	0.082	0.060	0.033	0.029	0.031	0.037	0.029
1890	0.220	0.097	0.071	0.042	0.034	0.037	0.040	0.031
1900	0.246	0.119	0.083	0.040	0.035	0.042	0.046	0.034
1913	0.277	0.133	0.106	0.040	0.041	0.053	0.056	0.037
1929	0.334	0.187	0.137	0.064	0.060	0.088	0.072	0.050
1938	0.366	0.266	0.156	0.081	0.070	0.113	0.080	0.062
1950	0.417	0.335	0.215	0.093	0.097	0.123	0.112	0.081
1960	0.482	0.413	0.263	0.166	0.130	0.168	0.152	0.108
1970	0.541	0.482	0.313	0.222	0.160	0.220	0.182	0.139
1980	0.593	0.490	0.374	0.257	0.185	0.261	0.233	0.173
1990	0.658	0.509	0.403	0.308	0.225	0.314	0.286	0.185
2000	0.745	0.497	0.481	0.408	0.267	0.364	0.350	0.194
2007	0.809	0.537	0.520	0.470	0.311	0.417	0.389	0.220

Panel B: Average Growth Rates (%)

	OECD	Central & Eastern Europe (Incl. Russia)	Latin America	China	India	Rest of Asia (Excl. Japan)	North Africa	Sub-Saharan Africa
1870-1880	0.9	1.3	0.8	0.1	1.5	1.2	0.4	0.6
1880-1890	1.4	1.7	1.7	2.5	1.7	1.5	0.9	0.8
1890-1900	1.1	2.0	1.6	-0.4	0.1	1.3	1.3	0.9
1900-1913	0.9	0.9	1.9	0.0	1.2	1.9	1.5	0.8
1913-1929	1.2	2.1	1.6	3.0	2.4	3.2	1.6	1.8
1929-1938	1.0	3.9	1.4	2.5	1.8	2.8	1.2	2.4
1938-1950	1.1	1.9	2.7	1.2	2.7	0.7	2.8	2.2
1950-1960	1.4	2.1	2.0	5.8	2.9	3.1	3.0	2.9
1960-1970	1.2	1.5	1.7	2.9	2.1	2.7	1.8	2.5
1970-1980	0.9	0.2	1.8	1.5	1.5	1.7	2.5	2.2
1980-1990	1.0	0.4	0.7	1.8	1.9	1.8	2.1	0.7
1990-2000	1.2	-0.2	1.8	2.8	1.7	1.5	2.0	0.5
2000-2007	1.2	1.1	1.1	2.0	2.2	2.0	1.5	1.8
1870-1913	1.1	1.4	1.5	0.5	1.1	1.5	1.0	0.8
1913-1950	1.1	2.5	1.9	2.3	2.4	2.3	1.9	2.1
1950-1970	1.3	1.8	1.9	4.4	2.5	2.9	2.4	2.7
1970-1990	1.0	0.3	1.3	1.6	1.7	1.8	2.3	1.4
1990-2007	1.2	0.3	1.5	2.5	1.9	1.7	1.8	1.0
1870-1913	1.1	1.4	1.5	0.5	1.1	1.5	1.0	0.8
1913-1970	1.2	2.3	1.9	3.0	2.4	2.5	2.1	2.3
1970-2007	1.1	0.3	1.4	2.0	1.8	1.7	2.1	1.3
1870-2007	1.1	1.5	1.6	2.0	1.8	2.0	1.7	1.5

Table 5 *Human Development and its Dimensions: the World, 1870-2007*

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.076	0.038	0.047	0.242
1880	0.083	0.040	0.056	0.255
1890	0.095	0.046	0.069	0.272
1900	0.107	0.054	0.079	0.291
1913	0.122	0.063	0.092	0.318
1929	0.157	0.099	0.117	0.336
1938	0.185	0.119	0.155	0.344
1950	0.210	0.174	0.166	0.323
1960	0.263	0.215	0.224	0.375
1970	0.307	0.263	0.264	0.416
1980	0.334	0.294	0.282	0.450
1990	0.367	0.328	0.308	0.489
2000	0.416	0.372	0.369	0.526
2007	0.460	0.411	0.403	0.589

Panel B: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	1.0	0.2	0.6	0.2
1880-1890	1.4	0.5	0.7	0.2
1890-1900	1.2	0.5	0.5	0.2
1900-1913	1.0	0.4	0.4	0.2
1913-1929	1.6	1.0	0.5	0.1
1929-1938	1.8	0.7	1.1	0.1
1938-1950	1.1	1.1	0.2	-0.2
1950-1960	2.2	0.7	1.0	0.5
1960-1970	1.5	0.7	0.5	0.3
1970-1980	0.9	0.4	0.2	0.3
1980-1990	0.9	0.4	0.3	0.3
1990-2000	1.3	0.4	0.6	0.2
2000-2007	1.4	0.5	0.4	0.5
1870-1913	1.1	0.4	0.5	0.2
1913-1950	1.5	0.9	0.5	0.0
1950-1970	1.9	0.7	0.8	0.4
1970-1990	0.9	0.4	0.3	0.3
1990-2007	1.3	0.4	0.5	0.4
1870-1913	1.1	0.4	0.5	0.2
1913-1970	1.6	0.8	0.6	0.2
1970-2007	1.1	0.4	0.4	0.3
1870-2007	1.3	0.6	0.5	0.2

Table 6 ***Human Development and its Dimensions: the OECD, 1870-2007***

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1880	0.192	0.091	0.182	0.429
1890	0.220	0.112	0.211	0.454
1900	0.246	0.131	0.237	0.485
1913	0.277	0.152	0.268	0.522
1929	0.334	0.210	0.314	0.563
1938	0.366	0.243	0.354	0.569
1950	0.417	0.319	0.387	0.586
1960	0.482	0.374	0.451	0.663
1970	0.541	0.412	0.513	0.748
1980	0.593	0.474	0.551	0.797
1990	0.658	0.544	0.622	0.841
2000	0.745	0.657	0.717	0.878
2007	0.809	0.776	0.760	0.898

Panel B: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.9	0.2	0.5	0.2
1880-1890	1.4	0.7	0.5	0.2
1890-1900	1.1	0.5	0.4	0.2
1900-1913	0.9	0.4	0.3	0.2
1913-1929	1.2	0.7	0.3	0.2
1929-1938	1.0	0.5	0.4	0.0
1938-1950	1.1	0.8	0.2	0.1
1950-1960	1.4	0.5	0.5	0.4
1960-1970	1.2	0.3	0.4	0.4
1970-1980	0.9	0.5	0.2	0.2
1980-1990	1.0	0.5	0.4	0.2
1990-2000	1.2	0.6	0.5	0.1
2000-2007	1.2	0.8	0.3	0.1
1870-1913	1.1	0.4	0.4	0.2
1913-1950	1.1	0.7	0.3	0.1
1950-1970	1.3	0.4	0.5	0.4
1970-1990	1.0	0.5	0.3	0.2
1990-2007	1.2	0.7	0.4	0.1
1870-1913	1.1	0.4	0.4	0.2
1913-1970	1.2	0.6	0.4	0.2
1970-2007	1.1	0.6	0.4	0.2
1870-2007	1.1	0.5	0.4	0.2

Table 7 ***Human Development and its Dimensions: the Rest, 1870-2007***

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.040	0.024	0.014	0.196
1880	0.044	0.025	0.017	0.201
1890	0.051	0.026	0.024	0.214
1900	0.057	0.029	0.027	0.228
1913	0.065	0.033	0.034	0.249
1929	0.094	0.063	0.051	0.263
1938	0.124	0.080	0.088	0.273
1950	0.148	0.131	0.100	0.247
1960	0.203	0.173	0.162	0.299
1970	0.249	0.227	0.201	0.338
1980	0.278	0.257	0.222	0.378
1990	0.315	0.290	0.252	0.427
2000	0.363	0.326	0.313	0.468
2007	0.405	0.354	0.347	0.541

Panel B: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.8	0.1	0.6	0.1
1880-1890	1.5	0.2	1.2	0.2
1890-1900	1.0	0.4	0.5	0.2
1900-1913	1.1	0.3	0.6	0.2
1913-1929	2.3	1.3	0.8	0.1
1929-1938	3.1	0.9	2.0	0.1
1938-1950	1.5	1.4	0.3	-0.3
1950-1960	3.2	0.9	1.6	0.6
1960-1970	2.0	0.9	0.7	0.4
1970-1980	1.1	0.4	0.3	0.4
1980-1990	1.2	0.4	0.4	0.4
1990-2000	1.4	0.4	0.7	0.3
2000-2007	1.6	0.4	0.5	0.7
1870-1913	1.1	0.3	0.7	0.2
1913-1950	2.2	1.2	1.0	0.0
1950-1970	2.6	0.9	1.2	0.5
1970-1990	1.2	0.4	0.4	0.4
1990-2007	1.5	0.4	0.6	0.5
1870-1913	1.1	0.3	0.7	0.2
1913-1970	2.3	1.1	1.0	0.2
1970-2007	1.3	0.4	0.5	0.4
1870-2007	1.7	0.7	0.8	0.2

Table 8 *Catching up in the Rest, 1870-2007*

HIHD Catching-up Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	-0.1	-0.1	0.1	-0.1
1880-1890	0.2	-0.5	0.7	0.0
1890-1900	-0.1	-0.2	0.1	0.0
1900-1913	0.2	-0.1	0.2	0.0
1913-1929	1.1	0.7	0.5	0.0
1929-1938	2.0	0.4	1.6	0.1
1938-1950	0.4	0.6	0.1	-0.4
1950-1960	1.7	0.4	1.1	0.2
1960-1970	0.9	0.6	0.3	0.0
1970-1980	0.2	-0.1	0.1	0.2
1980-1990	0.2	0.0	0.0	0.2
1990-2000	0.2	-0.2	0.2	0.2
2000-2007	0.4	-0.4	0.2	0.6
1870-1913	0.1	-0.2	0.3	0.0
1913-1950	1.1	0.6	0.6	-0.1
1950-1970	1.3	0.5	0.7	0.1
1970-1990	0.2	-0.1	0.1	0.2
1990-2007	0.3	-0.3	0.2	0.3
1870-1913	0.1	-0.2	0.3	0.0
1913-1970	1.2	0.5	0.7	0.0
1970-2007	0.2	-0.2	0.1	0.3
1870-2007	0.6	0.1	0.4	0.0

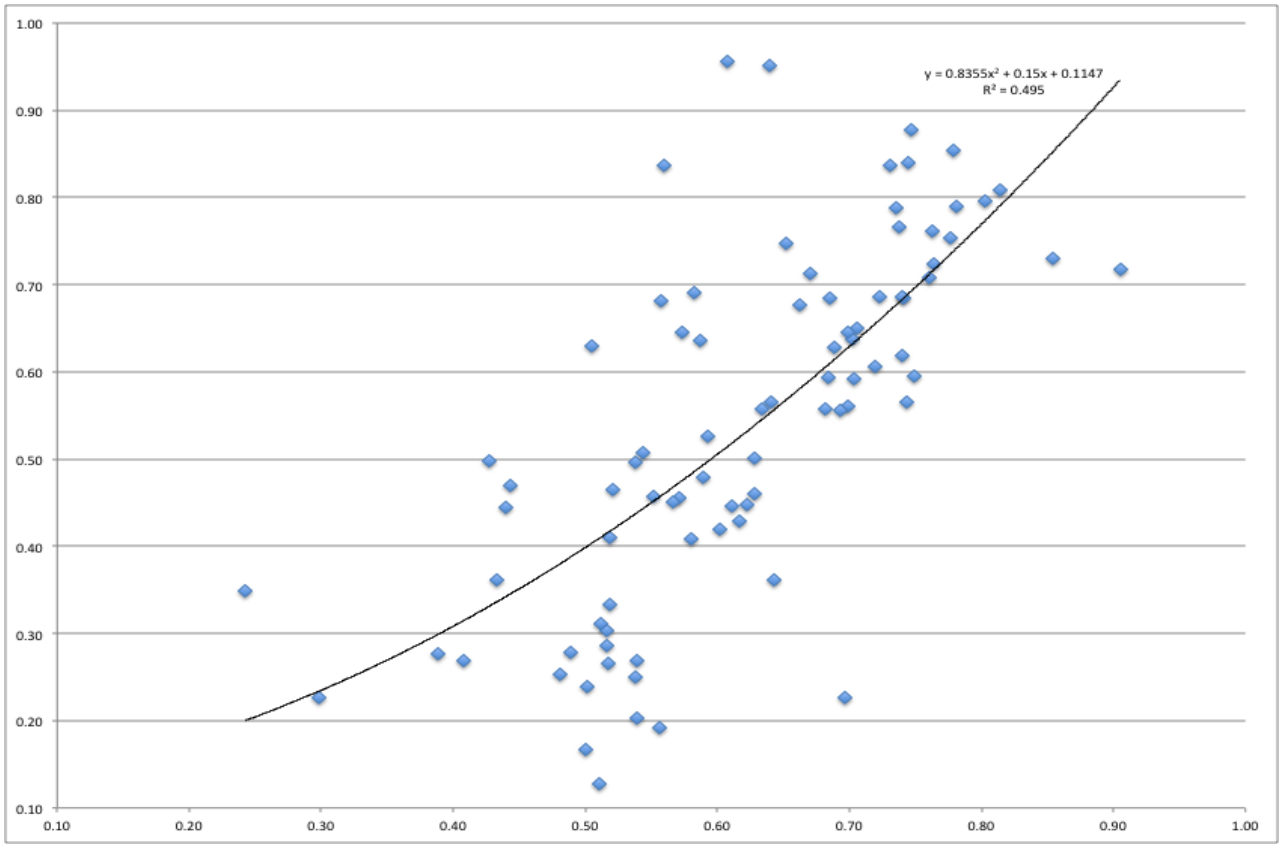

Figure 1. Cognitive skills (Hanuskek and Kimko 1990) [normalized] (vertical axis) versus gross enrolment rates (horizontal axis), 1960-1990

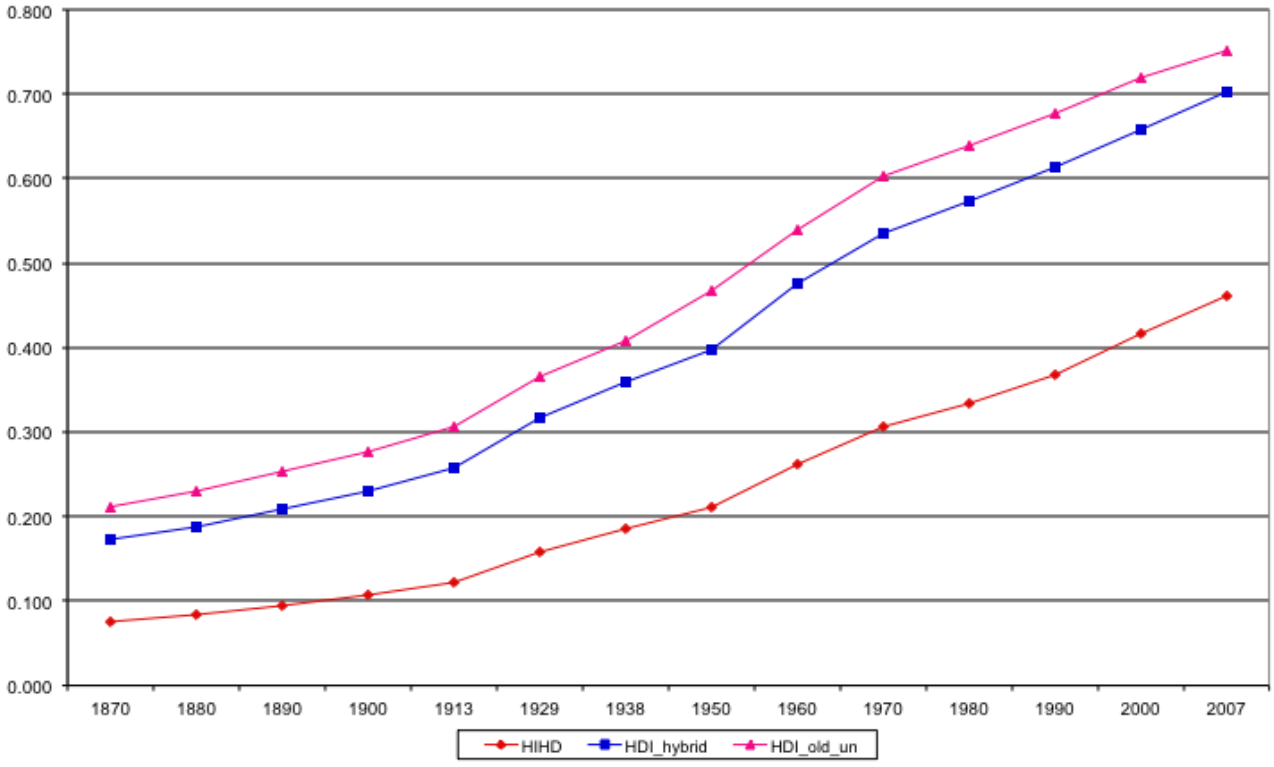

Figure 2 World Human Development: HIHD and 'hybrid' and 'old' HDI, 1870-2007

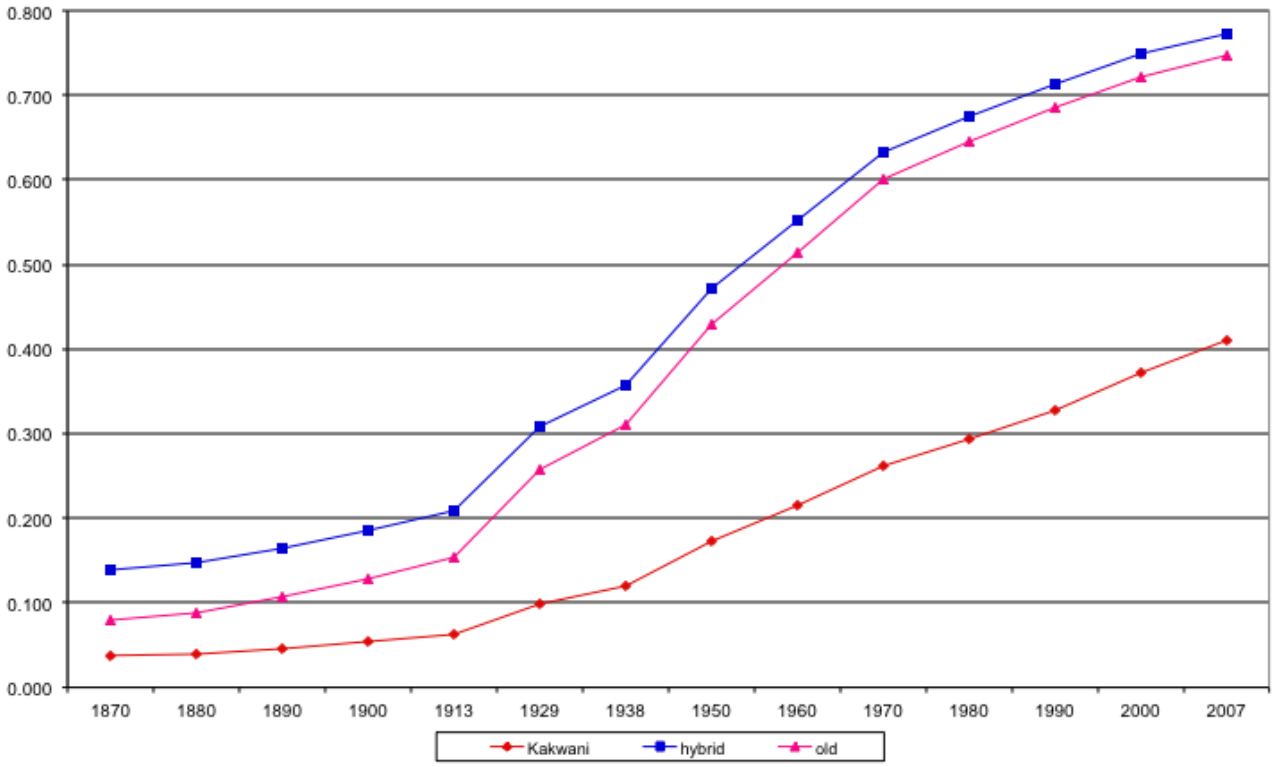

Figure 3 World Life Expectancy: Kakwani, 'hybrid' and 'old' UNDP indices, 1870-2007

