Consequences of growth: Living standards and inequality

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Consequences of growth: living standards and inequality, 1700-1900[1]

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1. Introduction

The evolution of living standards during the period of early industrialization has been a hotly debated topic. Indeed, at least four major debates have to be mentioned in any review of this issue. The initial, classic debate concerns the consequences of the Industrial Revolution on living standards – in particular in England, although similar discussions have been going on for other countries. The three subsequent debates have refined the initial debate by including comparisons with other parts of the world. The second of the four debates relates to the Little Divergence: why is it that North-western and Southern Europe grew apart? The third of the four adds a further international dimension: in the 'Great Divergence' debate the issue is at what time did the standard of living of the population of Western Europe start to diverge significantly from that of the rest of the world, in particular from China. Kenneth Pomeranz (2000) maintains that this did not happen until the final decades of the 18th century. Specifically, up until about 1780 the standard of living of the Chinese was the same, or nearly the same, as that of the inhabitants of the UK. A fourth, related, debate concerns the comparison of well-being between the UK and the US (or before 1776, the North American colonies). New research by, amongst others, Allen et al. (2012) and Lindert and Williamson (2015) concludes that the standard of living of North American settlers was at least on par with, and probably even higher than, that of English workers.

These debates link up with the literature, which suggests that there was an 'early growth paradox': that the growth of GDP that can be estimated for industrializing countries did not result in matching increases in the standard of living of the labouring class (Komlos 1998). The link with inequality is obvious: part of the explanation for the paradox appears to be the rise in income and wealth inequality during early industrialization.

These debates about historical trends and comparisons have taken place against the background of a more general discussion about how to measure well-being. Thanks to work by

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Kuznets, Maddison and others, GDP has come to be used as the key measure of the economic performance of countries. It is, however, becoming increasingly clear that well-being is a multi-dimensional phenomenon, including health, education, political justice, personal security, and so on, all of which cannot be ignored when studying historical changes in the standard of living (Van Zanden et al. 2014). However, data on these other dimensions are often scarce, and it is not clear *prima facie* how to weight these different indicators. The contribution of this chapter is to present estimates for the three dimensions of the Inequality-adjusted Human Development Index (IHDI) – real income, life expectancy, and education – to discuss trends and international disparities for the period 1700-1900, and, finally, to present a set of estimates of that IHDI for the countries concerned.

2. Real Income

Starting with the first dimension, real income, the estimates as presented by Maddison and the Maddison project that followed in his footsteps are at the moment arguably the best estimates of the purchasing power of a population. The recent revision of the Maddison dataset has tried address as best as possible the problems of comparing real incomes in time and space (Bolt and Van Zanden 2018). Various updates for North-western Europe have been made by, for example, Van Zanden and Van Leeuwen (2012) for Holland and Broadberry et al (2015) for England and Wales. Largely confirming the start of the industrial Revolution in the late-18th (England) or late-19th (Netherlands) century, the main contribution of these new studies has been the conclusion that per capita income in North-western Europe had already been exceeding subsistence levels prior to 1700.

International comparisons have also increased in number. For the Great Divergence debate these recent updates have produced highly relevant results: whereas both Pomeranz and Maddison thought that GDP per capita (or more generally, the standard of living) in China was more or less stable between 1500 and 1800, the new research suggests that this conclusion may have been too optimistic, and that real incomes were declining already in the 18th century (Table 1b). At the onset of our period of interest, in 1700, there is a substantial gap between the most advanced economies of Europe – England and the Netherlands – and China, but GDP per capita in the latter compares well with that in the rest of Western Europe (and seems to be higher than for India). Yet, at the end of the 19th century, it is argued that real wages in China were comparable to those of India or even Africa (Frankema and Waijenburg 2012).

Table 1a. GDP per capita in 1990 international dollars PPP

	UK	Netherlands	Germany	Italy	France	Spain	Poland	Russia
1700	1,517	2,123**	942	1,404*	1,065	865	619	540
1800	2,103	2,632**	989	1,419*	1,119	944	567	639
1850	2,725	2,376	1,431	1,613*	1,601	1,073	620	757
1900	4,776	3,337	2,992	2,050	2,918	1,683	1,698	1,149

Note: * Northern Italy, ** Holland

Source: Maddison Project Database, version 2019. Bolt and Van Zanden (2018); England from Broadberry et al (2015); Holland from Van Zanden and Van Leeuwen (2012).