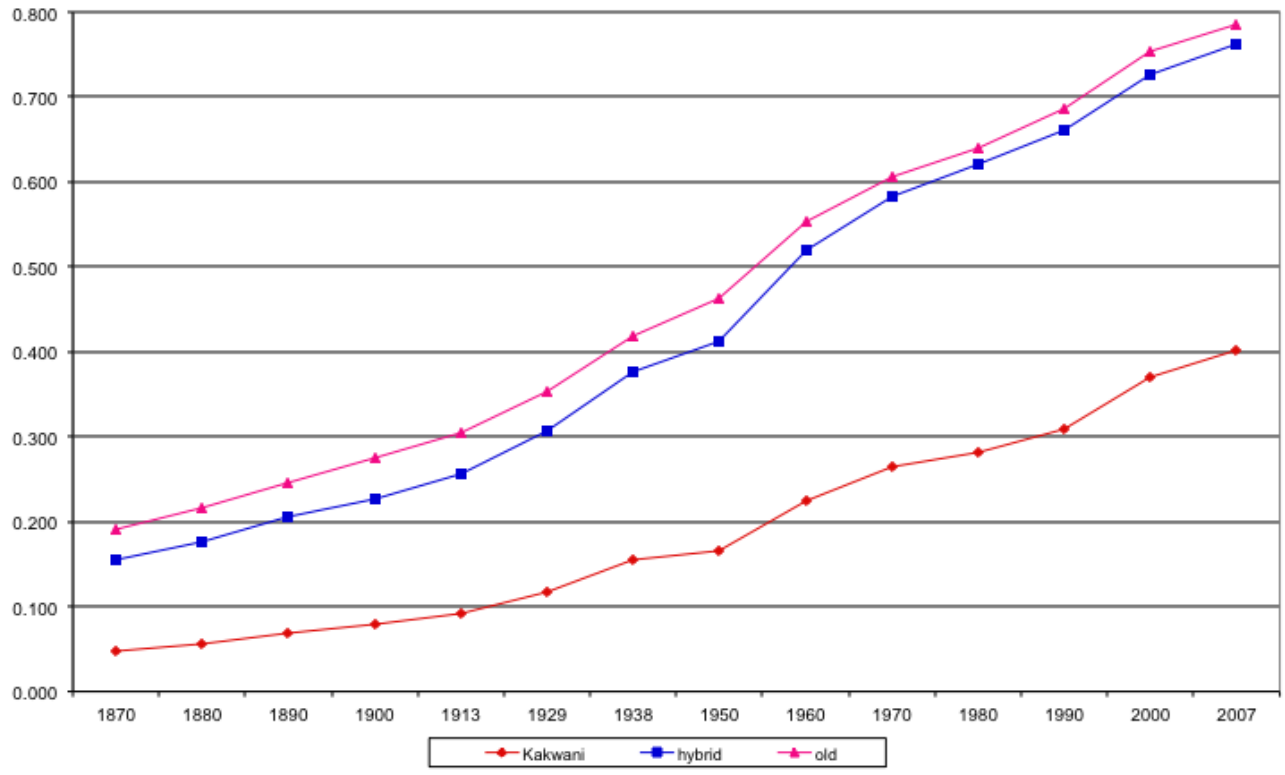

Figure 4 World Education: Kakwani, 'hybrid' and 'old' UNDP indices, 1870-2007

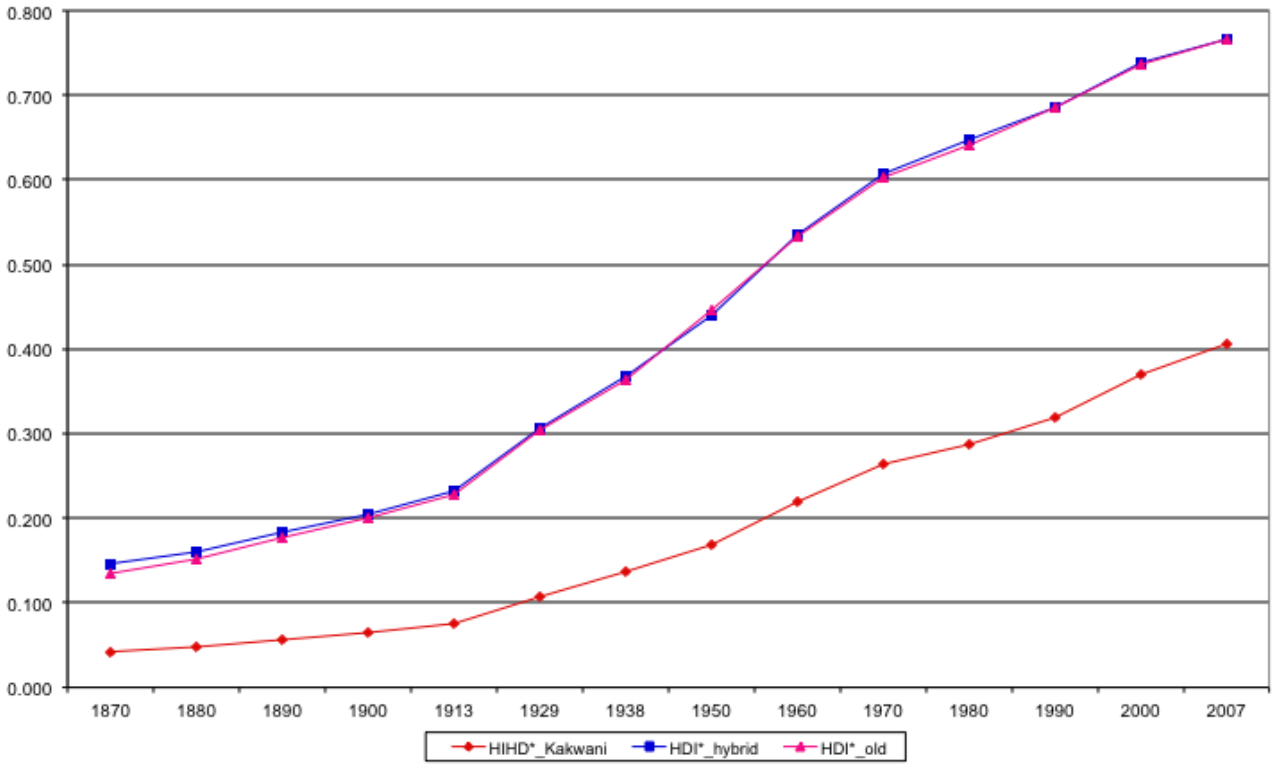

Figure 5 World Human Development* (excluding Per Capita Income): HIHD*, 'hybrid' and 'old' HDI*, 1870-2007

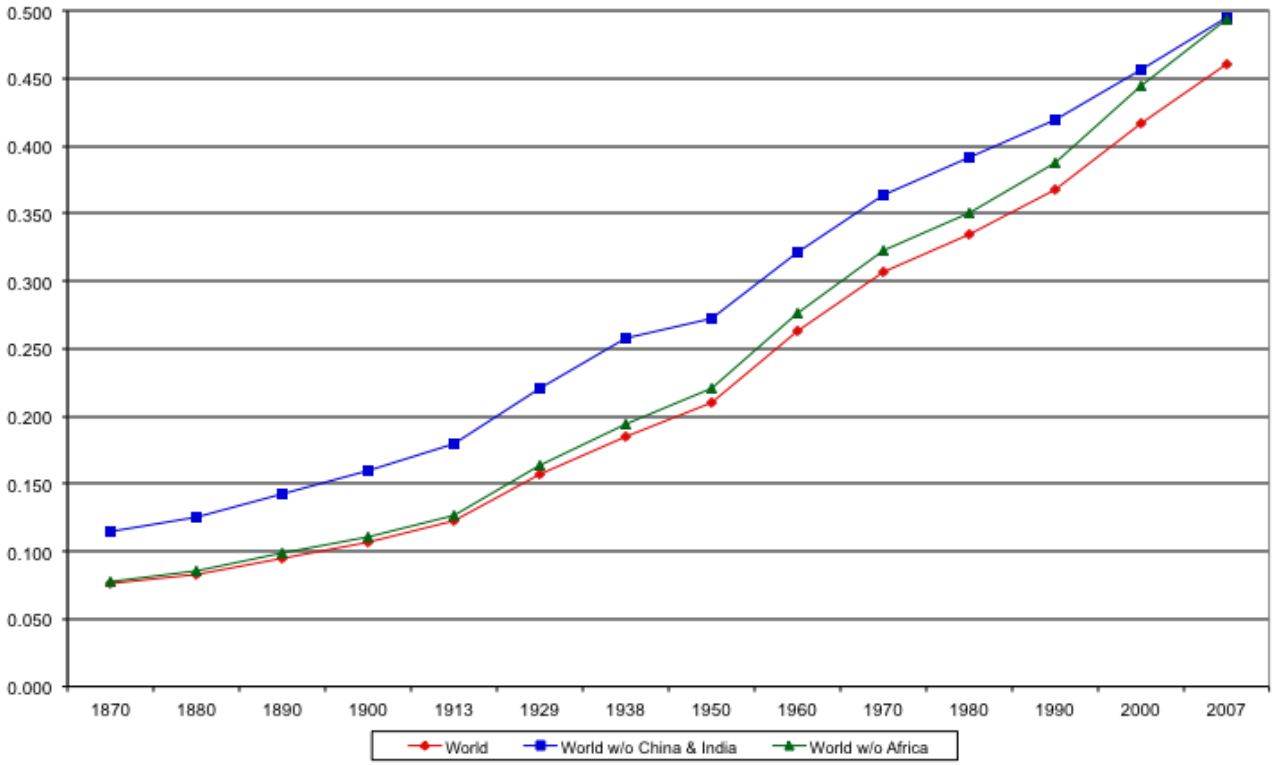

Figure 6 Human Development (HIHD) in the World and the World excluding China and India and Africa, 1870-2007

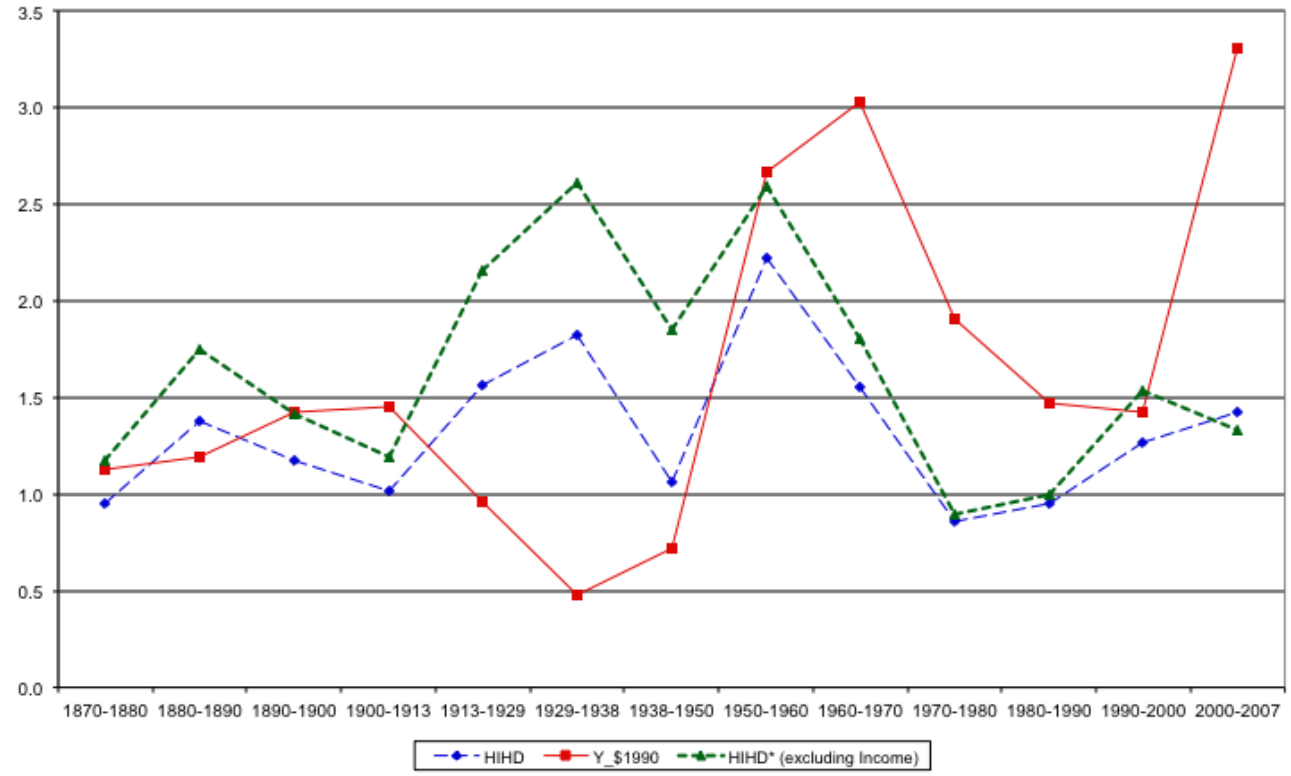

Figure 7 Growth of World Real GDP per Head and Human Development, HIHD and HIHD* (with and without income) (%)

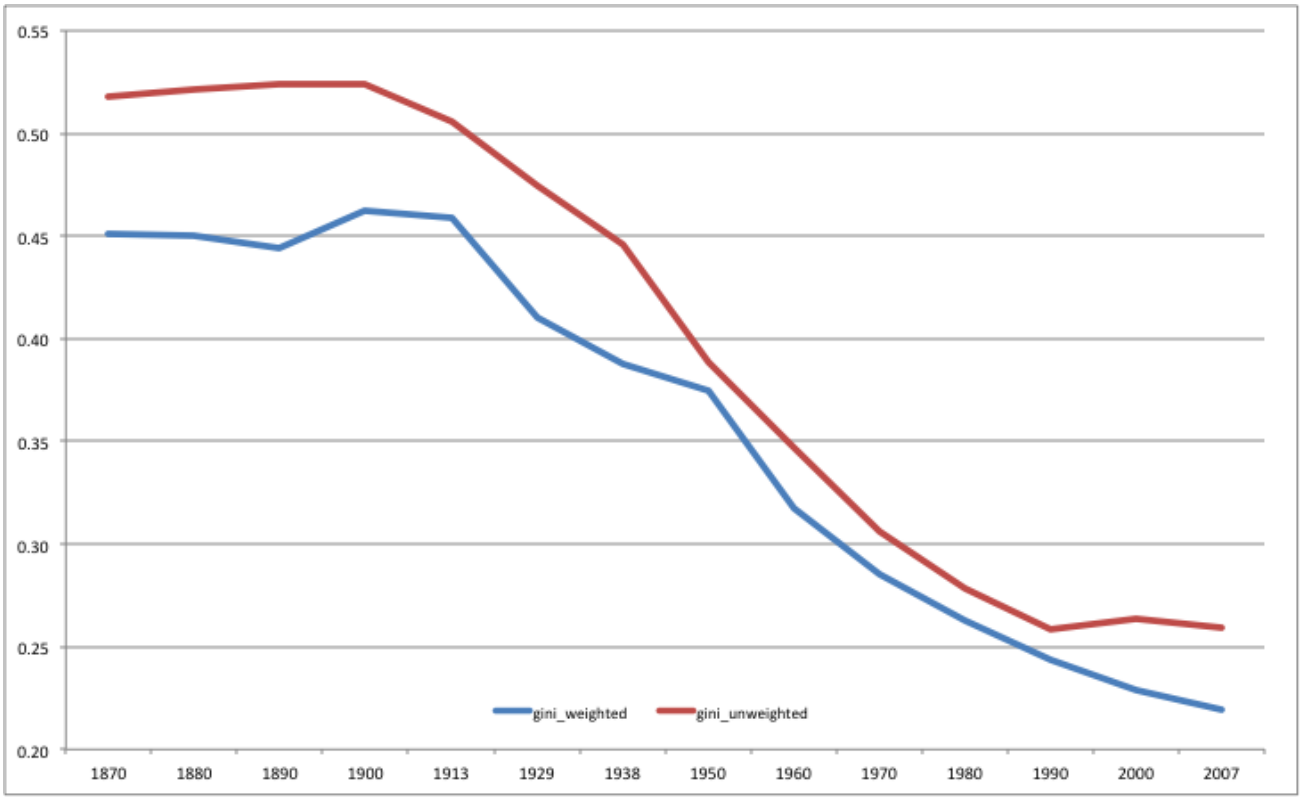

Figure 8 Human Development Inequality: Population-weighted and Unweighted Gini, 1870-2007

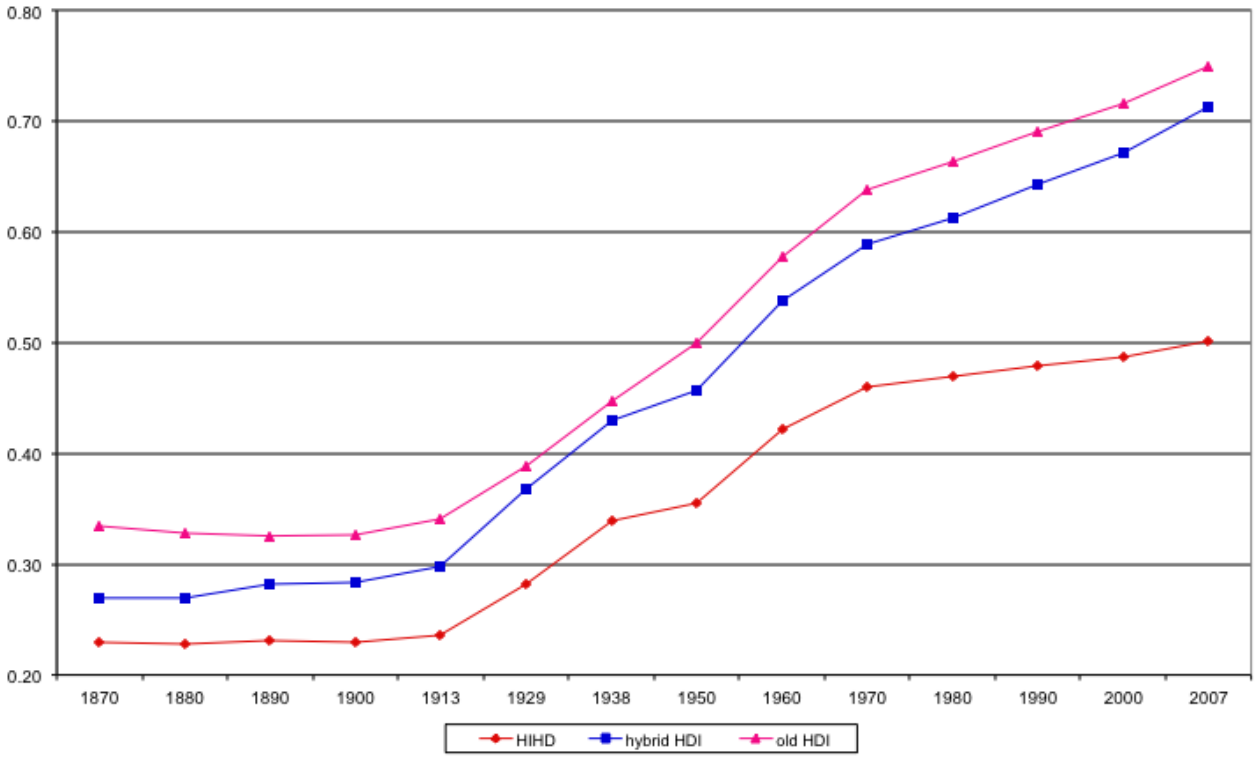

Figure 9 Human Development in the *Rest* as a share of *OECD*: HIHD, 'hybrid' and 'old' HDI, 1870-2007

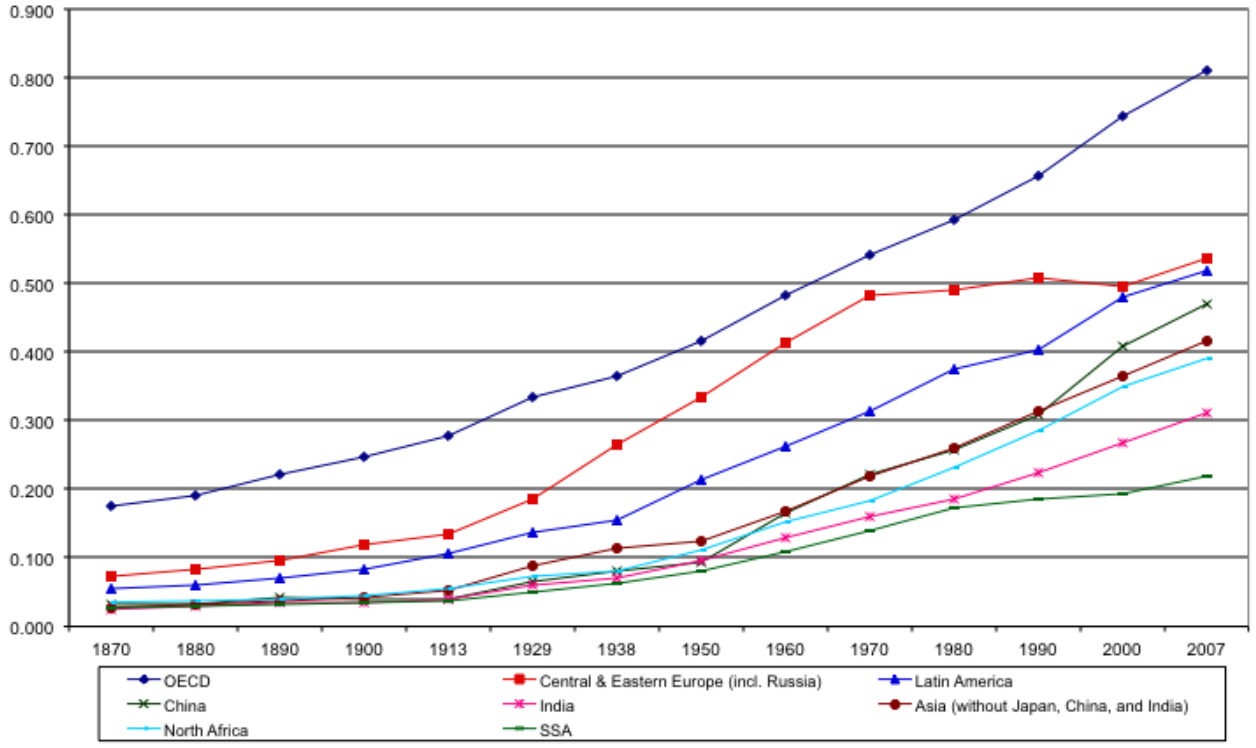

Figure 10 HIHD across World Regions, 1870-2007

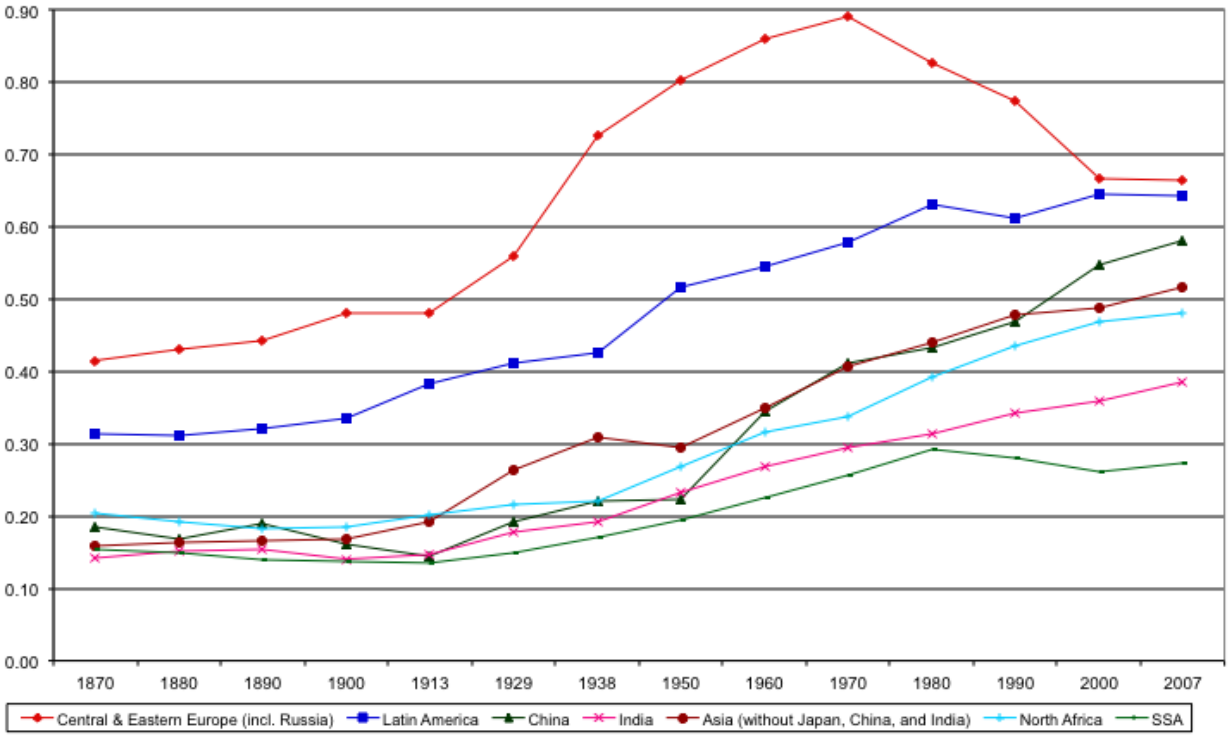

Figure 11 Relative HIHD across Developing Regions, 1870-2007 (OECD = 1)

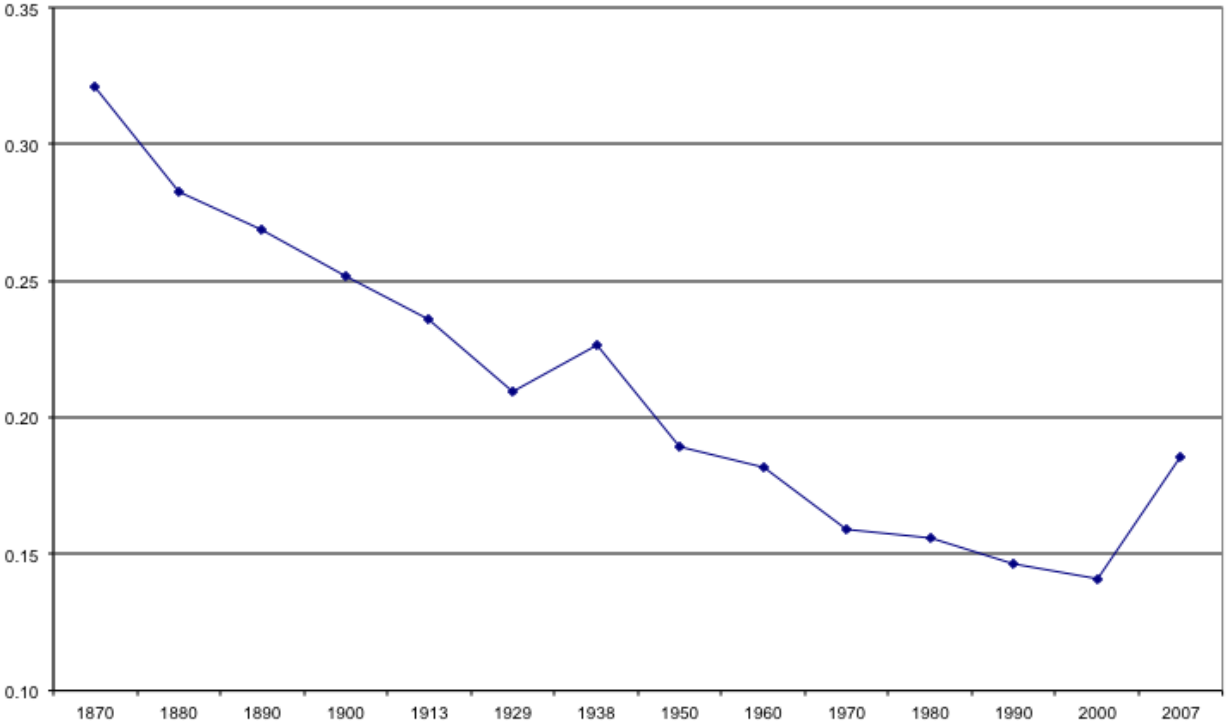

Figure 12 Relative Real GDP per Head in the Rest, 1870-2007 (OECD = 1)

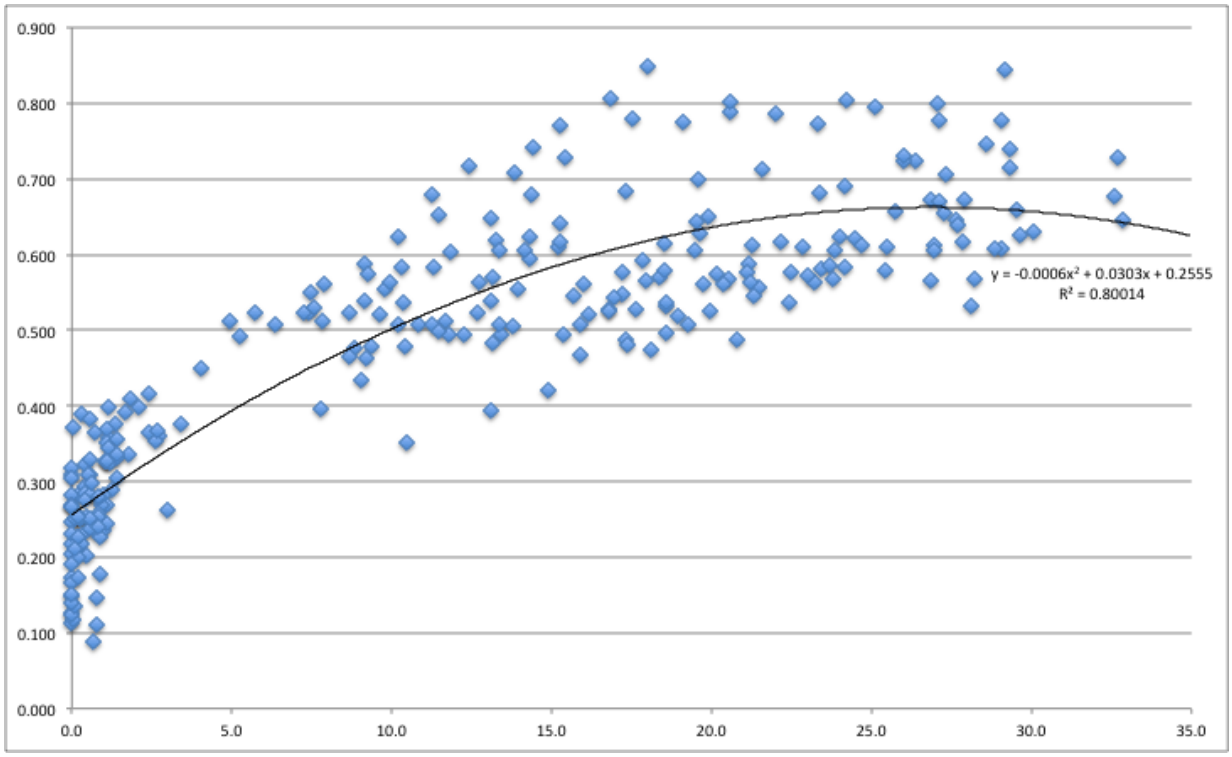

Figure 13. Human Development (vertical axis) and Social Transfers (% GDP) (horizontal axis) for a group of OECD countries, 1880-2000

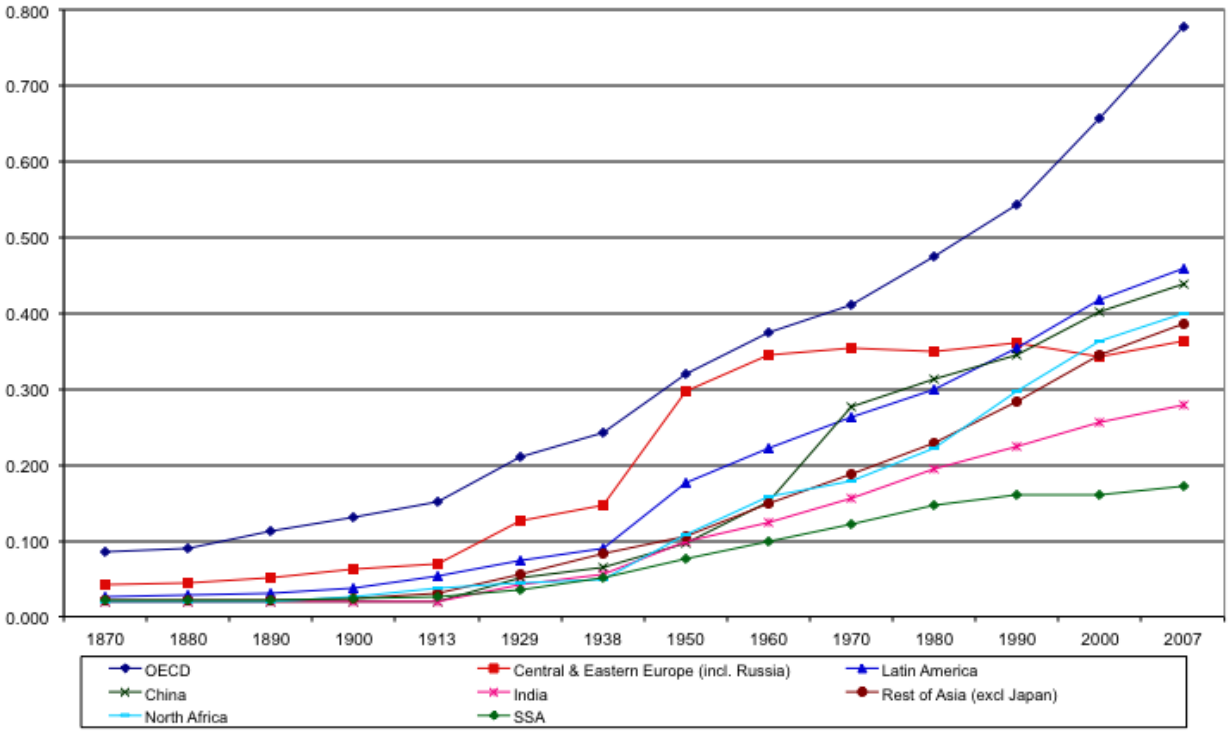

Figure 14 Kakwani Indices of Life Expectancy in World Regions, 1870-2007

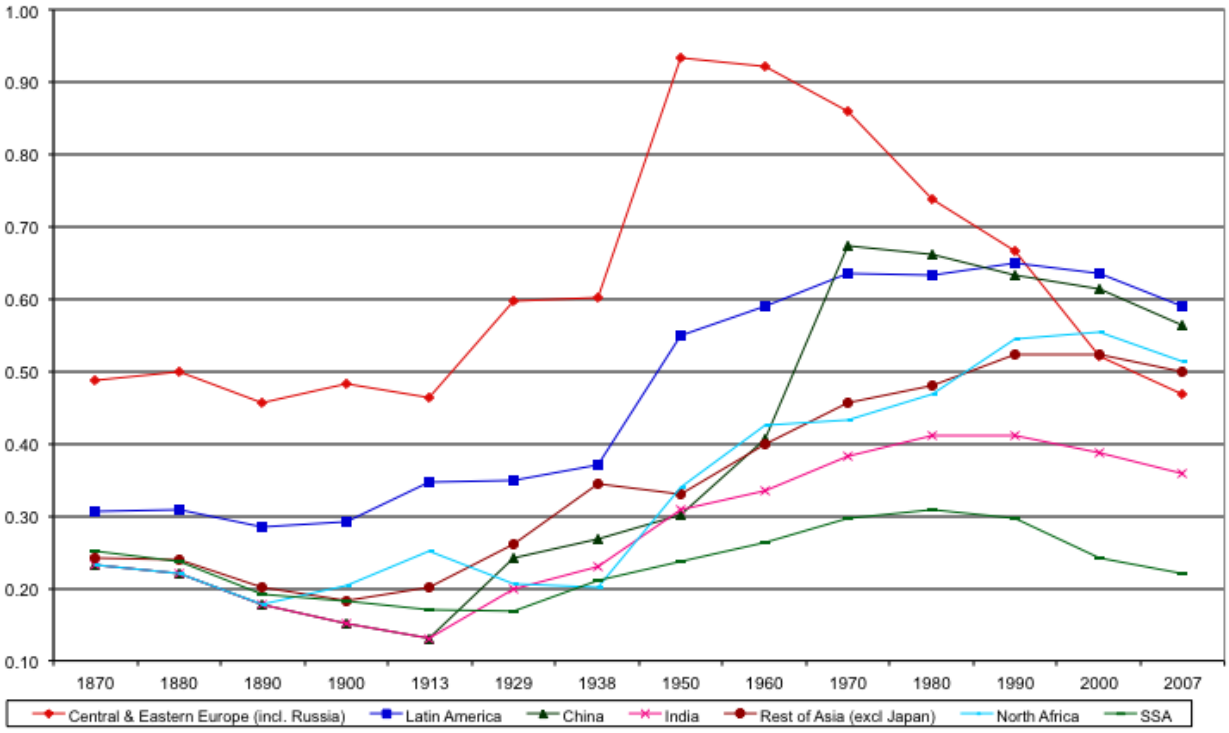

Figure 15 Life Expectancy Kakwani Indices in World Regions 1870-2007 (*OECD* = 1)

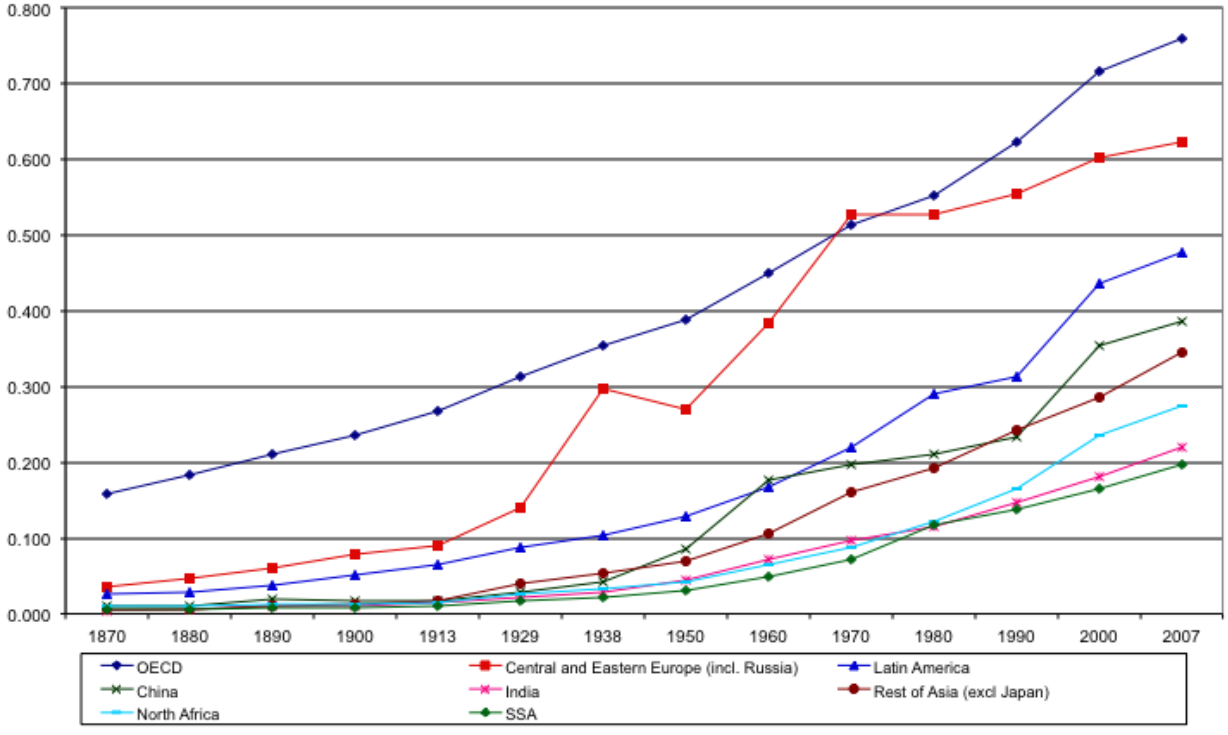

Figure 16 Kakwani Indices of Education in World Regions, 1870-2007

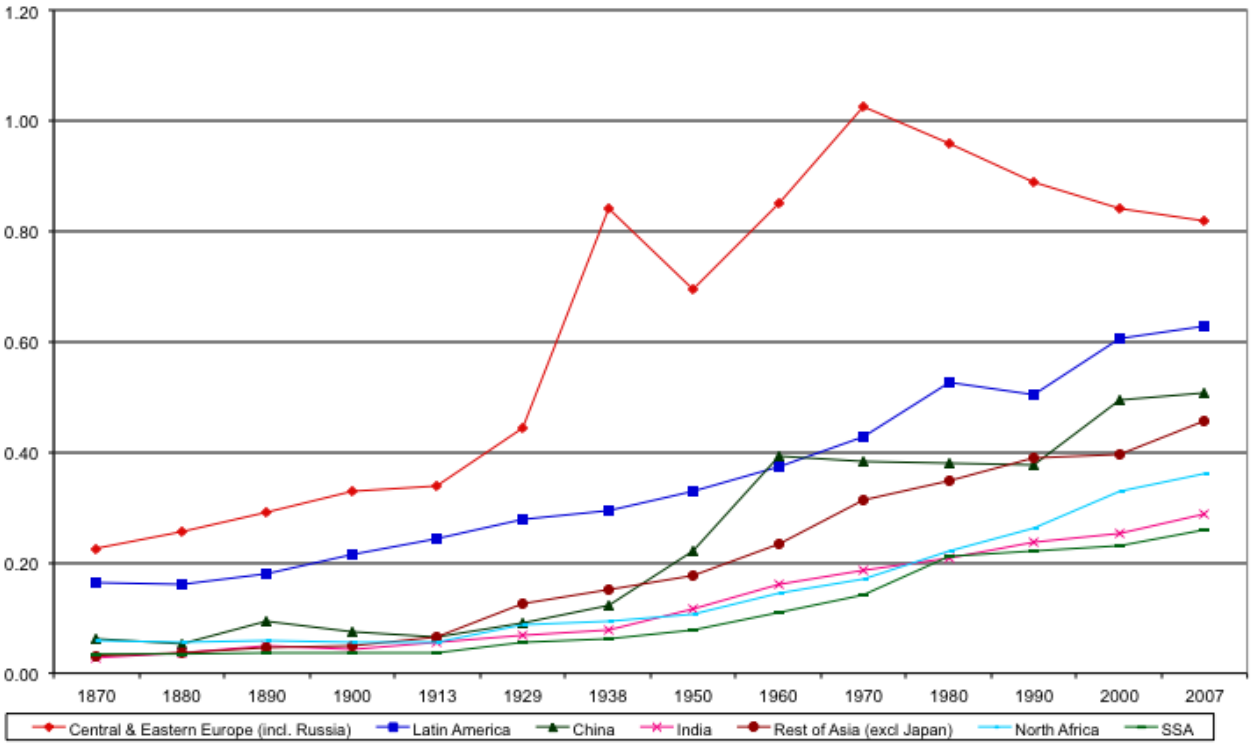

Figure 17 Education Kakwani Indices in World Regions 1870-2007 (*OECD* = 1)