Table 1b. GDP per capita in 1990 Intl dollar PPP

	Argentina	Brazil	Mexico	USA	Australia	India	China	Zimbabwe
1700			928	1,112		731	1089	
1750			815			672	749	
1800	933	545	821	1,601	519	650	654	
1850	1,254	545	663	2,284	1,980	596	540	300
1900	2,882	550	1,146	5,055	4,023	631	611	400

Sources: see Table 1a; data for Zimbabwe from Prados de la Escosura (2012), for India Broadberry et al (2014), and for China from Xu et al (2017).

The gap between the North Sea region and the rest of the world increased due to the growth of real incomes in the West and its decline in of Asia. Not all European countries did well, however. As Cvrcek (2013), for example, points out, the further East and South one goes,

the more real wages stagnate, with Poland and Italy being examples of countries suffered such stagnation until the mid-19th century.

For the Americas, a debate remains about their relative position in the global economy. Whereas Acemoglu et al. (2002) ranked North America substantially behind Latin America up to 1800, and Coatsworth (2008) argues for a smaller gap, Allen et al. (2012), using so-called subsistence ratios, showed income per worker in the British colonies in the 18th century to be already higher than in Latin America, and even on par with North-western Europe. The new estimates in Table 1b also confirm the positive assessment of real income growth in North America.[2]

3. Population and life expectancy

The traditional story about developments in life expectancy is that it was very low until the Industrial Revolution, that it rose very slowly (or barely at all) during the first stage of industrialization, and only started to increase rapidly after the demographic transition of the final decades of the 19th century. Moreover, Pomeranz (2000) maintains that life expectancy in the most advanced parts of China during the 18th century was probably higher than in Western Europe, while even in the settler colonies of the West (such as the USA) mortality was arguably lower than in many other parts of the world (Acemoglu et al. 2001; Table 2b).

As regards this traditional story, it is fair to say that there is increasing evidence that already before 1750 life expectancy in parts of Europe began to improve – slowly, but more or less steadily. The new research that supports this is sometimes based on rather problematic samples. In a detailed reconstruction of the life histories of more than 300,000 famous people, De la Croix and Licandro (2015) show that human longevity began to increase from the 1640s onwards – clearly preceding the Industrial Revolution.

Cummins (2017) analysed a different segment of the European population – members of the nobility – and arrived at even more 'optimistic' conclusions: their life expectancy had already increased during the late-Medieval period (roughly 14th century, spanning the period of the Black Death), but noted that this 'growth spurt' ended in the 16th century. Life expectancy began to increase again around 1650, confirming De la Croix and Licandro's

[2] The same is true for the subsistence ratio literature. Allen (2001) and Allen et al. (2011) developed this method to estimate the number of 'barebones' baskets that could be acquired with that income; he put together a very basic consumption basket that only contained the bare necessities for a family of four (the 'barebones' basket) and estimated how many such baskets a wage earner could afford to buy with his income.

analysis of the famous people. 'Everywhere in Europe, the modern sustained increase in longevity originates around 1650 for European nobility' (Cummins 2017, 431). Since De la Croix and Licandro focused on educated people, the fact that there is apparently a rise in their life expectancy, whereas this is less clear in the population as a whole (according to De la Croix and Licandro 2015), points to the importance of human capital as an explanation of this fundamental shift. This also seems to be confirmed by the positive correlation between the education and age-at-death inequality that we note in Section 6. Yet, as a similar increase occurred in China without education markedly increasing, it has been argued that climate and disease-related factors also played a role (Lee et al. 1994). Indeed, part of the decline in age-specific death rates is related to the lesser impact that warfare – direct violence – had on the nobility, which, being Medieval monopolists of violence, were gradually 'pacified' (Pinker 2011). This suggests that an increase in life expectancy also occurred for commoners in the second half of the 17th and much of the 18th centuries. Then followed what has been coined an 'Engels' pause' (Allen 2009) or a 'Malthusian Intermezzo', i.e. a period in which wages stagnate but labour productivity rises, resulting – in the late-18th century and the first half of the 19th century – in a stagnation of life expectancy.

Table 2a. Mean age at death for the population over 5 years of age

	England	Netherlands	Germany	Italy	France	Spain	Poland	Russia
1700	57.9	56.0	46.6	46.7	59.4	36.6		
1750	55.6	63.5	51.7	50.8	45.2	45.6	49.6	
1800	51.6	60.0	53.3	52.5	46.3	51.8	45.5	49.6
1850	50.3	48.6	51.6	47.6	62.7	51.9	43.6	48.6
1900	55.3	56.2	55.2	56.9	59.1	56.8	46.1	42.6
1930	60.8	60.7	62.3	60.4	53.9	61.8	49.8	42.3
1930 Estimated Life Expectancy at age 5	61.7	63.3	62.6	60.7	58.4	56.9	57.2	56.8*

*European part of the USSR

Sources: Family History Library (https://familysearch.org/search/). We excluded non-representative sources, such as Germans in Russia and Europeans in Africa. For countries with few observations we took 10 years around the benchmark, for example 1690-1710 for 1700. 1930 data were taken from the *Demographic Yearbook 1948*, Table 34.

Table 2b. Mean age at death for the population over 5 years of age

	Argentina	Brazil	Mexico	USA	Canada	Australia	India	China	Zimbabwe
1700	44.4		41.3	51.8	48.6			62.9	
1750	36.0	40.9	34.0	50.8	57.5			55.8	
1800	41.5	43.4	39.0	52.9	55.1	35.7		60.7	
1850	44.3	41.1	39.9	46.7	48.9	39.6	38.2	56.5	
1900	47.6	41.2	45.0	52.9	54.1	52.4		54.2	31.1
1930	55.2	44.6	50.9	58.4	60.2	63.3	37.8*	58.9	31.8
1930 Estimated Life Expectancy at age 5	55.7	47.9	47.9	59.4	62.7	64.1	37.8	52.0*	48**

* Taiwan

** Rhodesia: life expectancy at birth, 1954

Sources: See Table 2a; China taken from Chen (1959); 1930 data for Argentina and Zimbabwe from *Demographic Yearbook 1957*, Table 24; Zimbabwe 1930 from *Demographic Yearbook 1960,* Table 23.

On the basis of similar sources – family trees available on-line – we have estimated the evolution of the mean age at death (as a proxy for life expectancy) of the population over the age of 5 years. To this we added estimates of the mean age at death of Chinese citizens who left a gravestone (collected and published by Chen (1959)). Keeping possible biases in mind[3], it is clear that in the 18th century life expectancy was probably the highest in England, The Netherlands, and arguably China, followed by the USA (or rather the North American colonies). In the first half of the 19th century various European countries appear to have suffered from Engels' pause, but much progress in this respect was made after 1850. Other countries outside North-western Europe, such as Italy, seem to have been less prone to Engel's pause. They often show remarkable stability in life expectancy until the late-19th century, before starting their demographic transitions (Lo Cascio and Malanima 2005), which, however,

[3] Both sets of data are slightly biased: people with many children and grandchildren have a greater chance of being included in family trees, which have usually been put together by their (distant) offspring. The bias in the Chinese sources is even more pronounced, as not many families could afford to pay for a gravestone (moreover, the quality of the stone had to be good enough to survive through the ages and be included in Chen's (1959) survey). To get an idea of this bias, we compare, for 1930, with actual life expectancy for that year (at age 5); clearly, the difference for Western Europe and Argentina is very small, and larger for China.

lasted much shorter than in north-western Europe. Hence, in the 19th century the gap between the various countries disappears.

So far, we have mostly focused on mortality after the age of 5 years, hence ignoring child mortality. This choice is mostly determined by difficulties with the data rather than it being unimportant (Kannisto 2001). Indeed, a common problem is that, frequently, children below the age of 5 years were not recorded in mortality data. Obviously the pre-1850 European increase in longevity we show in Table 2 may be enhanced by declining child mortality (Schofield et al. 1991). That this is not a uniquely European phenomenon can be seen in the case of China (Lee et al. 1994, p. 401). Since China was economically stagnating at the same time as child mortality was declining, this suggests that factors other than just economic ones played a major role.

These early falls in child mortality, however, were restricted to certain world regions and continued after 1800. Even though on a global scale the mortality of children below 5 years of age declined from, on average, 43% in 1800 to 39% in 1900 (Gapminder 2019), the differences were mostly to be found in Western countries: the UK, for example, declining from 33% to 23% and the USA from 46% to 23%; China, India, Latin America and Africa stagnated. Only after 1900 did the share of surviving children outside Europe and the Western offshoots increase significantly.

4. Education

Another important aspect of well-being concerns education. Education gives access to reading (e.g. books), the economy (reading contracts) and social status. Yet, for the 18th century relatively little information about education is available. For the years around 1800, Reis (2005, 202) presents male literacy rates for various parts of Europe that indicate a literate core in Britain, Netherlands, Belgium, and Northern France of approximately 70% versus 20-40% for various other regions in Europe. That these low literacy rates are characteristic for many places is also shown by literacy rates of approximately 40% and 50%, respectively, in late-19th century China and Japan (Rawski 1979; Ohkawa & Rosovsky 1973, p. 8).