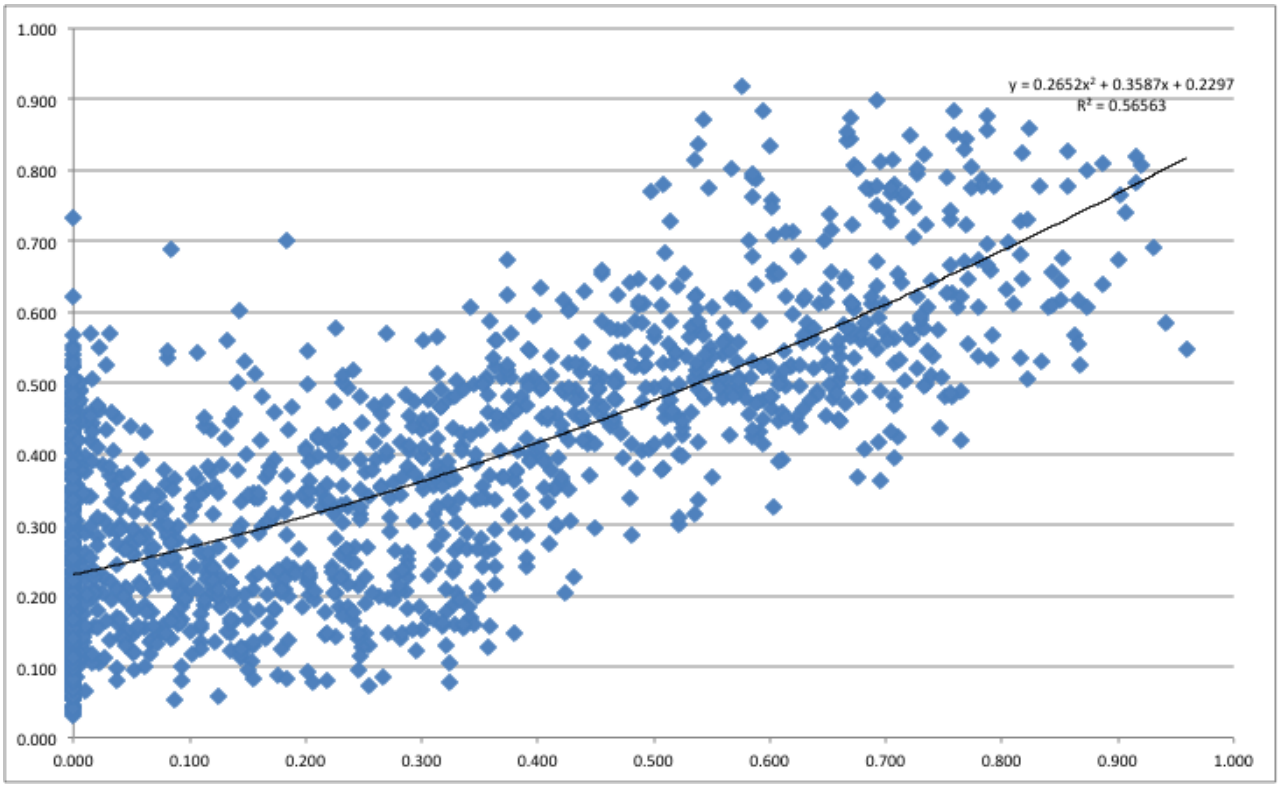

Figure 18. Human Development (vertical axis) and Democratization (horizontal axis) in the World, 1950-2007

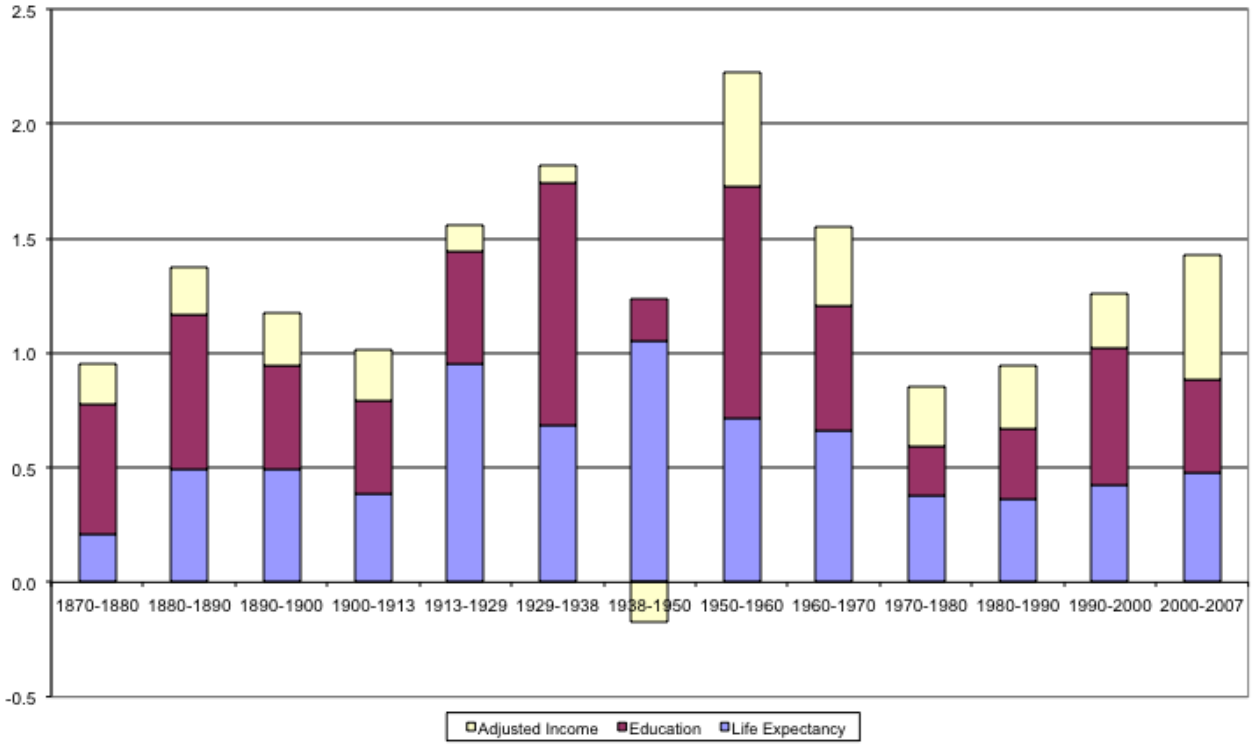

Figure 19 HIHD Growth and its Decomposition in the World, 1870-2007 (%)

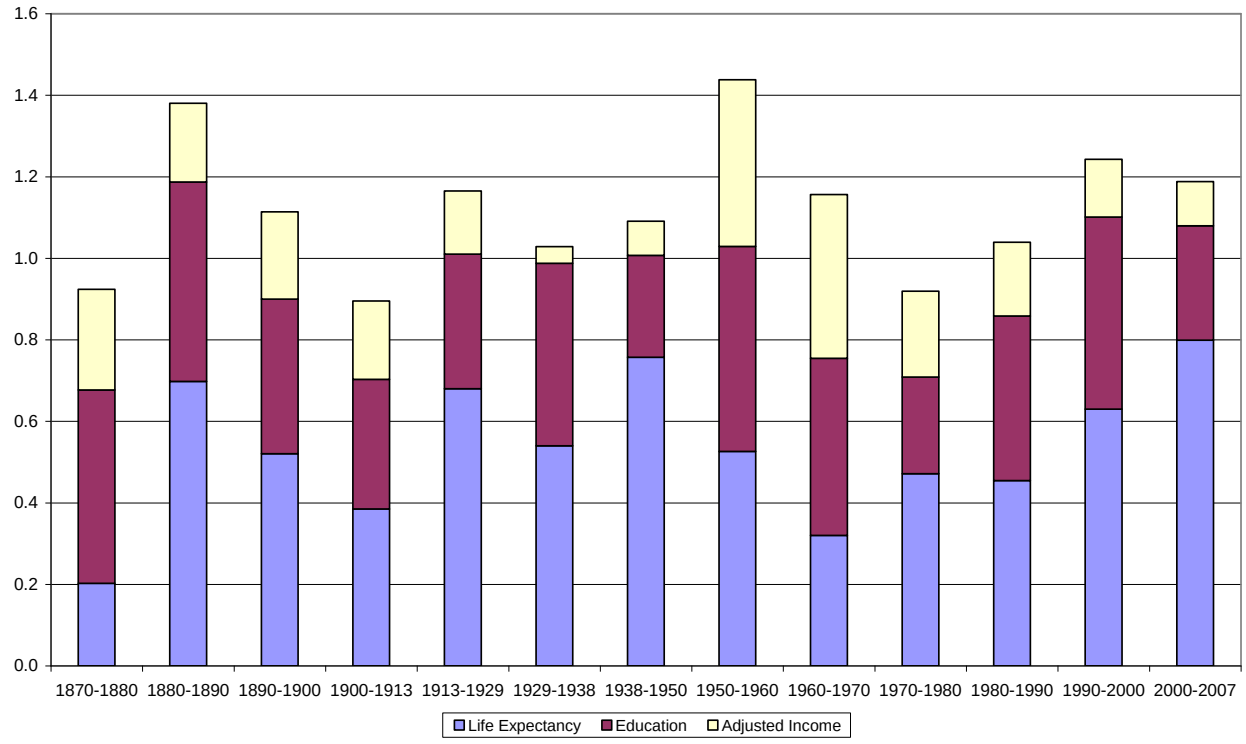

Figure 20 HIHD Growth and its Decomposition in *OECD*, 1870-2007 (%)

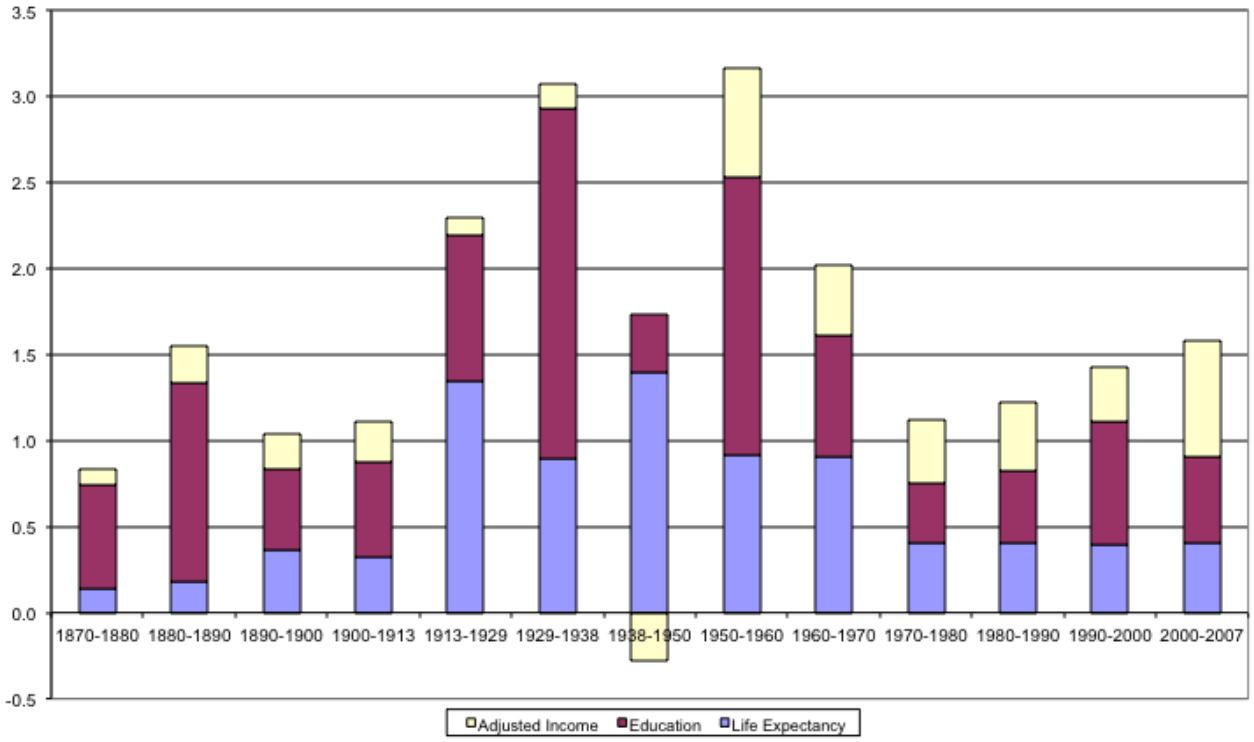

Figure 21 HIHD Growth and its Decomposition in the *Rest*, 1870-2007 (%)

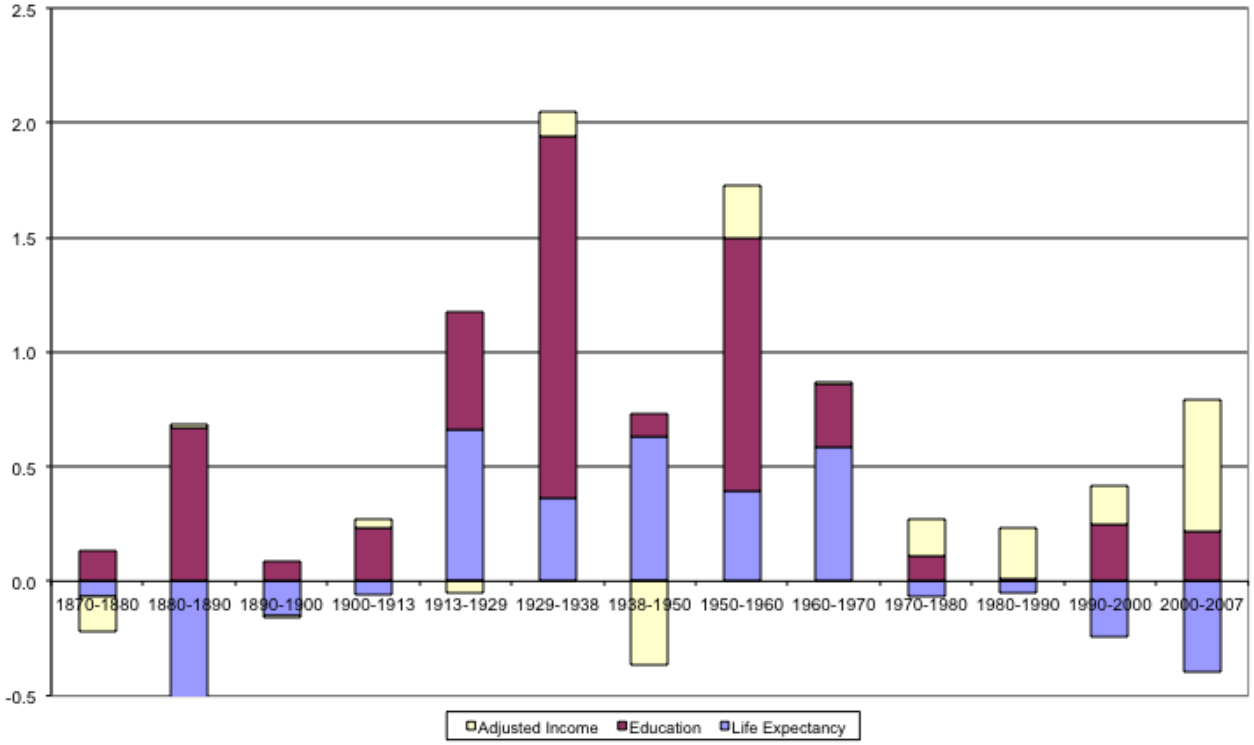

Figure 22 HIHD Catching-up with OECD in the *Rest*, 1870-2007 (%)

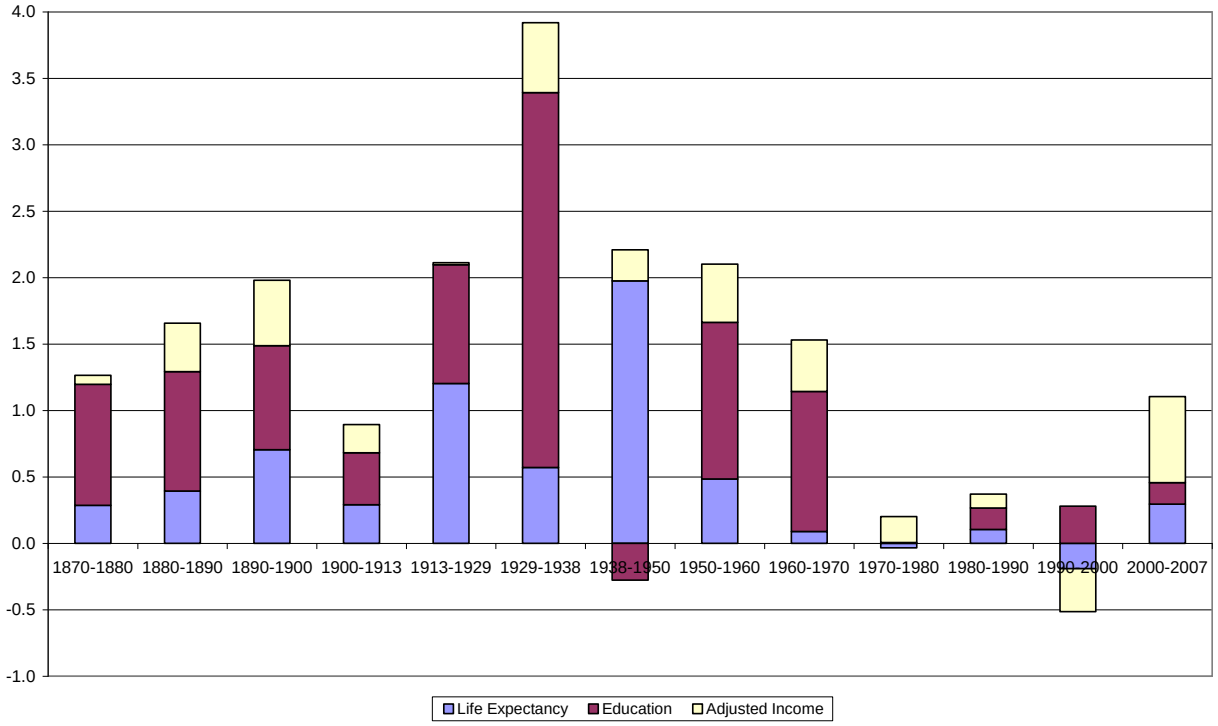

Figure 23 HIHD Growth and its Decomposition in Central and Eastern Europe (including Russia), 1870-2007 (%)

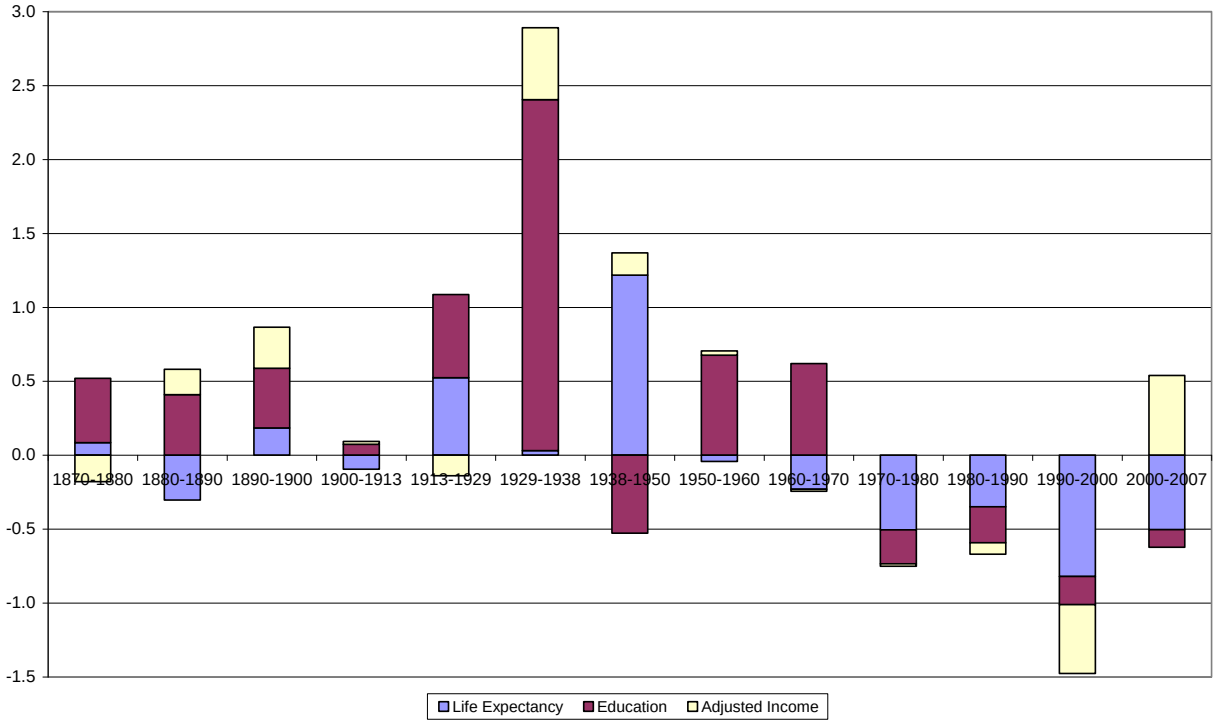

Figure 24 HIHD Catching-up with *OECD* in Central and Eastern Europe (including Russia), 1870-2007 (%)