Even though these literacy rates around 1800 seem to suggest significant 18th-century development in North-western Europe (Reis 2005), evidence for the pre-1800 period is scarce. Yet, looking at book titles per million inhabitants, we note, with the exception of

England, a growth between 1700 and 1800 for North-western Europe and stagnation for other regions (Van Zanden and Baten 2008; Fink-Jensen 2015). The same can be observed by looking at the ABCC index, i.e. the share of people that were numerate (able to state their age correctly). In 1700 this was, at a low 80%, relatively similar in most parts of the world. Yet, by around 1800 North-western Europe had forged ahead (A'Hearn et al. 2009; Baten 2013; Prayon and Baten 2013).

Table 3a. Average years of education

	UK	Netherlands	Germany	Italy	France	Spain	Poland	Russia
1800	1.7	2.1						
1850*	2.6	3.0	5.4	0.8	4.2	1.5		0.5
1900	5.3	5.6	6.5	2.4	6.3	3.1	2.4	0.7
1930	6.7	6.4	7.7	3.9	7.7	3.8	2.5	2.1

*1870

Sources: Van Zanden and Van Leeuwen (2012); Van Leeuwen and Li (2014); De Pleijt (2018).

Table 3b. Average years of education

	Argentina	Brazil	Mexico	USA	Canada	Australia	India	China	Zimbabwe
1800								0.3	
1850*	1.5	0.5	0.6	5.6	5.7	3.1	0.1	0.8	0.01
1900	2.1	0.7	1.1	7.1	7.1	6.3	0.3	1.2	0.03
1930	3.7	1.3	1.5	8.5	8.5	8.4	0.7	3.9	0.56

*1870

Sources: see Table 3a.

Whereas before 1800 only a modest change could be witnessed, mostly in North-western Europe, the developments in the 19th century are more spectacular with a nearly universal increase in mass education. Even though numeracy data do also exist for this period, average years of education may be a more efficient indicator for the period after 1800, since it also

picks up education above bare literacy; see the data in Tables 3a & 3b. From these data it seems that developed, North-western European countries and 'Western Offshoots' were able to build on their 18th century gains to expand mass education rapidly. Even though other countries improved, they remained far behind UK, USA and the Netherlands.

As regards the drivers of this diversity in educational patterns, it has been argued that in the first phase before 1940, among other things, economy, culture and religion played major roles (Benavot and Riddle 1988, pp. 201-203). This view has been criticized by Meyer et al (1992), based on the observation that the expansion of mass education occurred in many cases before the Industrial Revolution and, hence, cannot be directly related to economic growth. Likewise, mass education, albeit in rudimentary form, started in many places irrespective of culture and religion. Meyer et al offer as an alternative explanation that mass education started as an inherent part of nation-state formation and, hence, followed a global diffuse pattern (Meyer et al 1977). But no matter who is right, only after 1940 did this 'world development of education' start to lead to convergence.

5. Levels of inequality in the Inequality-adjusted Human Development Index (IHDI)

As pointed out in the introduction, we follow the method of calculation of the United Nations (2018) with the dimension indices[4] of GDP, age at death, and education, which together make up the so-called Human Development Index (HDI):

$$HDI = \left(I_{GDP} \cdot I_{age\ at\ death} \cdot I_{education}\right)^{1/3} \quad (1)$$

Yet, well-being is also influenced by inequality: higher inequality is considered to lower overall well-being. Hence, each of the three dimensions is multiplied by its 1-inequality, implying that if inequality is equal to zero the Inequality-adjusted Human Development Index (IHDI) is equal to the HDI, or proportionally lower if otherwise.[5] This is done using the Atkinson index, which takes a value between 0 and 1 that indicates the share in that dimension a person is willing to

[4] The dimension indices are calculated as (actual value - minimum value)/(maximum value - minimum value). Based on Tables 1-3, for GDP per capita we set the maximum value at US$ 7,000 and the minimum value at US$ 400; for years of education we set the maximum at 10 years and the minimum at 0; and for age at death the maximum is set at 70 years and the minimum at 30 years. The GDP dimension index is logarithmic.