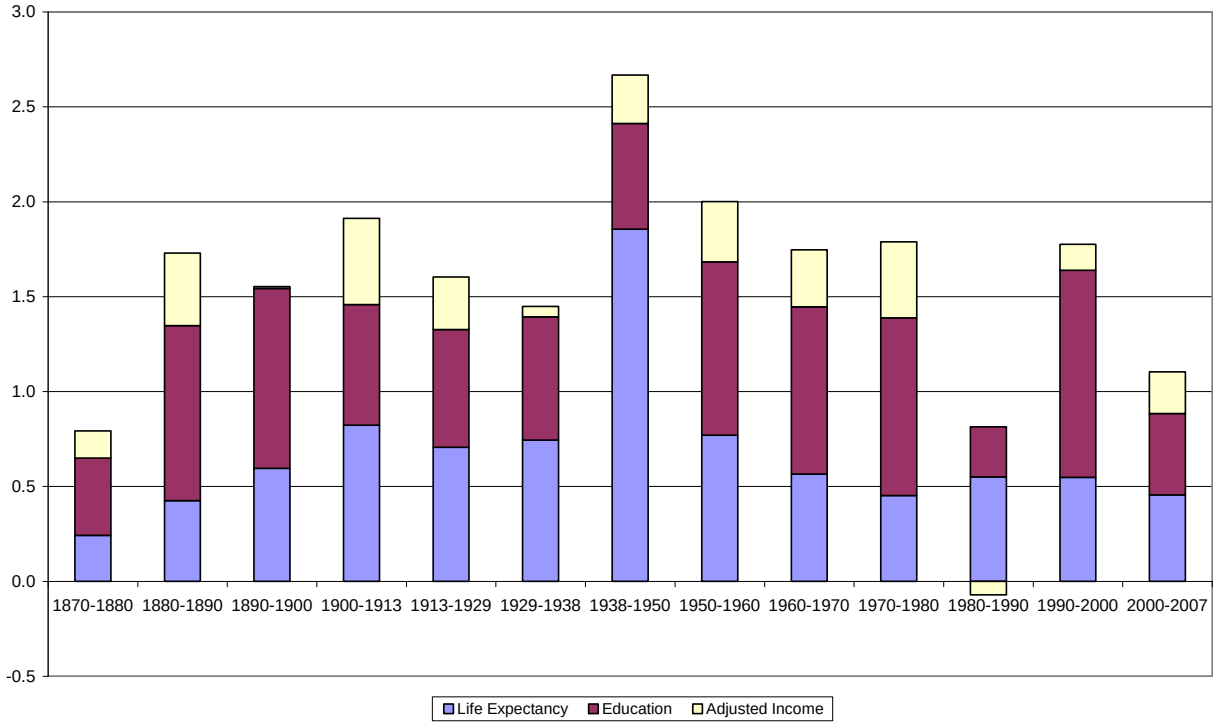

Figure 25 HIHD Growth and its Decomposition in Latin America, 1870-2007 (%)

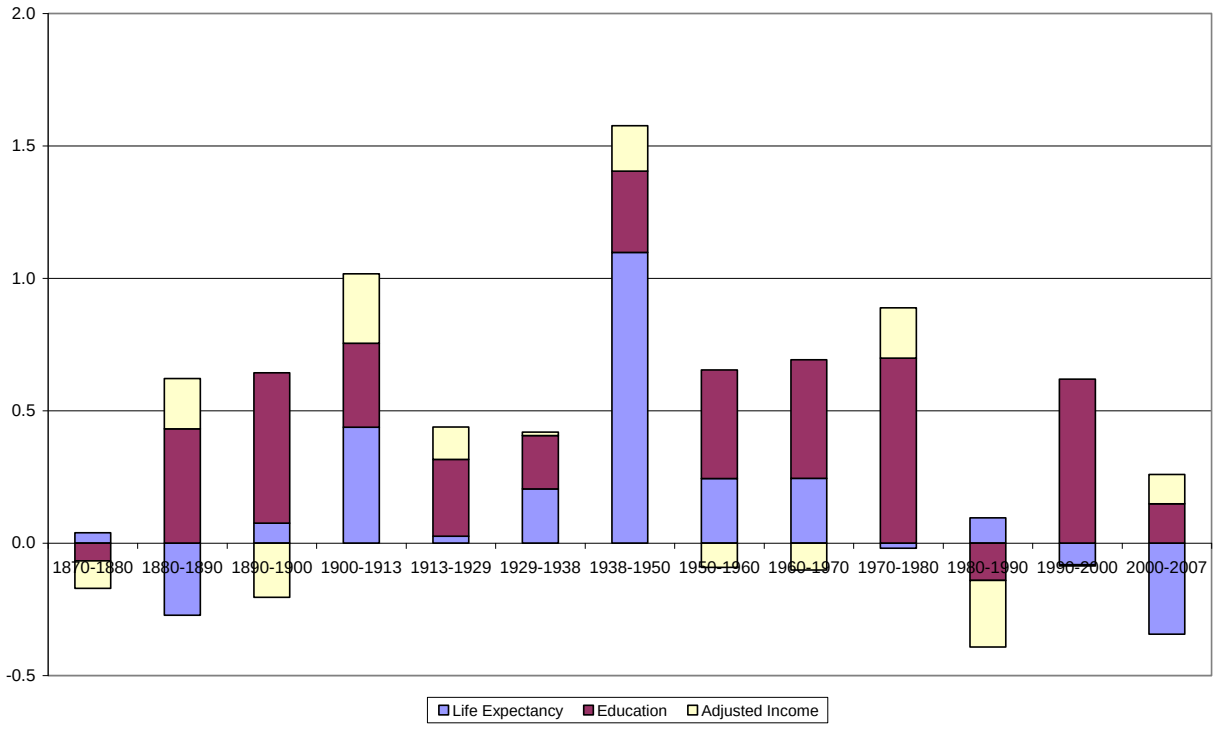

Figure 26 HIHD Catching-up with *OECD* in Latin America, 1870-2007 (%)

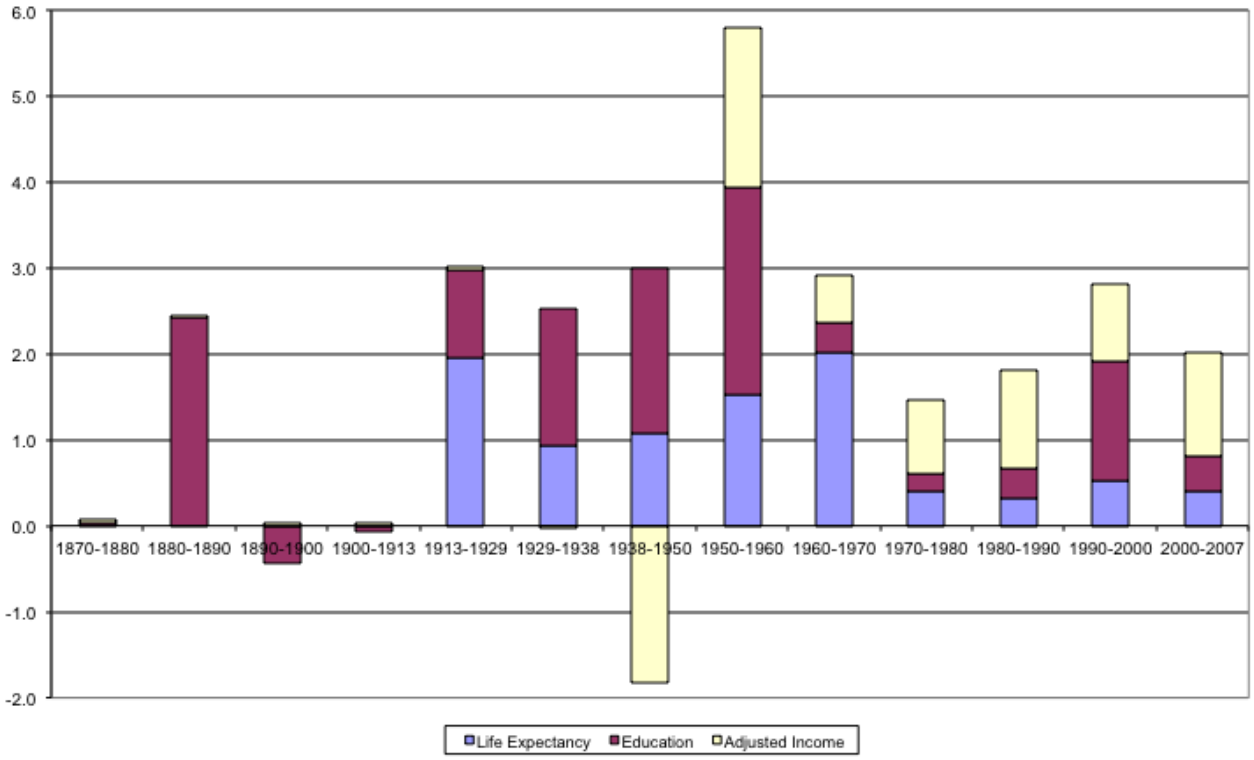

Figure 27 HIHD Growth and its Decomposition in China, 1870-2007 (%)

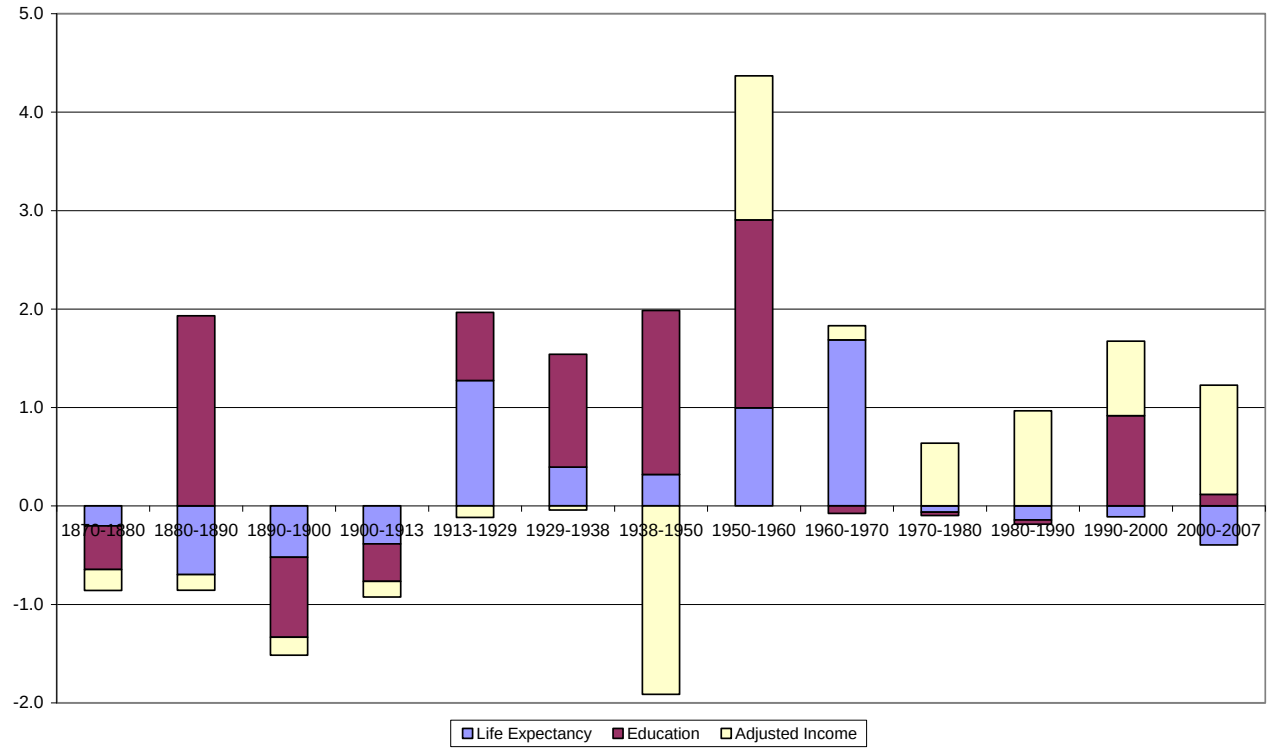

Figure 28 HIHD Catching-up with *OECD* in China, 1870-2007 (%)

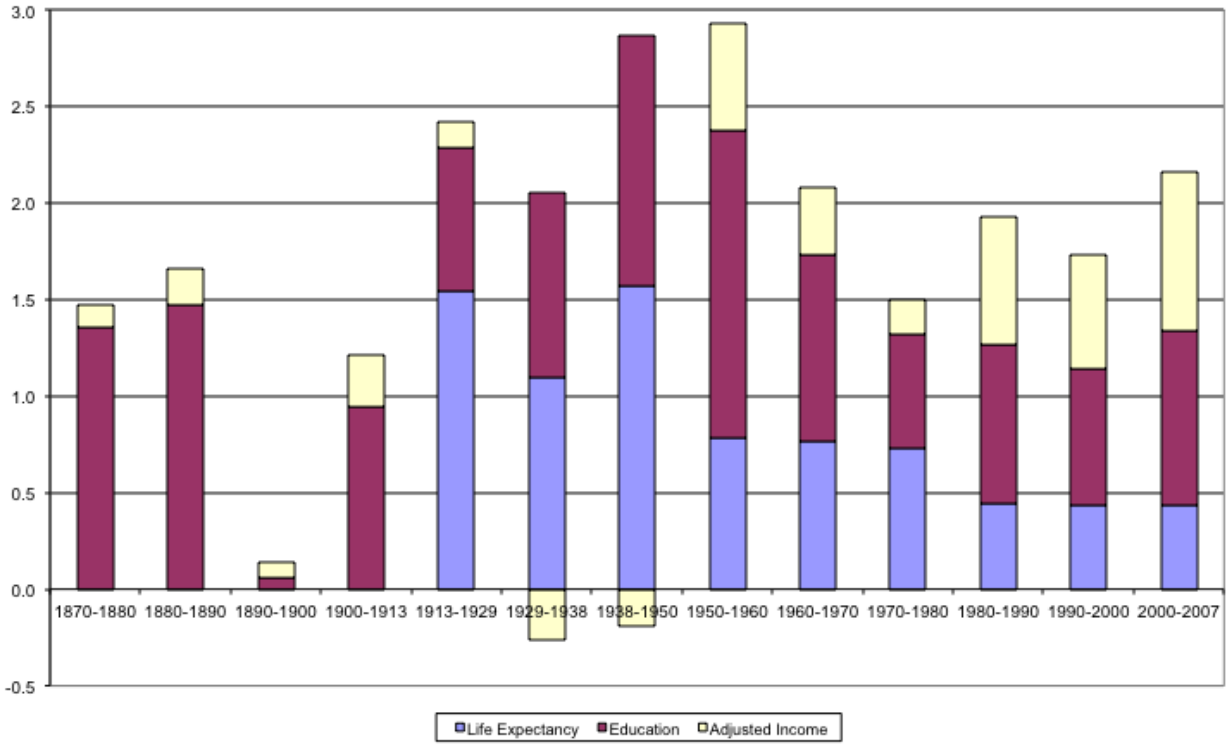

Figure 29 HIHD Growth and its Decomposition in India, 1870-2007 (%)

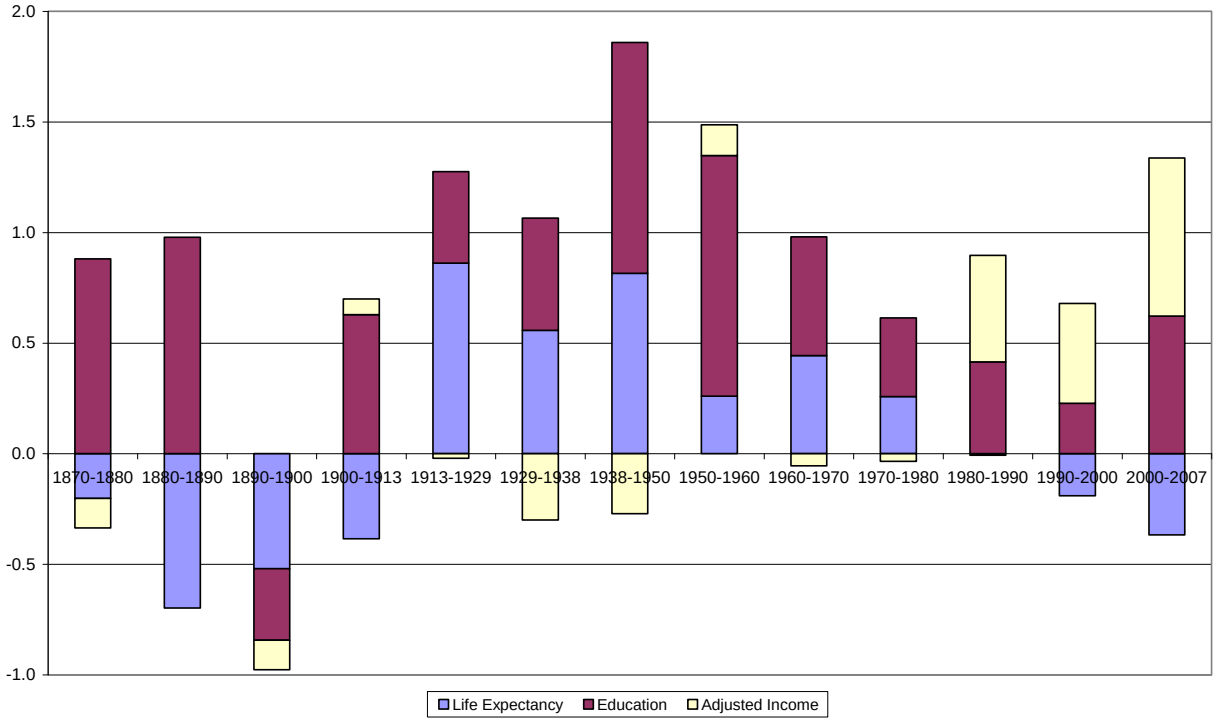

Figure 30 HIHD Catching-up with *OECD* in India, 1870-2007 (%)

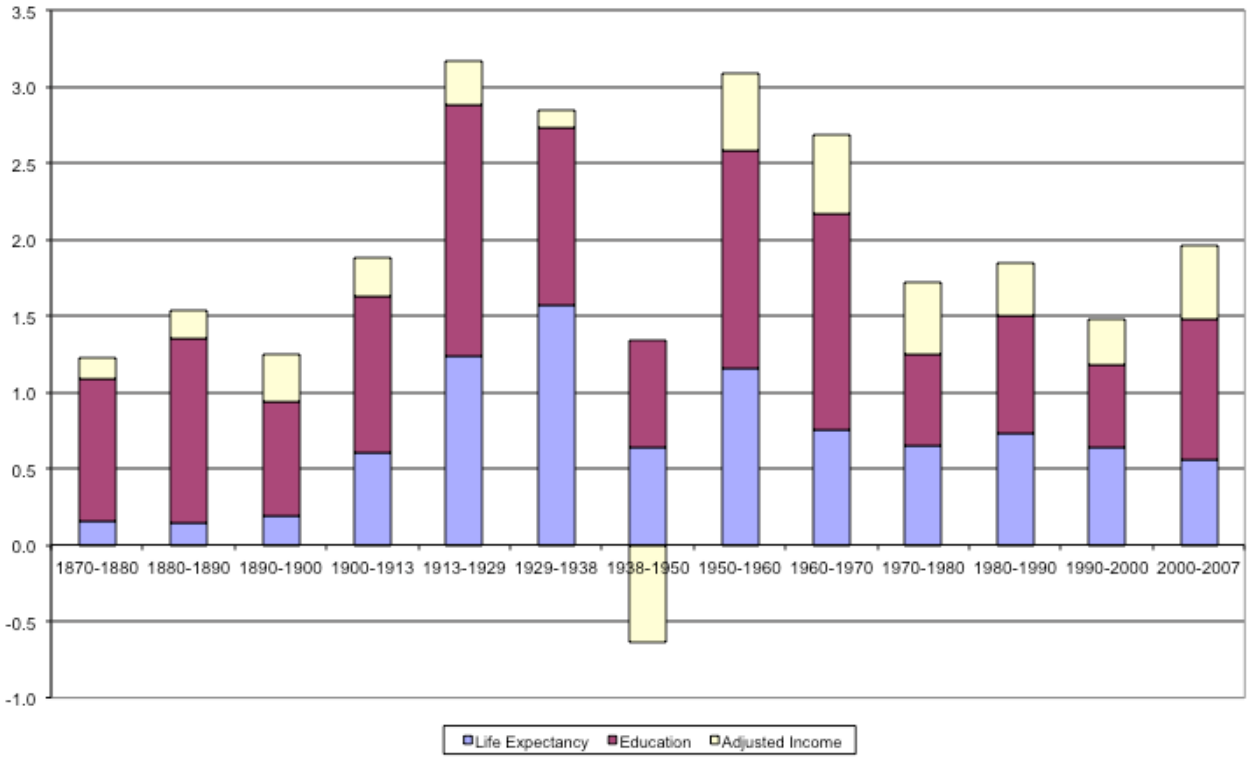

Figure 31 HIHD Growth and its Decomposition in the Rest of Asia (excl. Japan, China, and India), 1870-2007 (%)

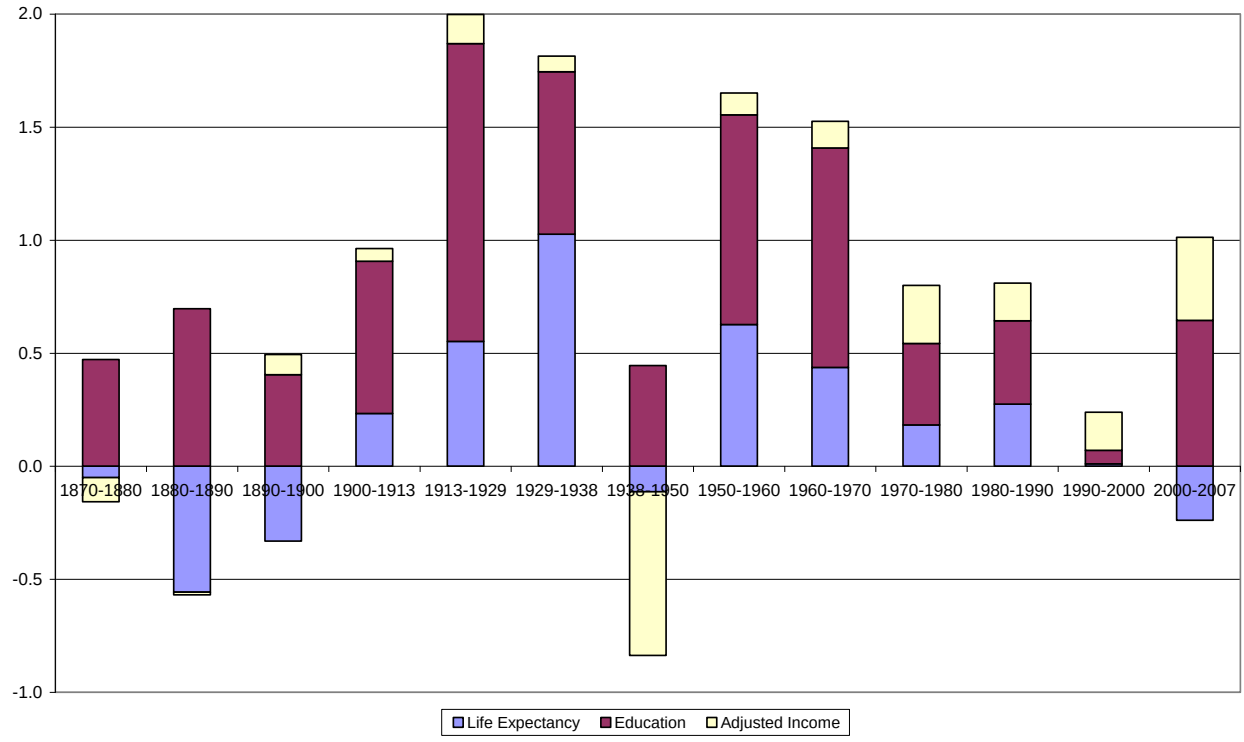

Figure 32 HIHD Catching-up with *OECD* in the Rest of Asia (excl. Japan, China, and India), 1870-2007 (%)

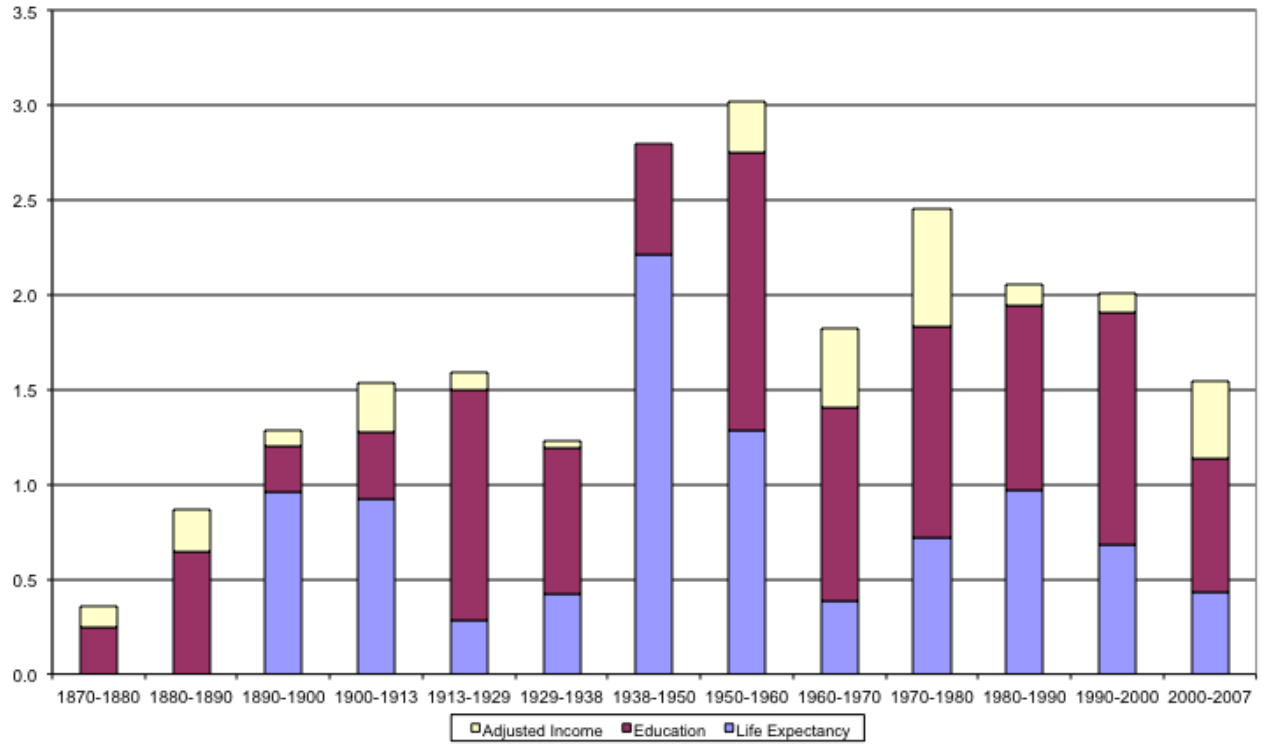

Figure 33 HIHD Growth and its Decomposition in North Africa, 1870-2007 (%)

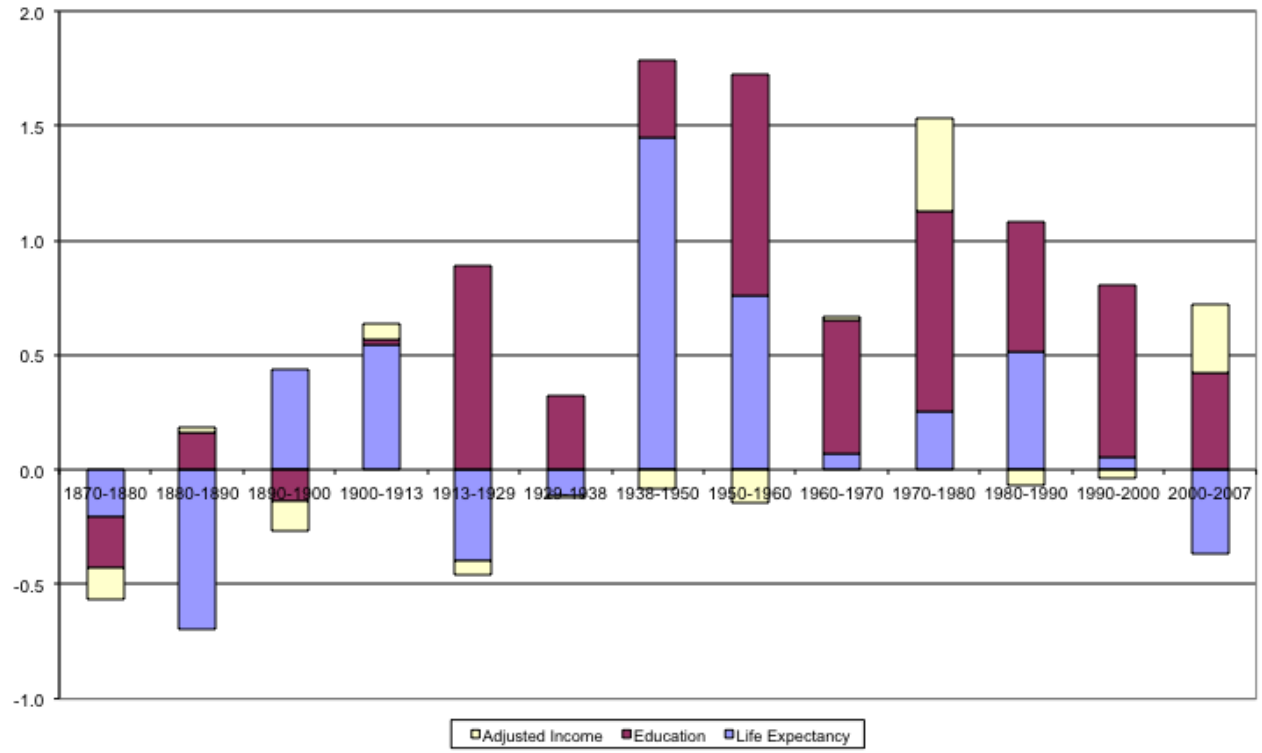

Figure 34 HIHD Catching-up with *OECD* in North Africa, 1870-2007 (%)

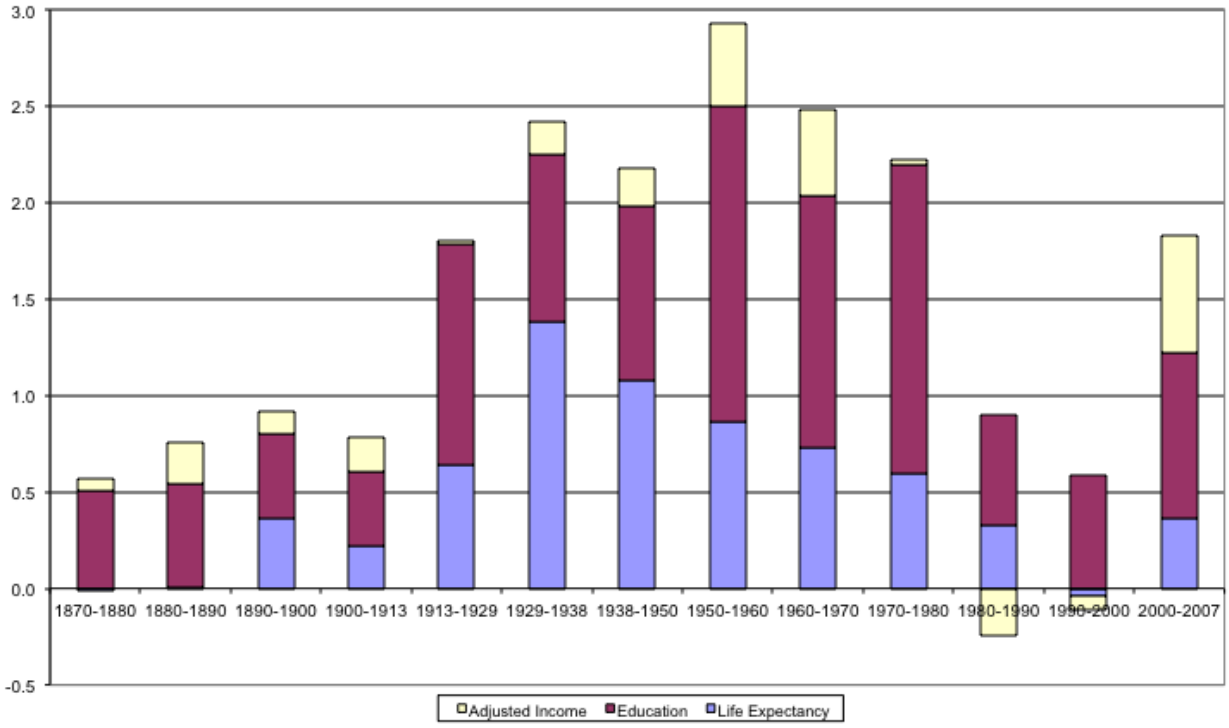

Figure 35 HIHD Growth and its Decomposition in Sub-Saharan Africa, 1870-2007 (%)

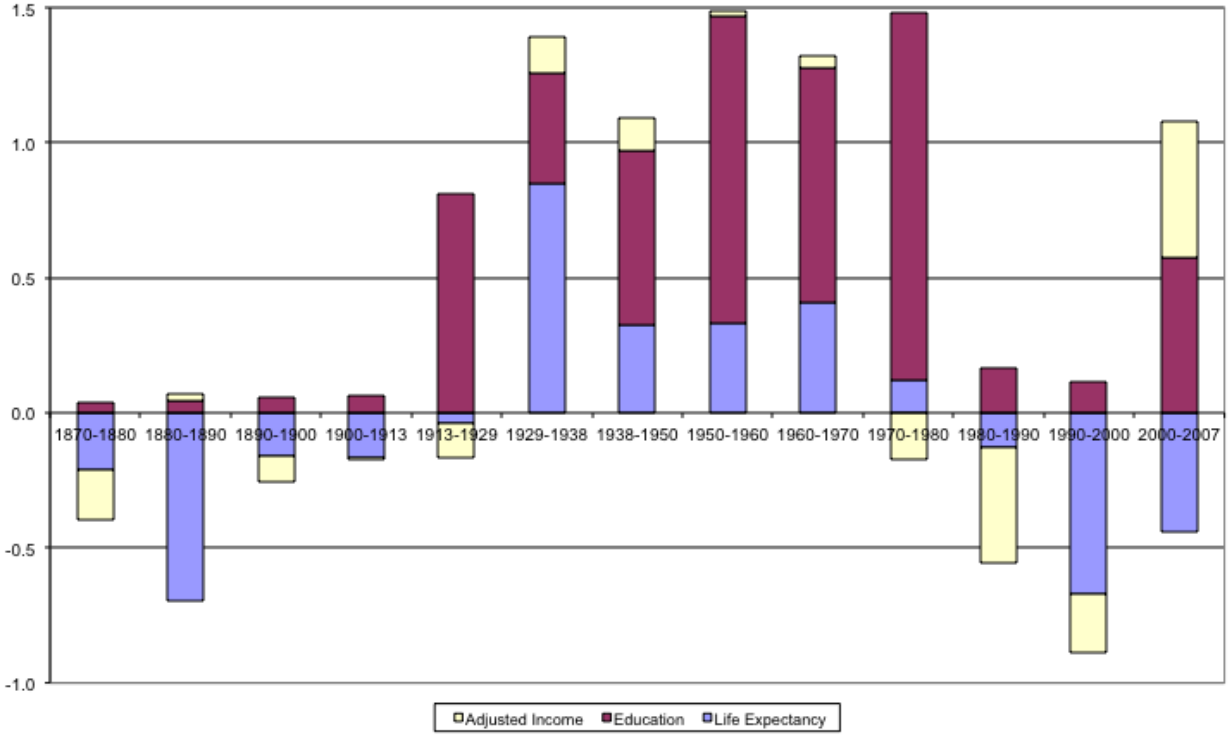

Figure 36 HIHD Catching-up with *OECD* in Sub-Saharan Africa, 1870-2007 (%)

Data Appendix. Sources and Procedures

Life Expectancy at birth

Africa

Estimates come from Prados de la Escosura (forthcoming) where a detailed explanation of the sources and procedures is provided.

The Americas

Most data come from the OxLAD database for Latin America (Astorga *et al*. 2003) -(supplemented with the working sheets prepared by Shane and Barbara Hunt and kindly provided by Pablo Astorga)- and Arriaga (1968). In addition, national sources used are:

Argentina, 1870-1890, Recchini de Lattes and Lattes (1975).

Canada, United Nations (2000) level for 1938 backwards projected for pre-1938 period with Bourbeau et al. (1997) in order to maintain consistence over time.

Chile, 1890-1900, and Uruguay, 1870-1900, assumed to have evolved along Argentina.

Uruguay, 1900-1938, Ministerio de Salud Pública (2001),

Life expectancy in Colombia, 1870-1900, Cuba, 1870-1900, Panama, 1880-1900, Honduras, 1890-1900, Puerto Rico, 1870-1890, and Venezuela, 1880-1900, has been assumed to evolve along Costa Rica's.

Peru, 1913-1938, assumed to evolve along Bolivia's.

Puerto Rico, 1870-1890, assumed it evolves along Costa Rica; 1890, Riley (2005b); 1900-1938, UN (1993).

Jamaica, 1880-1938, Riley (2005a: 198); 1870-1880, assumed it evolves along Costa Rica.

Trinidad-Tobago, 1860-1900, assumed to evolve along Jamaica's.

U.S.A., 1870-1890, Haines (1994)

In the absence of life expectancy estimates for early years projecting the available figures with infant survival rates (that is, 400 –as the maximum infant mortality rate per thousand- less the country's infant mortality rate) has derived them for Panama, 1900-1929 and Guyana, 1950-1960. Such a procedure was also used to distribute the average life expectancy estimate for Argentina, 1869-1894.

Asia

Most pre-1950 estimates come from Riley (2005b) who claims that the earliest health transition started in the 1870/1890s when mean and median values were 27.5 and 25.1 years, respectively. Lower bound estimates for 1950 or 1940s levels were used for 1938. In the absence data, pre-1929 life expectancy at birth was assumed to be 25 years.

Cambodia, 1938, Siampos (1970), cited in Riley (2005b); 1929 assumed it evolved along China as they had similar levels in 1938.

China, 1938, upper bound in 1936 respectively, Riley (2005b); 1929, Caldwell et al. (1986), cited in Lavely and Wong (1998).

Hong Kong SAR, assumed to have evolved at the same rate of variation as Taiwan's, 1900-1938

India, 1890-1938, McAlpin (1983) extrapolated to 1880 with Visaria and Visaria (1982).

Indonesia, 1929, Riley (2005b)

Japan, 1870, Riley (2005b); 1880, Janetta and Preston (1991); 1890-1900, Johansson and Mosk (1987)

Korea, 1913, Riley (2005b) provides a figure of 23.5 years for 1915. Since the historical lower bound was assumed to be 25 years, this value was assigned to the pre-1913 era; 1929, derived by increasing the initial figure by 0.87 yearly as suggested by Riley (2005b); 1938, UN (1993).

Lao PDR, 1929, assumed to evolve as Vietnam's.

Malaysia, 1929-1938 figures obtained by projecting 1950 level backwards with the infant survival rate.

Nepal, 1925, assumed to evolve as India.

Singapore, 1929-1938 figures obtained by projecting 1950 level backwards with the infant survival rate; 1870-1925, assumed to evolve at the same pace as Malaysia's.

Sri Lanka, 1890-1913, 1938, Langford and Storey (1993); 1929, Sarkar (1951)

Taiwan, 1890-1938, Cha and Wu (2002); 1950, Glass and Grebenik (1967); 1980-2007, english.moe.gov.tw/public/Attachment/9101916565871.pdf; 2000-2007, Tsai (2008)

Thailand, 1938, Vallin (1976)

Turkey, pre-1913, and 1929, assumed to evolve at the same yearly rate of change as Greece's; 1913, Pamuk (2007); 1938, Shorter and Macura (1982)

<u>Oceania</u>

Australia, 1870-1900, Whitwell et al. (1997)

New Zealand (adjusted for Maori population), 1870, Riley (2005b); 1880-1890, Glass and Grebenik (1967)

Europe

Austria, 1870, Helczmanovski (1979); 1880-1890, interpolated from data in Helczmanovski (1979), Glass and Grebenik (1967: 82), and the UN (1993)

Belgium, 1870, Deprez (1979); 1880-1900, Flora (1983); 1929, UN (1993)

Bulgaria, 1870-1890, assumed to move along Greece's.

Cyprus, since life expectancy levels in Cyprus and Greece in 1890 were identical and those for 1938, very close, I assumed they were the same up to 1929. Figures for 1890 and 1938, from Riley (2005b)

Czechoslovakia, 1870-1913, Sbr (1962); 1890, Riley (2005b)

Finland, 1870-1990, Kannisto et al. (1999)

France, 1870-1900, Flora (1983)

Germany, 1870-1890, Flora (1983)

Greece, 1870-1913, Valaoras (1960)

Hungary, 1870-1900, assumed to evolve along Austria's.

Ireland, 1850-1900, assumed to evolve along the U.K.'s

Italy, 1881, and 1901, Zamagni (1990); 1870-1938, Conte et al. (2007)

Poland, 1870-1913, assuming it evolved as Czechoslovakia's.

Portugal, 1850-1913, Leite (2005); 1929, Veiga (2005); 1938, UN (1993)

Romania, assumed to evolve along Greece, 1870-1890, and along Bulgaria's, 1890-1929.

Russia, 1870-1913, Pressat (1985), European Russia; 1929, European Soviet Union; 1938, Soviet Union

Spain, 1870-1938, Dopico and Reher (1998); 1950-2000, Nicolau (2005) and Goerlich and Pinilla (2005)

Sweden, 1870-1965, Keyfitz and Fleiger (1968), reproduced in Sandberg and Steckel (1997).

United Kingdom, 1850-1900, Floud and Harris (1997).

Yugoslavia, assumed to evolve along Greece's, 1870-1890, and along Bulgaria's, 1890-1929. For 1929 and 1938 life expectancy was estimated by projecting the available figures with infant survival rates for 1950.

Literacy

While, from a conceptual point of view, there are no objections to the UNESCO definition of a literate person, namely, "who can, with understanding, both read and write a short simple statement on his everyday life" (quoted in Nilsson 1999: 278), assessing a person's literacy is quite a different issue.

Reading and writing do not necessarily go together in developing societies and prior to the diffusion of the schooling system the lag between acquiring the ability to read and to write can be as wide as a century or more (Markussen 1990, Nilsson 1999). Hence, the literacy rate would vary wildly depending on whether a wide (read ability only) or a narrow (reading and writing skills) definition of literacy is used, and how it is actually measured (with marriage signatures being particularly misleading in pre-industrial societies). Moreover, becoming literate is far more difficult and time-intensive in countries which languages employ Chinese characters (Taira 1971, Honda 1997). In practice, although classifying a person as truly literate should imply that she is able to read and write, it not always possible make such a precise distinction for the past (Nilsson 1999: 279). Unfortunately, historical data are far from homogeneous and, therefore, the results will suffer from biases, which, nonetheless, will not condition decisively long run trends.