[5] In line with the literature, inequality is calculated using the Atkinson index, in which, via the chosen weight, the level of aversion to inequality is set. In our case, we set it at 1.

forego to arrive at perfect equality. For each of our three dimensions, we can derive the inequality-adjusted index:

$$I_x^* = (1 - A_x) \cdot I_x \quad (2)$$

Combining equation (1) and (2), we arrive at the IHDI as follows:

$$IHDI = \left(I_{GDP}^* \cdot I_{age\ at\ deat}^* \cdot I_{education}^*\right)^{1/3} \quad (3)$$

Given that the Atkinson index can be interpreted as the percentage of well-being a person is willing to give up in order to achieve equality, the percentage difference between the IHDI (Equation 3) and HDI (Equation 1) can be interpreted as welfare loss due to inequality. We find that welfare loss does differ among countries but only to a limited extent. For example, around 1700 welfare loss was lowest in North-western Europe at 13.4%, as against 18.7% in Eastern Europe and 16.5% in Latin America. Yet, whereas the percentage welfare loss stagnated in North-western Europe, in all other regions it was declining up to 1900. This decline in welfare loss was, however, reversed in 1930, when all regions – with the exception of North-western Europe, Southern Europe and the Western Offshoots – would start on a path of increasing welfare loss.

In order to tentatively explain these trends, we have to look both at the underlying inequalities (income, age at death and education), and their composite effect on the IHDI. The first factor, income inequality, was rather stable between 1700 and 1900. These patterns are often related to the Kuznets curve, which states that initially income inequality increases with rising income until a certain threshold is reached, after which it then declines. Such a curve was first argued for the 19th-century Industrial Revolution (see, for example, Williamson 1985). Yet, given recent studies pointing to pre-modern (i.e. pre-18th century) growth, it has also been argued that rising inequality as expressed in a Kuznets curve already existed for the pre-modern period (Van Zanden 1995; Hoffman et al 2002).

Whereas the pre-modern rise in inequality for Western and Southern Europe is relatively uncontroversial, its rise during the 19th-century Industrial Revolution is more in doubt (see for example Feinstein 1988). In part, this may be due to more equal growth than hypothesized during the period of the Industrial Revolution. However, this doubt may also be in part caused by the situation that the Kuznets curve is conditional on factors such as the ability of the elite to extract income, factor endowments, population density and colonialism, all of which vary widely across regions and over time.

Indeed, the most remarkable pattern is the decline of income inequality in Latin American after the 18th century, which runs counter to that of Western Europe. Before 1800, inequality was slightly higher than that of Western Europe, mostly driven by a declining land–labour ratio in combination with rising GDP per capita, which allowed for rising extraction of income by the colonial elite. The inequality started to decline on the eve of Latin American independence – caused by decolonization – and continued to decline for the following five decades (1820-1870) due to turmoil, lack of urbanization and poor economic growth (Williamson 2010). However, we need to stress that differences in income inequality around the world in the period 1700-1900 were small. Indeed, as also pointed out by Williamson (2010), Western European countries in similar phases of industrialization had levels of income inequality comparable with those in Latin America, an argument made on a global scale by Milanovic et al (2011).

The second factor, inequality of age at death, again shows more or less stable patterns, with only occasional peaks and troughs. There are two theories that are usually named when explaining this pattern. On the one hand, there is the constancy hypothesis, which argues that differences in life expectancy among social classes is, by and large, constant over time given similar disease environments and socio-economic characteristics (Bengtsson and Van Poppel 2011, p. 345). Short-term deviations due to changes in both factors, such as during the Industrial Revolution are, however, possible. The second hypothesis, based on the work of Antonovsky (1967), is the divergence-convergence theory. It argues that, before ca. 1650, the disease environment was highly virulent and targeted both upper and lower socio-economic classes alike. With the increases in income and levels of sanitation achieved between 1650 and 1850, nutritional causes of death became more prevalent, thus increasing the gap in life expectancy between the elite and common labourers. After 1850, this trend reversed (Bengtsson and Van Poppel 2011, p. 346).

In general, therefore, recent findings on inequality of age at death seem to support the divergence-convergence theory (see, for example, Woods and Williams 1995). Yet, rather than awarding the Industrial Revolution a key role as the main driver of inequality in life expectancy, the main conclusion is that increasing inequality had mostly occurred before that time, due to rising population densities and urbanization (Bengtsson and Van Poppel 2011, p. 354).

The third factor, educational inequality, showed larger differences than for income inequality. Nevertheless, patterns here also show stability in Western Europe versus declining inequality in most other regions up to 1800 and stability afterwards. This is mostly the result

of the high levels of literacy already attained in Western Europe in the 18th century that resulted in lower initial levels of inequality.

Overall, on the issue of inequality, although there seems to be convergence of the non-Western World with North-western Europe in terms of income and educational inequality, age-at-death inequality remained virtually stable between 1700 and 1900. This leads to a fourth factor for explaining declining differences in welfare-loss in the 19th century: when one or two types of inequality are much larger than other types, the loss in HDI tends to be larger. As we have already pointed out, this was the case in most non-Western countries around 1700. Around 1900, however, these differences in inequality were much smaller, hence creating, together with already falling income and educational inequalities, a faster decline in welfare-loss.

6. Global change in well-being

The IHDI results are reported in Tables 4a & 4b and Figures 1-2. [6] Clearly, North-western Europe and the Western Offshoots were leading the world, with a marginally higher score for North-western Europe both in 1700 and 1800. However, during the 19th century the American offshoots advanced more than England and the Netherlands. England, being the first industrializer, experienced the fastest growth in IHDI in North-western Europe during the 18th century, even though this was accompanied by increasing income inequality and falling age at death. In comparison, income growth in the Netherlands started only in the 19th century, but was also accompanied in that period by declining age at death. This suggests the importance of Engels' pause in early industrialization, and it has been debated whether that 'pause' was exacerbated by urbanization taking place in this period (Williamson 1981).

Little Divergence between North-western and Southern Europe is something that comes back in the data as well. Yet, whereas in terms of GDP there was divergence, the IHDI shows an 18th century convergence by Southern Europe, which was mainly the result of increases in

[6] The data have been derived from Tables 1-3. Data lacking for the early 19th, and 18th, centuries, mostly for education, were obtained by linking years in primary school with the numeracy estimates of Baten (2013). Inequality for education and age at death was directly calculated from the underlying data. In cases where data was lacking, again mostly for education, we extrapolated backwards to 1700 using 1-ABCC index as a proxy of educational inequality. Income inequality was obtained from Van Zanden et al (2014) and Moatsos et al (2014) and, where applicable, extended using the Williamson index of income inequality. The index we used is GDP÷real wage. The higher this index, the less income goes to the bottom of society, i.e. income inequality is higher. Various sources were used including Allen (2001), Studer (2008), Allen et al (2011, Frankema and Waijenburg (2012), Arroyo Abad et al (2012), and Challú and Gómez-Galvarriato (2015).

age at death. This Little Divergence in GDP between North-western and Southern Europe has been widely discussed. Some have argued that this divergence in income can be explained by institutional changes (Van Zanden et al 2012; Carmichael et al 2016)[7], while others have argued for the effect of human capital (De Pleijt et al 2016) and international trade (Allen 2001). Nevertheless, given its importance in explaining over-all well-being in Southern Europe, the focus should be on rising age at death. As we have mentioned earlier, this may be related to rising levels of education. Indeed, a simple correlation of our data shows that health and educational inequalities are positively correlated. Likewise, better climate and a more favourable disease environment may have played a beneficial role. Engels' pause in North-western Europe may, however, have obstructed this positive development for that region.

Table 4a. Inequality-adjusted Human Development Index for selected European countries

	England	Netherlands	Germany	Italy	France	Spain	Poland	Russia
1700	0.383	0.357	0.273	0.206	0.296	0.154	0.180	
1800	0.400	0.412	0.352	0.231	0.277	0.238	0.165	0.121
1850	0.426	0.382	0.384	0.229	0.470	0.268	0.183	0.147
1900	0.579	0.561	0.452	0.396	0.584	0.413	0.320	0.171
1930	0.685	0.675	0.530	0.525	0.609	0.509	0.360	0.260

Source: calculations based on Tables 1-3.

[7] But for a critique of this point of view, see Dennison and Ogilvie (2014).

Table 4b. Inequality-adjusted Human Development Index for selected non-European countries

	Argentina	Brazil	Mexico	USA	Canada	Australia	India	China	Zimbabwe
1700			0.139	0.351	0.346*			0.181	
1800	0.176	0.097	0.126	0.389	0.373		0.058	0.142	
1850	0.237	0.094	0.120	0.444	0.426	0.293	0.055	0.159	
1900	0.336	0.111	0.211	0.603	0.577	0.564	0.085	0.195	0.022
1930	0.485	0.191	0.276	0.719	0.719	0.549	0.120	0.316	0.089

*1750

Source: calculated based on Tables 1-3.