In the absence of historical data on literacy, available literacy rates were projected backwards with the rate of primary enrolment. Also, occasionally, available literacy rates have been projected backwards with years of primary education (from Morrisson and Murtin 2009). In the post-1960 period, the literacy rate has been, in a few cases, derived by assuming that the illiteracy rate was identical to the share of population with no schooling provided by Barro and Lee (2002, 2010) and Cohen and Soto (2007)

<u>Africa</u>

Estimates come from Prados de la Escosura (forthcoming) where a detailed explanation of the sources and procedures is provided.

The Americas

OxLAD database (Astorga et al. 2003) (plus the working sheets prepared by Shane and Barbara Hunt and kindly provided by Pablo Astorga) and Newland (1991) provide most of the data. Otherwise, the sources are:

Chile, 1870, Braun et al. (2000)

Cuba, 1870-1890, Newland (1991)

Nicaragua, 1900, Núñez (2005)

U.S., 1870-1890, 1960-1970, Costa and Steckel (1997)

Literacy rates have been backwards projected with the rate of primary enrolment for Bolivia, 1870-1890, and Puerto Rico, 1870-1890.

Literacy rates have been backwards projected with years of primary education for the population above 15 years (Morrisson and Murtin (2009) for Dominican Republic, 1870-1900; El Salvador, 1870-1890; Uruguay, 1870-1890, and Venezuela, 1870-1880.

Asia

China, 1870, 1913, Morrisson and Murtin (2007)

India, 1890, 1938, Tomlinson (1993)

Japan, 1870, Steckel and Floud (1997); 1880-1890 (by assuming that the rate of primary enrolment was a good approximation), Hanley (1990); 1900-1938, Honda (1997)

Korea, 1929, Kimura (1990)

Literacy rates have been projected backwards with the rate of primary enrolment for Cambodia and Laos, 1913-1938; China, 1929; Hong Kong, 1870-1913; India, 1870-1880, 1929; Indonesia, Taiwan, and Vietnam, 1900-1938; Iran, Jordan, Malaysia and Myammar, 1929; Israel, Lebanon, Sri Lanka, and Syria, 1920-1938; Korea, 1913; Fiji, 1900-1913, 1929-38.

Literacy rates have been backwards projected with years of primary education for the population above 15 years (Morrisson and Murtin (2009) for Iraq, 1870-1938; Malaysia, 1870-1900; Myammar, 1870-80; Philippines, 1870-1913; Syria, 1870-1900; Thailand, 1880-1913, 1929.

Oceania

Australia, 1870, Vamplew (1987); 1890-1900, Steckel and Foud (1997b)

Europe

Austria, 1880-1913, Flora (1983)

Belgium, 1938, Banks (2010)

Czechoslovakia, 1880-1900, Flora (1983); 1938, Banks (2010)

Finland, 1870, Crafts (1997); 1880-90, Myllantaus (1990); 1900, Flora (1983); 19295-60, Banks (2010).

Germany, 1950, Banks (2010)

Greece, 1929-1950, Banks (2010)

Ireland, 1870-1900, Flora (1983); 1913, Crafts (1997)

Italy, 1870-80, Flora (1983); 1890, 1960, Conte et al. (2007); 1938, Banks (2010)

Poland, 1870-90, assumed to evolve along Hungary's; 1900, Flora (1983); 1929-1960, Banks (2010)

Portugal, 1880, Reis (1993); 1880-1890, 1913-1938, Nunes (1993)

Romania, 1929-1960, Banks (2010)

Russia, 1870-1960, Mironov (1991, 1993)

Spain, 1870-1880, Núñez (2005); 1890-1930, Reher (personal communication); Viñao (1990)

Sweden, 1870-1960, Banks (2010).

Yugoslavia//Serbia, 1929-1990, Banks (2010)

U.K., 1870-1960, Banks (2010).

Literacy rates have been backwards projected with the rate of primary enrolment for Albania, 1920-1938; Cyprus, 1880-1900.

Literacy rates have been backwards projected with years of primary education (Morrisson and Murtin (2009) for Bulgaria, 1870-1880.

Enrolment

Figures on enrolment rates, apparently straightforward, present difficulties of interpretation. The usual measurement procedure is to divide the number of students by the relevant school-age population cohort. For example, primary enrolment rate defined as the share of children receiving primary education over population aged 5 to 14 years, keeping this yardstick fixed over time. This way the unadjusted (primary) enrolment rate is obtained. Such age span is, however, longer than primary schooling, leading to an under-estimate. Even worse, comparability is fraught with difficulties as the length of primary or secondary schooling changes across countries and over time,

and, therefore, biases of an unknown sign are introduced (Benavot and Riddle 1988: 195; Nilsson 1999: 282). Alas, up to the mid-twentieth century, the only kind of enrolment rate that can be easily computed for a large number of countries and over a long time-span is the unadjusted one. Then, UNESCO, OECD, and the World Bank provide gross enrolment rates, in which the denominator is adjusted to the age bracket for each type of schooling (primary, secondary, tertiary) for the present.

For the pre-World War II era, in the absence of direct estimates, Benavot and Riddle (1998) and Frankema (2011), and Lindert (2004), estimates of primary enrolment rates, and primary plus secondary education enrolment rates, respectively, have been used.

For those countries for which no evidence on enrolment was available at given dates, the closer enrolment rates have been projected backwards with the average years of schooling among the population above 15 (Morrisson and Murtin 2009).

Occasionally, for nineteenth and early twentieth century countries (mostly African and Asian) the total -that is, primary, secondary, and tertiary- enrolment rate has been obtained by adjusting the primary or primary and secondary enrolment ratio with the ratio resulting from dividing the share of population aged 5-14 years of age by the share of population aged 5-24. This crude procedure implies the assumption that secondary and tertiary enrolment numbers represent a negligible proportion of the relevant population cohort.

The relevant population was derived as follows. Firstly, I computed the share of population aged 5-24 (and 5-14) over total population at census years from Mitchell (2003a, 2003b, 2003c) that was, then, interpolated log-linearly to derive yearly series and, finally, its result multiplied by total population figures (see below). The population share of those aged 5-24 years of age for missing countries, as it is often the case for Africa, has been replaced with that of a neighbour country with a similar demographic transition.

Africa

Estimates come from Prados de la Escosura (forthcoming) where a detailed explanation of the sources and procedures is provided.

The Americas

Most data come from OxLAD database (Astorga et al. 2003), supplemented it with the working sheets prepared by Shane and Barbara Hunt. Otherwise, the sources are:

Puerto Rico, 1870-1880, Newland (1991)

Venezuela, 1870-1890, Newland (1991)

All enrolment derived with primary enrolment in Benavot and Riddle (1988), adjusted with the ratio of those aged 5-14 years to those aged 5-24 years, for Dominican Rep., 1870-1913; Ecuador, 1870-1880.

All enrolment rates have been backwards projected with years of primary education for the population above 15 years (Morrisson and Murtin (2009) for Cuba, 1870-1890; Honduras, 1870-1880; Panama, 1870-1890, and Paraguay, 1870-1880.

Asia

China, 1890-1913, assumed to evolve as Hong Kong's.

Hong-Kong assumed to have evolved as China, 1960-1980, and Kuwait as Iraq, 1950-1960.

Bahrein, 1950-1970, and Brunei-Darassalam, Oman, Qatar, and UAE, 1950-1980, assumed to evolve along Kuwait's.

All enrolment derived with primary enrolment in Benavot and Riddle (1988), adjusted to all enrolment with the ratio of those aged 5-14 years to those aged 5-24 years, for Cambodia, 1929 and 1938; Iraq, 1913; Israel and Laos, 1920-38 1929 and 1938; Philippines, Taiwan, and Fiji, 1900; Syria, 1900-1913.

All enrolment rates have been backwards projected with years of primary education for the population above 15 years (Morrisson and Murtin (2009) for India and Myanmar, 1870; Iran and Iraq, 1870-1900; Philippines and Syria, 1870-1890; Thailand, 1800-1900; Turkey, 1870-1880.

Population aged 5-24 (and 5-14) share in total population in Syria accepted for Lebanon and that of China for Nepal.

Europe

Italy, 1870, 1913, 1929, Conte et al. (2007)

Portugal, 1880-1913, Reis (1993), primary enrolment

Spain, 1870-1980, Núñez (2005)

Population aged 5-24 (and 5-14) share in total population for Cyprus, Turkey's and Greece's, weighted by the shares of Turkish and Greek in total population.
All enrolment derived with primary enrolment in Benavot and Riddle (1988), adjusted to all enrolment with the ratio of those aged 5-14 years to those aged 5-24 years, for Czechoslovakia, 1913; Denmark, 1870; Romania, 1870.
All enrolment derived with primary and secondary enrolment in Lindert (2004), adjusted to all enrolment with the ratio of those aged 5-14 years to those aged 5-24 years (Mitchell 2003c), for Ireland, 1870-1900; Italy, 1870; Switzerland, 1870; UK, 1870-1900.
All enrolment rates have been backwards projected with years of primary education for the population above 15 years (Morrisson and Murtin (2009) for Bulgaria, 1870-1880.

Per Capita GDP

GDP per head is expressed in 1990 Geary-Khamis dollars. Unless stated below, post-1950 GDP per head data come from Maddison (2006, 2010) completed with Conference Board (2010), since 1995. Occasionally, Conference Board estimates have been accepted for the entire post-1950 period, as it is the case of China, whose estimates were adjusted to the recent findings of the 2005 PPP round. Otherwise, for specific countries shown below, Maddison's per capita GDP levels (usually) for 1950 have been projected backwards with volume indices of real per capita GDP taken from historical national accounts.

Africa

GDP per head was derived from Prados de la Escosura (2012).

The Americas

Data for twentieth-century Latin America -except for Cuba (see below)- comes from CEPAL (2009) from 1950 onwards, and from Astorga and Fitzgerald (1998) and OxLAD database (Astorga *et al*. 2003). Otherwise national sources have been used. Argentina, Della Paolera *et al*. (2003), 1884-1950, assuming the rate of growth over 1870-84 was identical to that for 1884-90. The alternative option of projecting backwards the level for 1884 to 1875 with Cortés Conde (1997) casts too low a figure. I assumed the level for 1870 was identical to that of 1875.

Brazil, 1870-1950, Goldsmith, (1986)

Bolivia, 1870-1950, Herranz-Loncán and Peres Cajías (2011).

Chile, 1870-1950,Díaz, Lüders and Wagner (2007)

Colombia, 1870-1905, Kalmanovitz Krauter and López Rivera (2009) and data kindly provided by Salomon Kalmanovitz in private communication; 1905-1950, GRECO (2002).

Cuba, up to 1902, Santamaría (2005); 1902-1958, Ward and Devereux (2012); 1958 onwards, Maddison (2010)

An important caveat in the case of Cuba is that Maddison (2006) level for 1990 has not been accepted. The reason is that, given the lack of PPPs for Cuba in 1990, Maddison (2006: 192) assumed Cuban per capita GDP was 15 percent below the Latin American average. Since this is an arbitrary assumption, I started from Brundenius and Zimbalist's (1989) estimate of Cuba's GDP per head relative to six major Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela, LA6) in 1980 (provided in Astorga and Fitzgerald 1998) and applied this ratio to the average per capita income of LA6 in 1980 Geary-Khamis dollars to derive Cuba's level in 1980. Then, following Maddison (1995: 166), I derived the level for 1990 with the growth rate of real per capita GDP at national prices over 1980-1990 and reflated the result with the US implicit GDP deflator in order to arrive to an estimate of per capita GDP in 1990 at 1990 Geary-Khamis dollars. Interestingly, Cuba's position relative to the US in 1929 and 1955 is very close to the one Ward and Devereux (2012) estimated using a different approach.

Ecuador, 1870-1890, I assumed it evolved as Peru over 1880-1900, yielding $447 for 1880, and I arbitrarily assumed a per capita GDP of $400 for 1870.

Mexico, 1870-1900, Coatsworth (1989: 41); 1896-1950, INEGI (1995)

Peru, 1870-1950, Seminario (2011)

Uruguay, 1870-1938, Bértola (1998)

Venezuela, 1870-1950, Baptista (1997)

Central America (Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua), I derived the level for 1913 by assuming the growth over 1913-20 was identical to that of 1920-25, the latter derived from OxLAD database (Astorga *et al*. 2003).

Caribbean. Bahamas, Barbados, Belize, Guyana, 1950-2007, and St. Kitts and Nevis, St. Vincent and the Grenadines, 1990-2007, Maddison (2006, 2010), Conference Board (2010), and Bulmer-Thomas (personal communication)

Trinidad-Tobago, 1950-1970, Maddison (2010)

Jamaica, 1870-1929, Eisner (1961); 1938, Maddison (2010)

Puerto Rico, 1950-2007, Maddison (2010)

Canada, 1870-1926, Urquhart (1993); 1926-1976, Statistics Canada (2004)

U.S., 1870-1950, Kendrik (1961); 1950-2007, Bureau of Economic Activities (BEA)

Asia

Middle East (Iran, Iraq, Jordan, Lebanon, Palestine (Israel), Saudi Arabia, Syria, Yemen, and the Gulf -Bahrain, Kuwait, Oman, Qatar, UAE-), 1870-1913, Pamuk (2006)

Bhutan, Brunei, and Maldives, Maddison (2006).

Korea, 1913-1938, Cha and Kim (2006); 1890, Bourguignon and Morrisson (2002)

Myammar, 1880-1890, assumed to evolve along India.

Philippines, 1890, Bourguignon and Morrisson (2002).

Turkey, 1880, Altug et al. (2008); 1890, Bourguignon and Morrisson (2002)

Taiwan, 1880-1890, assumed to evolve as China's; 1900, Cha and Wu (2002).

Oceania

New Zealand, 1870-1938, Greasley and Oxley (2000a, 2000b)

Europe

Austria, 1870-1913, Maddison (2010) level for 1913 projected backwards with Schulze (2000) estimates for Imperial Austria under the assumption that real output per head in Modern Austria moved along Imperial Austria's.

Belgium, 1870-1913, Horlings (1997); 1929-1938, average of GDP estimates of income and expenditure approaches in Buyst (1997), and output in Horlings (1997)

Czechoslovakia, Poland, Romania, Yugoslavia, 1880, computed with Good (1994) ratio of 1880 GDP per head to the average GDP per head of 1870 and 1890 applied to Maddison's (2010) average levels for 1870 and 1890.

Cyprus, 1913-2007, Apostolides (2011). I assumed the level for 1913 was identical to that for 1921.

Denmark, 1850-1938, Hansen (1974)

France, 1870-1950, Toutain (1997)

Finland, 1870-1990, Hjerppe (1996)

Germany, Nominal GDP, 1950-2000, IMF (2010); 1901-1913, 1925-1949, Spoerer and Ritschl (1997); 1901 level backwards projected to 1870 with Hoffmann *et al*. (1965). Real GDP derived by deflating Nominal GDP. The deflator comes from IMF, 1960-2000; Spoerer and Ritschl (1997), 1901-1960; Hoffmann *et al*. (1965), 1870-1901.

Greece, 1870-1938, Kostelenos *et al*. (2007), moving base series

Hungary, 1870-1913, Maddison (2009) level for 1913 projected backwards to 1870 with Schulze (2000) estimates for Imperial Hungary, under the assumption that movements in real output per head in Modern Hungary reflected those in Imperial Hungary; 1913-1938, Eckstein (1955: 175) for Modern (Republic of) Hungary, as defined by the Treaty of Trianon (1919).

Italy, 1870-1913, Fenoaltea (2005)

Netherlands, 1870-1913, Smits et al. (2000), average of income, output and expenditure estimates; 1921-1938, Bakker et al. (1990)

Norway, 1870-2000, Grytten (2004)

Portugal, 1850-1910, Lains (2006); 1910-1950, Batista et al. (1997)

Russia, 1870-1885, Imperial Russia, Goldsmith (1961), agricultural and industrial output weighted with Gregory (1982) weights for 1883-87; 1885-1913, Gregory (1982), Table 3.1; 1913-1928, Markevich and Harrison (2011).

Spain, 1870-2007, Prados de la Escosura (2003, updated)

Sweden, 1870-2000, Krantz and Schön (2007).

United Kingdom, 1850-1985, Mitchell (1988)

Population

All figures are adjusted to refer to mid-year and to take into account the territorial changes and are derived from Maddison (2010) and and Mitchell (2003a, 2003b, 2003c), completed for Latin America and the Caribbean with OxLAD database (Astorga et al. 2003), 1900-1938, and CEPAL (2009), 1950-2007. Otherwise, national sources were used.

Spain, 1870-2000, Nicolau (2005)

Turkey, 1870-1913, Pamuk (2006, 2007)

Cyprus, 1929-1938, Apostolides (2011)

Algeria and Tunisia, 1870-1950, Fargues (1986).

South Africa, 1870-2000, Feinstein (2005)

Sub-Saharan Africa, 1910-1950 data come from Smits (private communication), completed with Banks (2010), for Ethiopia, Liberia, Malawi, and Sierra Leone. Missing observations for Sub-Saharan African countries in the late 19th century were filled by assuming the average growth rate for countries in the region.

Table A.1 ***Human Development and its Dimensions: Central and Eastern Europe (including Russia), 1870-2007***

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.073	0.041	0.036	0.259
1880	0.082	0.045	0.047	0.264
1890	0.097	0.051	0.061	0.295
1900	0.119	0.063	0.078	0.342
1913	0.133	0.070	0.091	0.371
1929	0.187	0.125	0.139	0.374
1938	0.266	0.146	0.298	0.431
1950	0.335	0.298	0.269	0.469
1960	0.413	0.344	0.384	0.535
1970	0.482	0.354	0.526	0.601
1980	0.490	0.350	0.527	0.637
1990	0.509	0.362	0.554	0.657
2000	0.497	0.341	0.602	0.596
2007	0.537	0.363	0.623	0.683

Panel B: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	1.3	0.3	0.9	0.1
1880-1890	1.7	0.4	0.9	0.4
1890-1900	2.0	0.7	0.8	0.5
1900-1913	0.9	0.3	0.4	0.2
1913-1929	2.1	1.2	0.9	0.0
1929-1938	3.9	0.6	2.8	0.5
1938-1950	1.9	2.0	-0.3	0.2
1950-1960	2.1	0.5	1.2	0.4
1960-1970	1.5	0.1	1.1	0.4
1970-1980	0.2	0.0	0.0	0.2
1980-1990	0.4	0.1	0.2	0.1
1990-2000	-0.2	-0.2	0.3	-0.3
2000-2007	1.1	0.3	0.2	0.6
1870-1913	1.4	0.4	0.7	0.3
1913-1950	2.5	1.3	1.0	0.2
1950-1970	1.8	0.3	1.1	0.4
1970-1990	0.3	0.0	0.1	0.1
1990-2007	0.3	0.0	0.2	0.1
1870-1913	1.4	0.4	0.7	0.3
1913-1970	2.3	0.9	1.0	0.3
1970-2007	0.3	0.0	0.2	0.1
1870-2007	1.5	0.5	0.7	0.2

Table A.2 *Catching-up in Central and Eastern Europe (including Russia), 1870-2007*

HIHD Catching-up Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.3	0.1	0.4	-0.2
1880-1890	0.3	-0.3	0.4	0.2
1890-1900	0.9	0.2	0.4	0.3
1900-1913	0.0	-0.1	0.1	0.0
1913-1929	0.9	0.5	0.6	-0.1
1929-1938	2.9	0.0	2.4	0.5
1938-1950	0.8	1.2	-0.5	0.2
1950-1960	0.7	0.0	0.7	0.0
1960-1970	0.4	-0.2	0.6	0.0
1970-1980	-0.8	-0.5	-0.2	0.0
1980-1990	-0.7	-0.3	-0.2	-0.1
1990-2000	-1.5	-0.8	-0.2	-0.5
2000-2007	-0.1	-0.5	-0.1	0.5
1870-1913	0.3	0.0	0.3	0.1
1913-1950	1.4	0.6	0.6	0.1
1950-1970	0.5	-0.1	0.6	0.0
1970-1990	-0.7	-0.4	-0.2	0.0
1990-2007	-0.9	-0.7	-0.2	-0.1
1870-1913	0.3	0.0	0.3	0.1
1913-1970	1.1	0.4	0.6	0.1
1970-2007	-0.8	-0.5	-0.2	0.0
1870-2007	0.3	0.0	0.3	0.0

Table A.3 *Human Development and its Dimensions: Russia, 1870-2007*

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.055	0.036	0.019	0.245
1880	0.060	0.040	0.023	0.238
1890	0.074	0.045	0.033	0.270
1900	0.097	0.054	0.052	0.330
1913	0.111	0.058	0.066	0.362
1929	0.170	0.117	0.117	0.357
1938	0.267	0.134	0.322	0.439
1950	0.348	0.321	0.268	0.491
1960	0.424	0.348	0.394	0.553
1970	0.501	0.348	0.586	0.618
1980	0.494	0.335	0.559	0.644
1990	0.512	0.342	0.578	0.680
2000	0.481	0.301	0.610	0.607
2007	0.512	0.316	0.610	0.698