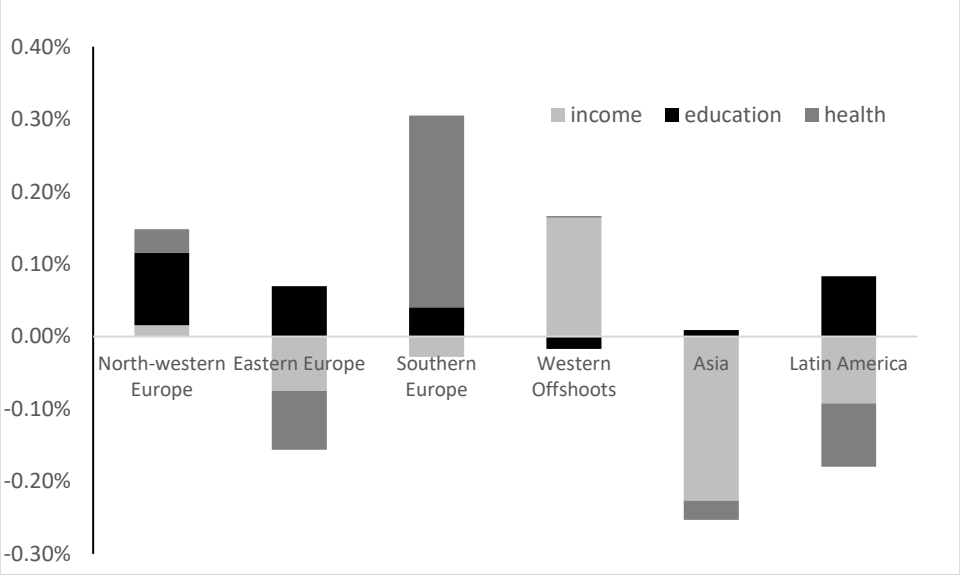
The rise in IHDI of North America showed a very different pattern with, in the 18th century, growth mostly being driven by income, with education being added in the 19th century. This was enough to stay abreast, or ahead, of North-western Europe. An explanation for this was in part stability in age at death, arguably the result of an unchanging disease environment. Another, but related, explanation is the omission of child mortality from our data: by excluding the rapid fall in child mortality in the USA (Gapminder 2019) we ignore most of the increase in life expectancy at birth.

For income growth, again both institutional and factor endowment explanations exist. In terms of institutions, it links up well with the Little Divergence: the institutions transplanted from England to North America, such as secure property rights and small government, were more efficient in enhancing market exchange than those transferred from Southern Europe to Latin America (North et al 2000; see also Field 1985). For factor endowments, it has been argued that those countries with plantations based on slave labour generated economic and social inequalities (Engerman and Sokolov 1997; Sokoloff and Engerman 2000). Another reason for creating extractive institutions, as brought forward by Acemoglu et al (2001), was

high settler mortality in Latin America, which resulted in extractive institutions being created by the colonizers.[8]

Of course, in almost all cases societal well-being was the product of a combination of the colonizer being willing to extract wealth – via force and/or trade – and the available factor endowments. Low labour costs and a high concentration of land in the hands of a few resulted in systems like *encomienda* in Latin America, where rich men were granted land and forced indigenous labour (after abolishing forced Indian labour, African slaves were increasingly imported). This concentration of wealth in a few hands resulted in high levels of inequality (Milanovic *et al.* 2011; De Ferranti et al. 2004).[9] This was also true for education (Allen et al. 2012, 865): Juif and Baten (2012), for example, show that numeracy among the Inca was about half of that of the Spanish conquistadores. In North America, the scarcity of labour generated high wages, which, combined with less profitable crops, created fewer opportunities to generate excessive inequality of wealth (Allen et al. 2012).