Panel B: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.9	0.3	0.6	-0.1
1880-1890	2.1	0.5	1.2	0.4
1890-1900	2.7	0.5	1.5	0.7
1900-1913	1.1	0.2	0.6	0.2
1913-1929	2.6	1.5	1.2	0.0
1929-1938	5.0	0.5	3.7	0.8
1938-1950	2.2	2.4	-0.5	0.3
1950-1960	2.0	0.3	1.3	0.4
1960-1970	1.7	0.0	1.3	0.4
1970-1980	-0.1	-0.1	-0.2	0.1
1980-1990	0.4	0.1	0.1	0.2
1990-2000	-0.6	-0.4	0.2	-0.4
2000-2007	0.9	0.2	0.0	0.7
1870-1913	1.6	0.4	1.0	0.3
1913-1950	3.1	1.5	1.3	0.3
1950-1970	1.8	0.1	1.3	0.4
1970-1990	0.1	0.0	0.0	0.2
1990-2007	0.0	-0.1	0.1	0.1
1870-1913	1.6	0.4	1.0	0.3
1913-1970	2.6	1.1	1.3	0.3
1970-2007	0.1	-0.1	0.0	0.1
1870-2007	1.6	0.5	0.8	0.3

Table A.4 *Catching-up in Russia, 1870-2007*

HDI Catching-up Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.0	0.1	0.2	-0.3
1880-1890	0.7	-0.2	0.7	0.2
1890-1900	1.6	0.0	1.1	0.5
1900-1913	0.2	-0.2	0.3	0.0
1913-1929	1.5	0.8	0.9	-0.2
1929-1938	4.0	-0.1	3.3	0.7
1938-1950	1.1	1.7	-0.8	0.2
1950-1960	0.5	-0.3	0.8	0.0
1960-1970	0.5	-0.3	0.9	0.0
1970-1980	-1.1	-0.6	-0.4	-0.1
1980-1990	-0.7	-0.4	-0.3	0.0
1990-2000	-1.9	-1.1	-0.3	-0.5
2000-2007	-0.3	-0.6	-0.3	0.6
1870-1913	0.6	-0.1	0.6	0.1
1913-1950	2.0	0.9	0.9	0.2
1950-1970	0.5	-0.3	0.8	0.0
1970-1990	-0.9	-0.5	-0.3	0.0
1990-2007	-1.2	-0.8	-0.3	-0.1
1870-1913	0.6	-0.1	0.6	0.1
1913-1970	1.5	0.5	0.9	0.1
1970-2007	-1.0	-0.7	-0.3	-0.1
1870-2007	0.5	0.0	0.5	0.1

Table A.5 *Human Development and its Dimensions: Latin America, 1870-2007*

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.055	0.026	0.026	0.249
1880	0.060	0.028	0.029	0.260
1890	0.071	0.032	0.038	0.291
1900	0.083	0.038	0.051	0.292
1913	0.106	0.052	0.065	0.349
1929	0.137	0.074	0.088	0.398
1938	0.156	0.090	0.105	0.404
1950	0.215	0.175	0.128	0.443
1960	0.263	0.221	0.168	0.488
1970	0.313	0.262	0.219	0.534
1980	0.374	0.300	0.290	0.602
1990	0.403	0.354	0.314	0.589
2000	0.481	0.417	0.435	0.614
2007	0.520	0.459	0.476	0.642

Panel B: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.8	0.2	0.4	0.1
1880-1890	1.7	0.4	0.9	0.4
1890-1900	1.6	0.6	0.9	0.0
1900-1913	1.9	0.8	0.6	0.5
1913-1929	1.6	0.7	0.6	0.3
1929-1938	1.4	0.7	0.6	0.1
1938-1950	2.7	1.9	0.6	0.3
1950-1960	2.0	0.8	0.9	0.3
1960-1970	1.7	0.6	0.9	0.3
1970-1980	1.8	0.5	0.9	0.4
1980-1990	0.7	0.6	0.3	-0.1
1990-2000	1.8	0.5	1.1	0.1
2000-2007	1.1	0.5	0.4	0.2
1870-1913	1.5	0.5	0.7	0.3
1913-1950	1.9	1.1	0.6	0.2
1950-1970	1.9	0.7	0.9	0.3
1970-1990	1.3	0.5	0.6	0.2
1990-2007	1.5	0.5	0.8	0.2
1870-1913	1.5	0.5	0.7	0.3
1913-1970	1.9	0.9	0.7	0.2
1970-2007	1.4	0.5	0.7	0.2
1870-2007	1.6	0.7	0.7	0.2

Table A.6 Catching-up in Latin America, 1870-2007

HIHD Catching-up Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	-0.1	0.0	-0.1	-0.1
1880-1890	0.3	-0.3	0.4	0.2
1890-1900	0.4	0.1	0.6	-0.2
1900-1913	1.0	0.4	0.3	0.3
1913-1929	0.4	0.0	0.3	0.1
1929-1938	0.4	0.2	0.2	0.0
1938-1950	1.6	1.1	0.3	0.2
1950-1960	0.6	0.2	0.4	-0.1
1960-1970	0.6	0.2	0.4	-0.1
1970-1980	0.9	0.0	0.7	0.2
1980-1990	-0.3	0.1	-0.1	-0.3
1990-2000	0.5	-0.1	0.6	0.0
2000-2007	-0.1	-0.3	0.1	0.1
1870-1913	0.5	0.1	0.3	0.1
1913-1950	0.8	0.4	0.3	0.1
1950-1970	0.6	0.2	0.4	-0.1
1970-1990	0.3	0.0	0.3	0.0
1990-2007	0.3	-0.2	0.4	0.0
1870-1913	0.5	0.1	0.3	0.1
1913-1970	0.7	0.4	0.3	0.0
1970-2007	0.3	-0.1	0.3	0.0
1870-2007	0.5	0.2	0.3	0.0

Table A.7 Human Development and its Dimensions: China, 1870-2007

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.032	0.020	0.010	0.177
1880	0.033	0.020	0.010	0.178
1890	0.042	0.020	0.020	0.180
1900	0.040	0.020	0.018	0.182
1913	0.040	0.020	0.017	0.184
1929	0.064	0.051	0.028	0.188
1938	0.081	0.065	0.043	0.188
1950	0.093	0.096	0.086	0.097
1960	0.166	0.152	0.177	0.170
1970	0.222	0.277	0.197	0.201
1980	0.257	0.314	0.209	0.259
1990	0.308	0.344	0.233	0.365
2000	0.408	0.402	0.354	0.478
2007	0.470	0.438	0.385	0.617

HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.1	0.0	0.0	0.0
1880-1890	2.5	0.0	2.4	0.0
1890-1900	-0.4	0.0	-0.4	0.0
1900-1913	0.0	0.0	-0.1	0.0
1913-1929	3.0	2.0	1.0	0.0
1929-1938	2.5	0.9	1.6	0.0
1938-1950	1.2	1.1	1.9	-1.8
1950-1960	5.8	1.5	2.4	1.9
1960-1970	2.9	2.0	0.4	0.5
1970-1980	1.5	0.4	0.2	0.8
1980-1990	1.8	0.3	0.4	1.1
1990-2000	2.8	0.5	1.4	0.9
2000-2007	2.0	0.4	0.4	1.2
1870-1913	0.5	0.0	0.4	0.0
1913-1950	2.3	1.4	1.5	-0.6
1950-1970	4.4	1.8	1.4	1.2
1970-1990	1.6	0.4	0.3	1.0
1990-2007	2.5	0.5	1.0	1.0
1870-1913	0.5	0.0	0.4	0.0
1913-1970	3.0	1.5	1.4	0.0
1970-2007	2.0	0.4	0.6	1.0
1870-2007	2.0	0.8	0.9	0.3

Table A.8 Catching-up in China, 1870-2007

HIHD Catching-up Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	-0.9	-0.2	-0.4	-0.2
1880-1890	1.1	-0.7	1.9	-0.2
1890-1900	-1.5	-0.5	-0.8	-0.2
1900-1913	-0.9	-0.4	-0.4	-0.2
1913-1929	1.8	1.3	0.7	-0.1
1929-1938	1.5	0.4	1.1	0.0
1938-1950	0.1	0.3	1.7	-1.9
1950-1960	4.4	1.0	1.9	1.5
1960-1970	1.8	1.7	-0.1	0.1
1970-1980	0.5	-0.1	0.0	0.6
1980-1990	0.8	-0.1	0.0	1.0
1990-2000	1.6	-0.1	0.9	0.8
2000-2007	0.8	-0.4	0.1	1.1
1870-1913	-0.6	-0.4	0.0	-0.2
1913-1950	1.2	0.8	1.1	-0.7
1950-1970	3.1	1.3	0.9	0.8
1970-1990	0.7	-0.1	0.0	0.8
1990-2007	1.3	-0.2	0.6	0.9
1870-1913	-0.6	-0.4	0.0	-0.2
1913-1970	1.8	1.0	1.0	-0.2
1970-2007	0.9	-0.2	0.2	0.8
1870-2007	0.8	0.2	0.5	0.1

Table A.9 Human Development and its Dimensions: India, 1870-2007

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.025	0.020	0.004	0.178
1880	0.029	0.020	0.007	0.184
1890	0.034	0.020	0.010	0.195
1900	0.035	0.020	0.010	0.200
1913	0.041	0.020	0.015	0.221
1929	0.060	0.042	0.022	0.236
1938	0.070	0.056	0.028	0.220
1950	0.097	0.099	0.045	0.206
1960	0.130	0.125	0.072	0.242
1970	0.160	0.157	0.096	0.269
1980	0.185	0.196	0.115	0.284
1990	0.225	0.224	0.147	0.346
2000	0.267	0.255	0.181	0.413
2007	0.311	0.279	0.219	0.491

Panel B: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	1.5	0.0	1.4	0.1
1880-1890	1.7	0.0	1.5	0.2
1890-1900	0.1	0.0	0.1	0.1
1900-1913	1.2	0.0	0.9	0.3
1913-1929	2.4	1.5	0.7	0.1
1929-1938	1.8	1.1	1.0	-0.3
1938-1950	2.7	1.6	1.3	-0.2
1950-1960	2.9	0.8	1.6	0.5
1960-1970	2.1	0.8	1.0	0.3
1970-1980	1.5	0.7	0.6	0.2
1980-1990	1.9	0.4	0.8	0.7
1990-2000	1.7	0.4	0.7	0.6
2000-2007	2.2	0.4	0.9	0.8
1870-1913	1.1	0.0	1.0	0.2
1913-1950	2.4	1.4	1.0	-0.1
1950-1970	2.5	0.8	1.3	0.4
1970-1990	1.7	0.6	0.7	0.4
1990-2007	1.9	0.4	0.8	0.7
1870-1913	1.1	0.0	1.0	0.2
1913-1970	2.4	1.2	1.1	0.1
1970-2007	1.8	0.5	0.7	0.5
1870-2007	1.8	0.6	1.0	0.2

Table A.10 Catching-up in India, 1870-2007

HIHD Catching-up Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.5	-0.2	0.9	-0.1
1880-1890	0.3	-0.7	1.0	0.0
1890-1900	-1.0	-0.5	-0.3	-0.1
1900-1913	0.3	-0.4	0.6	0.1
1913-1929	1.3	0.9	0.4	0.0
1929-1938	0.8	0.6	0.5	-0.3
1938-1950	1.6	0.8	1.0	-0.3
1950-1960	1.5	0.3	1.1	0.1
1960-1970	0.9	0.4	0.5	-0.1
1970-1980	0.6	0.3	0.4	0.0
1980-1990	0.9	0.0	0.4	0.5
1990-2000	0.5	-0.2	0.2	0.5
2000-2007	1.0	-0.4	0.6	0.7
1870-1913	0.1	-0.4	0.5	0.0
1913-1950	1.2	0.8	0.6	-0.2
1950-1970	1.2	0.4	0.8	0.0
1970-1990	0.7	0.1	0.4	0.2
1990-2007	0.7	-0.3	0.4	0.6
1870-1913	0.1	-0.4	0.5	0.0
1913-1970	1.2	0.6	0.7	-0.1
1970-2007	0.7	-0.1	0.4	0.4
1870-2007	0.7	0.1	0.6	0.0

Table A.11 Human Development and its Dimensions: Rest of Asia (excluding Japan), 1870-2007

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.028	0.021	0.005	0.207
1880	0.031	0.022	0.007	0.216
1890	0.037	0.023	0.010	0.228
1900	0.042	0.024	0.012	0.250
1913	0.053	0.030	0.018	0.275
1929	0.088	0.055	0.039	0.315
1938	0.113	0.084	0.053	0.325
1950	0.123	0.106	0.069	0.258
1960	0.168	0.149	0.106	0.300
1970	0.220	0.187	0.161	0.351
1980	0.261	0.228	0.192	0.404
1990	0.314	0.284	0.243	0.448
2000	0.364	0.344	0.285	0.492
2007	0.417	0.387	0.346	0.543

Panel B: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	1.2	0.2	0.9	0.1
1880-1890	1.5	0.1	1.2	0.2
1890-1900	1.3	0.2	0.8	0.3
1900-1913	1.9	0.6	1.0	0.2
1913-1929	3.2	1.2	1.6	0.3
1929-1938	2.8	1.6	1.2	0.1
1938-1950	0.7	0.6	0.7	-0.6
1950-1960	3.1	1.2	1.4	0.5
1960-1970	2.7	0.8	1.4	0.5
1970-1980	1.7	0.7	0.6	0.5
1980-1990	1.8	0.7	0.8	0.3
1990-2000	1.5	0.6	0.5	0.3
2000-2007	2.0	0.6	0.9	0.5
1870-1913	1.5	0.3	1.0	0.2
1913-1950	2.3	1.1	1.2	-0.1
1950-1970	2.9	1.0	1.4	0.5
1970-1990	1.8	0.7	0.7	0.4
1990-2007	1.7	0.6	0.7	0.4
1870-1913	1.5	0.3	1.0	0.2
1913-1970	2.5	1.1	1.3	0.1
1970-2007	1.7	0.7	0.7	0.4
1870-2007	2.0	0.7	1.0	0.2

Table A.12 Catching-up in the Rest of Asia (excl. Japan), 1870-2007

HIHD Catching-up Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.3	-0.1	0.5	-0.1
1880-1890	0.1	-0.6	0.7	0.0
1890-1900	0.2	-0.3	0.4	0.1
1900-1913	1.0	0.2	0.7	0.1
1913-1929	2.0	0.6	1.3	0.1
1929-1938	1.8	1.0	0.7	0.1
1938-1950	-0.4	-0.1	0.4	-0.7
1950-1960	1.7	0.6	0.9	0.1
1960-1970	1.5	0.4	1.0	0.1
1970-1980	0.8	0.2	0.4	0.3
1980-1990	0.8	0.3	0.4	0.2
1990-2000	0.2	0.0	0.1	0.2
2000-2007	0.8	-0.2	0.6	0.4
1870-1913	0.4	-0.1	0.6	0.0
1913-1950	1.2	0.5	0.9	-0.2
1950-1970	1.6	0.5	0.9	0.1
1970-1990	0.8	0.2	0.4	0.2
1990-2007	0.5	-0.1	0.3	0.2
1870-1913	0.4	-0.1	0.6	0.0
1913-1970	1.3	0.5	0.9	-0.1
1970-2007	0.6	0.1	0.3	0.2
1870-2007	0.9	0.2	0.6	0.0

Table A.13 Human Development and its Dimensions: North Africa, 1870-2007

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.036	0.020	0.009	0.239
1880	0.037	0.020	0.010	0.247
1890	0.040	0.020	0.012	0.264
1900	0.046	0.027	0.013	0.270
1913	0.056	0.038	0.015	0.299
1929	0.072	0.044	0.027	0.312
1938	0.080	0.049	0.034	0.315
1950	0.112	0.108	0.042	0.315
1960	0.152	0.159	0.065	0.341
1970	0.182	0.179	0.088	0.386
1980	0.233	0.222	0.122	0.465
1990	0.286	0.296	0.164	0.481
2000	0.350	0.364	0.237	0.496
2007	0.389	0.399	0.274	0.540

Panel B: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.4	0.0	0.2	0.1
1880-1890	0.9	0.0	0.6	0.2
1890-1900	1.3	1.0	0.2	0.1
1900-1913	1.5	0.9	0.3	0.3
1913-1929	1.6	0.3	1.2	0.1
1929-1938	1.2	0.4	0.8	0.0
1938-1950	2.8	2.2	0.6	0.0
1950-1960	3.0	1.3	1.5	0.3
1960-1970	1.8	0.4	1.0	0.4
1970-1980	2.5	0.7	1.1	0.6
1980-1990	2.1	1.0	1.0	0.1
1990-2000	2.0	0.7	1.2	0.1
2000-2007	1.5	0.4	0.7	0.4
1870-1913	1.0	0.5	0.4	0.2
1913-1950	1.9	0.9	0.9	0.0
1950-1970	2.4	0.8	1.2	0.3
1970-1990	2.3	0.8	1.0	0.4
1990-2007	1.8	0.6	1.0	0.2
1870-1913	1.0	0.5	0.4	0.2
1913-1970	2.1	0.9	1.0	0.2
1970-2007	2.1	0.7	1.0	0.3
1870-2007	1.7	0.7	0.8	0.2

Table A.14 Catching-up in North Africa, 1870-2007

Panel C: HIHD Catching-up Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	-0.6	-0.2	-0.2	-0.1
1880-1890	-0.5	-0.7	0.2	0.0
1890-1900	0.2	0.4	-0.1	-0.1
1900-1913	0.6	0.5	0.0	0.1
1913-1929	0.4	-0.4	0.9	-0.1
1929-1938	0.2	-0.1	0.3	0.0
1938-1950	1.7	1.5	0.3	-0.1
1950-1960	1.6	0.8	1.0	-0.1
1960-1970	0.7	0.1	0.6	0.0
1970-1980	1.5	0.3	0.9	0.4
1980-1990	1.0	0.5	0.6	-0.1
1990-2000	0.8	0.1	0.8	0.0
2000-2007	0.4	-0.4	0.4	0.3
1870-1913	0.0	0.1	0.0	0.0
1913-1950	0.8	0.3	0.6	-0.1
1950-1970	1.1	0.4	0.8	-0.1
1970-1990	1.3	0.4	0.7	0.2
1990-2007	0.6	-0.1	0.6	0.1
1870-1913	0.0	0.1	0.0	0.0
1913-1970	0.9	0.3	0.6	-0.1
1970-2007	1.0	0.2	0.7	0.1
1870-2007	0.6	0.2	0.4	0.0

Table A.15 Human Development and its Dimensions: Sub-Saharan Africa, 1870-2007

Panel A: Levels

	HIHD	Life Expectancy	Education	Adjusted Income
1870	0.027	0.021	0.005	0.168
1880	0.029	0.021	0.006	0.171
1890	0.031	0.021	0.008	0.182
1900	0.034	0.024	0.009	0.189
1913	0.037	0.026	0.010	0.203
1929	0.050	0.035	0.017	0.205
1938	0.062	0.051	0.022	0.215
1950	0.081	0.076	0.030	0.231
1960	0.108	0.098	0.049	0.263
1970	0.139	0.123	0.072	0.301
1980	0.173	0.146	0.117	0.304
1990	0.185	0.161	0.138	0.282
2000	0.194	0.159	0.165	0.276
2007	0.220	0.172	0.197	0.314

Panel C: HIHD Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	0.6	0.0	0.5	0.1
1880-1890	0.8	0.0	0.5	0.2
1890-1900	0.9	0.4	0.4	0.1
1900-1913	0.8	0.2	0.4	0.2
1913-1929	1.8	0.6	1.1	0.0
1929-1938	2.4	1.4	0.9	0.2
1938-1950	2.2	1.1	0.9	0.2
1950-1960	2.9	0.9	1.6	0.4
1960-1970	2.5	0.7	1.3	0.4
1970-1980	2.2	0.6	1.6	0.0
1980-1990	0.7	0.3	0.6	-0.2
1990-2000	0.5	0.0	0.6	-0.1
2000-2007	1.8	0.4	0.9	0.6
1870-1913	0.8	0.2	0.5	0.1
1913-1950	2.1	1.0	1.0	0.1
1950-1970	2.7	0.8	1.5	0.4
1970-1990	1.4	0.5	1.1	-0.1
1990-2007	1.0	0.1	0.7	0.2
1870-1913	0.8	0.2	0.5	0.1
1913-1970	2.3	0.9	1.2	0.2
1970-2007	1.3	0.3	0.9	0.0
1870-2007	1.5	0.5	0.9	0.2

Table A.16 Catching-up in Sub-Saharan Africa, 1870-2007

Panel C: HIHD Catching-up Growth and its Decomposition (%)

	HIHD	Contribution of Life Expectancy	Contribution of Education	Contribution of Adjusted Income
1870-1880	-0.4	-0.2	0.0	-0.2
1880-1890	-0.6	-0.7	0.0	0.0
1890-1900	-0.2	-0.2	0.1	-0.1
1900-1913	-0.1	-0.2	0.1	0.0
1913-1929	0.6	0.0	0.8	-0.1
1929-1938	1.4	0.8	0.4	0.1
1938-1950	1.1	0.3	0.6	0.1
1950-1960	1.5	0.3	1.1	0.0
1960-1970	1.3	0.4	0.9	0.0
1970-1980	1.3	0.1	1.4	-0.2
1980-1990	-0.4	-0.1	0.2	-0.4
1990-2000	-0.8	-0.7	0.1	-0.2
2000-2007	0.6	-0.4	0.6	0.5
1870-1913	-0.3	-0.3	0.1	-0.1
1913-1950	1.0	0.3	0.7	0.0
1950-1970	1.4	0.4	1.0	0.0
1970-1990	0.5	0.0	0.8	-0.3
1990-2007	-0.2	-0.6	0.3	0.1
1870-1913	-0.3	-0.3	0.1	-0.1
1913-1970	1.1	0.3	0.8	0.0
1970-2007	0.2	-0.3	0.6	-0.1
1870-2007	0.4	0.0	0.5	0.0

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