Figure 1. Compound annual per capita growth rate of IHDI, ca. 1700-1800

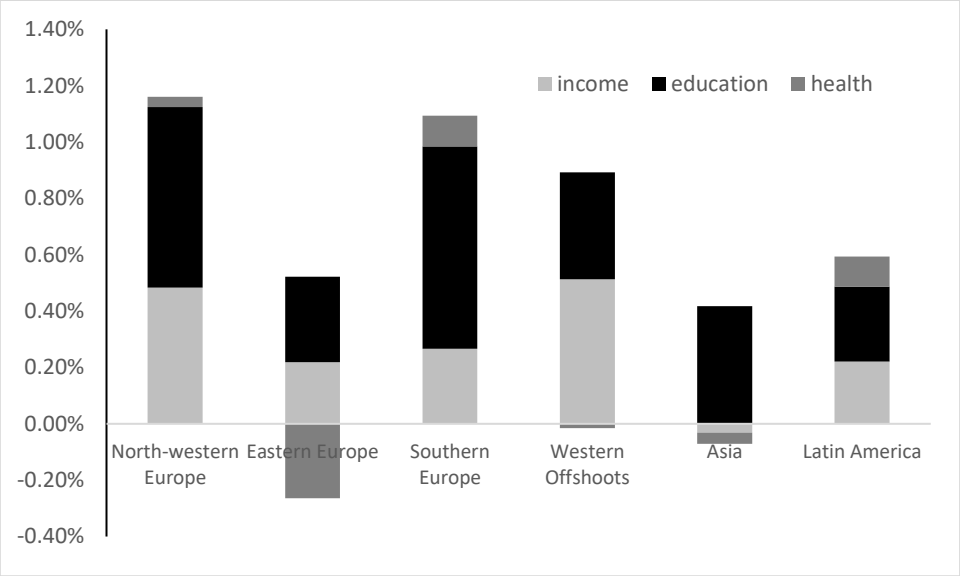


Note: North-western Europe = Netherlands and UK; Eastern and Middle Europe = Germany, Poland and Russia; Southern Europe = France, Spain and Italy; Western Offshoots = Australia, Canada and USA; Asia = China and India; Latin America = Argentina, Brazil and Mexico.

Source: See Tables 4a & 4b.

[8] For a critique see Albouy (2012).
[9] For a critique see Williamson (2010).

Figure 2. Compound annual per capita growth rate of IHDI, ca. 17000-1900



Note: North-western Europe = Netherlands and UK; Eastern and Middle Europe = Germany, Poland and Russia; Southern Europe = France, Spain and Italy; Western Offshoots = Australia, Canada and USA; Asia = China and India; Latin America = Argentina, Brazil and Mexico.

Source: See Figure 1.

The discrepancy between the West and Asia, specified in the Great Divergence debate, can in many ways be considered an extreme variant of what happened in Latin America, with the same pattern of negative growth in income and health in the 18th century and minor improvement in the 19th century. The explanation of the effect of this strongly negative growth in well-being for Asia consists, for the 18th century, of per capita income decline, which, for the 19th century, is compounded with a rise in education. Our results thus do not confirm the view developed by the 'California school' that up to the 18th century China and India were on a par with North-western Europe (Pomeranz 2000; Parthasarathi 2011). In reality, the gap with England and Netherlands (Holland) was in 1700 already large for both China and India, which is confirmed by most recent research (e.g. Allen 2007; Allen et al. 2011; Xu et al. 2017; Broadberry et al. 2018).However, in 1700 the gap between East Asia and parts of Southern and Eastern Europe was very limited.

The dating of this gap is of importance for its explanation. For example, the argument that India and China were unable to develop their own industrial revolution due to Western

(colonial) policy loses its point because divergence had, in fact, started earlier (Parthasarathi (2011) for India; the Sprouts of Capitalism debate in China). This clears the way for explanations that reinforce the importance of factors of production. Clark (1987), for example, argues for higher labour productivity in England, with corresponding higher wages, thus clearing a path for increases in technology. Pomeranz (2000) in explaining 19th century Chinese stagnation, argued that, compared to China, England was blessed with coal reserves and overseas consumer markets. A similar "stroke of luck" for Europe can be distilled from Rosenthal and Wong (2011), who claim that the Continent's violent past resulted in higher demand for capital intensive technologies and rising urbanization, both of which led to growth.

7. Conclusion

The period 1700-1900 witnessed a most dramatic break with previous global economic history: the transition from a more or less stagnant, or at best – in Western Europe – very slow growing, economy to the 'modern economic growth' of the 19th and, ultimately, 20th centuries. This radical break, also known as the Industrial Revolution, began in the region of the world that already before 1800 attained the highest levels of real income, a region where other dimensions of well-being –life expectancy and education – had also attained relatively high levels. In the UK this was indeed closely linked to the process of industrialization, but in other parts of the North Sea area comparable changes in services and agriculture produced comparable advances in well-being. Similarly, in the Western Offshoots the standard of living was often as high as in the most advanced parts of Europe, even though the industrialization processes often started much later than in the UK. To explain why the Offshoots were able to achieve such high levels of well-being already before their Industrial Revolution – for which a wide variety of institutional and factor-endowment theories have been suggested – is beyond the scope of this chapter.

The 'Great Divergence', the 19th century combination of rapid economic growth in the core regions of the world economy and stagnation in the rest, was in many ways a continuation of trends already at play in the 18th century. In the West occasional signs of a 'growth paradox' can be found, in the sense that GDP growth did not always lead to comparable advances in other dimensions of the standard of living. Yet, the overall tendency is one of a long-term improvement in well-being. In the non-Western world, however, the picture is more mixed, with some countries such as Argentina registering increased prosperity, but giants (in terms of

population) such as China and India showing hardly any development. Disparities in the world economy sharply increased as a result. The world in 1900 was much more unequal than in 1700.

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